Appendix B ECONOMIC CONSIDERATIONS:

B-01 Areas of Consideration:

The study area comprises a stretch of the west bank of the Rio Grande extending from Bridge Blvd. south to the I-25 crossing over the Rio Grande. The study area is largely contained within Bernalillo County, New Mexico. The city of Albuquerque, NM is the largest population center within the county, containing 448,607 people (2000 census). The 1990 U.S. Census determined that 384,915 people lived within that city. While the county largely serves as bedroom communities for the Albuquerque metropolitan area, Valencia County also contains some key businesses and infrastructure operations. Some of the area's largest employers include the Central New Mexico Correctional Facility, the Santa Fe Railway, and various governmental agencies.

B-02 General Computational Procedures:

The assumptions and procedures used to analyze and quantify the economic variables are presented in this section. The hydro-economic model used to develop expected annual damages is based on discharge-frequency, stage-frequency, and stage-damage curves used to develop a damage-frequency curve. Stage-percent damage curves express dollar damages resulting from varying depths of water based on a percentage of the value of structure and contents.

Each surveyed property is assigned to a category (e.g., commercial, residential, public, outbuilding, transportation facilities, utilities, and vehicles) with as many subcategories (e.g., contents) as necessary, and details of ground and first floor elevations are noted. Each category has an associated depth-damage relationship expressed as a cumulative percentage of value for each foot of inundation. The depth-damage relationships were derived from historical data obtained from insurance companies, a recent commercial content survey, the Flood Insurance Administration, and Corps of Engineers experience. Note that the 2001 residential curves developed by the Institute of Water Resources (IWR) were used; thus, the residential content damages are a percentage of structure value. Table 1 depicts the depth-damage relationships used in this study.

The elevation of each property (determined from topographic maps and field investigations) is aggregated by location and structure type to compute the vertical distribution of damageable property at that location. Each property category is then tabulated in terms of the number of units, average value per unit and aggregate value, within consecutive inundation depth ranges for each location.

For each category, the aggregate value of property at each flood depth is combined with the depth-damage relationship to compute total, single event damages for each level of flooding. An application created with the @RISK program (Palisade Corporation) was used to develop stage-damage relationships incorporating uncertainty distributions.   Repeating this process with the discharge rates from appropriate HEC-LIMIT data sets provides the discharge-damage relationship for the category, described as a mean value and a standard deviation (SD). Tables 4A and 4B display the single occurrence damages by category for the floodplain evaluated. This is combined with the discharge-frequencies of the reference floods to produce damage-frequency relationships. Damage-frequency relationships provide probable average annual damages for each category under the conditions of each reference flood. Tables 5A and 5B presents the average annual damages computation.

Residual, average annual damages for each alternative, including the without project alternative, are obtained through consecutive iterations of the above computations for each alternative. The difference between damages in the without-project alternative and the residual damages for each alternative is the value of the benefits (inundation reduction) for each alternative.

B-03 Sources of Uncertainty:

The major sources of economic uncertainty include many of the same variables identified above in the damage estimate analysis and others noted as follows:

1. Value of property;
2. Value of property contents;
3. Flood stage at which damage begins;
4. First floor elevations of structures;
5. Responses to flood forecasts and warnings;
6. Flood fighting efforts;
7. Cleanup costs;
8. Business losses;
9. Depth-percent damage curves;
10. Estimate of the stage associated with a given discharge;
11. Estimate of damage for a given flood stage; and
12. Estimate of future land use
13. Estimate of discharge associated with given frequency

Principal sources of error affecting the stage-damage relationship were examined in a risk and uncertainty framework. Those sources of error are 1) errors associated with the damageable property elevation, 2) errors associated with the values of structures in the floodplain inventory, 3) errors associated with values of structure contents in the floodplain inventory, 4) errors associated with the damage functions used against the floodplain inventory.

Elevation of damageable property: A standard deviation of 0.2 feet was used to account for the uncertainty associated with the elevation of damageable property. In the Southwest Valley, the flooding depths are relatively shallow and the flood plains are large and flat; therefore, an elevation difference of one foot could potentially double the damages associated with a given stage. The 0.2 feet standard deviation was used for three reasons. First, since the economic inventory was conducted by a visual windshield inspection, the first floor elevations of structures were estimated rather than measured. Second, the aerial mapping scale and contour interval of 1 foot introduce a source of uncertainty relative to elevation. Third, digitized computer programming allows excellent interpolations within the contour lines.

Structure value: It was assumed that the estimated structure value, which was derived from county assessor records, sales information, and a field inventory, has a standard deviation of 15 percent of the structure value.

The structure inventory values and associated error distribution were then evaluated to compute floodplain inventory that incorporates errors concerning structure value. It was assumed that the estimated structure value (derived from field inventory and consultations with Realtors, insurance agents) could be off by 15% of the structure value (90% confidence). The floodplain inventory was then assessed using these assumptions, dropping all values more than three standard deviations from the reported (mean) value. The resulting distribution of structure values with error would contain 99% of possible values given the assumptions above.

Content value: The error distribution associated with content value varied by structure type. In terms of average annual damages for residential contents the damage curves relate to the structure value rather than the content value.

The content value error distributions varied by structure type. Corps guidance stipulates content values should be held to no more than 50% of structure values, though local insurers note that contents are valued at 55-60% of structure value, or more. New guidance issued by Corps higher authorities developed generic residential content stage-damage relationships as a function of the structure value, which was used here. Commercial and public contents used standard deviations that were equal to 35% of the content value to develop the content value with error. All content relationships were truncated to eliminate the possibility of negative values.

Stage-percent damage relationship: Stage-percent damage curves are among the most important and least exact data in benefit estimation. Stage-percent damage curves express dollar damages resulting from varying depths of water based on a percentage of the value of structure and contents. Errors associated with the stage-damage functions were applied after the structure and content values were determined. The errors associated with the stage-percent damage relationship were evaluated for structures and contents of all occupancy types. The standard deviations used were those estimated by IWR for residential structures and contents, which comprise the majority of the damages.

The errors associated with the stage-%damage relationship were evaluated for structures and contents of all occupancy types. It was assumed that the damage value used +/- 40% of that value would contain the true damages for a given stage 95% of the time. Errors associated with the stage-damage functions used were applied after the uncertain structure and content values were determined.

B-04 Value of Property:

A survey of structures within the floodplain was initially conducted in 2000 and reevaluated in 2002, to evaluate the flood threat to the area. The property examined was categorized into residential, commercial, and public buildings, as well as, vehicles, streets and utilities, and outbuildings (sheds and detached garages). Tables 2A and 2B show number of structures for present and future conditions. Value of damageable property units affected by the 10-percent, 4-percent, 1-percent and 0.2 percent chance flood events are presented in Tables 3A and 3B. The logic used to populate these tables effectively goes "If structures in the various locations within the study area is damaged by a given event's mean stage, include that structure in number of structures and structure value in value of damageable property. If a structure is not damaged by a given event stage, number of structures and value of damageable property is zero." Tables 2A and 2B represent a statistical mean and standard deviation for the number of structures within a given event's floodplain, which, given the uncertainties surrounding first floor elevation identified above, were sometimes in the mean stage identified for a given event, and sometimes not. Tables 3A and 3B represent a statistical mean and standard deviation for the value of structures and contents for those properties identified within Tables 2A and 2B, using the error distributions for structure and content value identified in paragraph B-03, above.

Depreciated, replacement residential structure values were computed using Bernalillo County assessor records, which display the assessed value for land in the study area and improvements to that land. Those assessments were then compared to recent sales figures by District Real Estate personnel to establish a factor to be applied to those assessed structure values in order to get the depreciated replacement cost of those structures. That computation was then verified in the field through interviews with Local Realtors, and insurance agents to verify structure ages and replacement costs of structures in the floodplain. A windshield survey of selected structures was also conducted to establish an average first floor elevation of structures in each damage reach using the factors and methods described in the Real Estate Cost Handbook, published by the Marshall and Swift Company. Commercial and public structures were inventoried in the field survey using the Marshall and Swift Valuation Service.

Content values were estimated from several sources. Residential content values were not necessary due to use of new generic residential structure and content stage-damage functions, which computes content damages as a percentage of structure value. Commercial and public content values were estimated primarily from surveys of similar establishments and interviews.

Vehicle estimates were determined using in-house data and published surveys. Total vehicles in the floodplain depicted are for residential structures and apartments. The typical household in Bernalillo County has two vehicles. It is assumed that one of these vehicles is driven out of the floodplain before any flood event. The remaining vehicles were distributed to the residential structures located within the 0.2 percent chance exceedance flood plain. It was assumed that all business-related vehicles were already evacuated from the floodplain. Other than these assumptions, no efforts to compute a mean and standard deviation for number or value of damageable vehicles, or an event-damage relationship.

Streets were measured from floodplain maps to determine quantities susceptible to flooding for each event. It was assumed that utility quantities (expressed in linear feet) were identical to street quantities. Damage estimates were calculated from published data provided by the Galveston District. Emergency costs were derived from locations that have had similar flood characteristics. Other than these assumptions, no efforts to compute a mean and standard deviation for number or value of damageable property, or an event-damage relationship for streets, utilities, or emergency costs.

B-05 Potential Flood Damages: It is currently estimated that the mean 1-percent chance exceedance flood would cause damages of about $9.9 million in the study area ("Year 1" conditions) up to $14.2 million in the future ("Year 27" conditions). Interpolating damages between the present and future conditions (using methods described in paragraph B-06 of this appendix), discounting damages to present value, and summing those damages over the project lifetime, the mean 1-percent chance event would cause an average of $11.0 million in damages. Tables 4A and 4B presents the single occurrence damages associated with the 10%, 4%, 1%, and 0.2% chance flows in the assorted floodplains. It was assumed that flood events of a magnitude greater than the 50% chance event damage structures, contents, and vehicles in the flooding areas analyzed. It should be noted that many intangible damages (such as loss of life, disruption to community services, and increased health risks) that could occur because of flooding are not represented in these damage values.

Emergency costs include the costs of evacuation, reoccupation, disaster relief, and other similar expenses. The emergency costs incurred are dependent upon factors including number of residences damaged, evacuated, etc. Factors used in this study are based upon historical flooding in Carlsbad, NM and interviews with American Red Cross personnel.

Future flood damages resulting from basin development or growth in the flood plain have not been included. The City of Albuquerque and Bernalillo County have adopted ordinances, which require new development within the 1 percent chance flood plain to be built at or above the median discharge 1 percent chance flood level. Second, the study area is largely urbanized, such that any future growth due to infill is not expected to be significant. Also, new development may not increase the damages to existing structures.

B-06 Average Annual Damages:

Risk and uncertainty analysis was used to derive average annual damages. Hydrologic and hydraulic uncertainty was combined through Monte Carlo simulations. A total of 100,000 simulations were run by reach and damageable property category for the present, without-project conditions (identified in this appendix as “Year 1”). Separate analyses were performed for each reach to account for increasing flood volumes that would occur in the future (as a result of urbanization uphill and outside of the study area, and a “96 hour rule” which prevents retaining water), without-project conditions (identified in this appendix as “Year 27”), and then discounted to compute equivalent average annual damages. When flooding from all sources is considered, the Southwest Valley faces the risk of approximately $1.7 million in average annual damages to structures and contents. Minor damage categories such as vehicles, streets, utilities, and emergency costs, which were not computed using risk and uncertainty techniques, increase the average annual damages to over $1.8 million. Tables 5A and 5B present the average annual damages that could occur from flooding in the study area without any flood protection, by land use category and floodplain, for present and future conditions. Note that no benefits for intensification within the floodplain are claimed. Table 5C presents the Equivalent Annual Damages (EAD) for the study area. Table 8A-8C present equivalent annual damages and benefits for locations where structural flood control measures are feasible.

B-07 Nonstructural Alternatives Evaluation:

Because the large number of structures (704 parcels) located within the floodplain that would be candidates for relocation, raising of structures and flood proofing measures to reduce flood damages were all found to be infeasible. Much of the damageable property is adobe or older structures; flood proofing would result in cost prohibitive structural improvements. Elevating existing structures and ring levees were also dropped from consideration as they transfer the flood problem to neighboring properties. Since much of the flood plain is a residential area, evacuation and relocation plans were deemed to be not only economically, but socially unacceptable. While floodplain management is an effective method of preventing damages to future development it does little or nothing to reduce damage to existing structures. The City of Albuquerque is a participant in the National Flood Insurance Program and vigorously enforces floodplain regulations to insure that structures are built either above or out of the 1% chance exceedance event floodplain.

B-08 Alternative Considered:

Several alternatives were formulated for several of the basins within the study area, largely comprised of retention basins and conveyances for floodwater. Alternatives were sized to contain volumes associated with the 10% chance exceedance event to the 0.2% chance exceedance event. Basin sizes were evaluated in a framework incorporating elements of risk and uncertainty in hydrology, hydraulics and economics. Any analysis of alternatives must include the no action alternative. If no action is taken, the floodplains defined by the study will continue to suffer damages described in Tables 5a and 5b.

The table, which follows, describes how the alternative retention pond sizes were selected to contain specific flood events. Given the Risk and Uncertainty framework used in plan selection, it is inappropriate to describe an alternative in terms of "level of protection." However, the terms “10-yr project,” “25-yr project,” etc… describe a project size that corresponds to containing a mean event volume. Project performance measurements (formerly known as Reliability) are addressed in paragraph B-12.

ALTERNATIVE POND SIZES EVALUATED

Alternative	Description
No action	No action
Alternative 4	hypothetical alternative smaller than Alternative 3
Alternative 3	smallest alternative size
Alternative 2	larger than Alternative 3
Alternative 1	largest alternative size

B-09 Average Annual Cost:

Table 7 shows, for each alternative and future situation considered, construction cost, interest during construction, total investment cost, interest and amortization costs, OMRR&R costs, and total average annual costs. Table 7A shows a sample interest during construction calculation for the NED plan. The period of construction is assumed to be 30 months for one phase with equal midmonthly payments and no project benefits until the project is complete. The current Federal interest rate of 5.625% was used in the calculations.

B-10 Equivalent Average Annual Benefits:

Equivalent average annual benefit computations for the flood control alternatives considered are depicted in Tables 8A-8C. Benefits were computed for the future, with-project condition and applied throughout the project life. Benefits for project baseline year are expected to be substantially higher, but were not documented in an effort to save study time and money. Average annual residual damages calculations for those alternatives considered are also presented in Tables 8A-8C. Tables 9 and 10 include probability that the value measured (residual damages or net benefits) for the structures and contents subtotal, identified in Table 5C will exceed a specific value. Only structures and contents where mean and standard deviations for values, were included in the benefit calculations. These tables measure the uncertainty distribution about the measurements. Table 11 shows the expected B/C ratio and the error distribution of the B/C ratio in the baseline year. The recommended alternative consists of an enlarged Isleta drain with a collection of feeder drains scattered throughout the study area. Specifically, the plan that maximizes net benefits is the smallest of the three alternative sizes investigated. Benefits for the post project condition were computed by changing the event-volume relationship, and were verified by redrawing the 10%, 4%, 1% and 0.2% chance exceedance floodplains to remove damageable property from these events. Benefit calculations for the alternative are displayed on Tables 8A through 8C.

Administrative costs of flood insurance policies represent an NED loss. Those administrative costs are approximately $133 per flood insurance policy (fiscal year 2003). FEMA has reported that 12.1% of New Mexico properties in the 1% chance floodplain have flood insurance. FEMA officials contacted indicated that Doña Ana and Bernalillo counties had higher participation rates, but no quantities were available, and the state average participation rate was applied to the structures within the study area's 1% chance exceedance floodplain. A benefit of the structural alternatives considered is the savings of those administrative costs. If the recommended plan captures the 1% chance exceedance event more than 95% of the time, administrative costs associated with flood insurance policies no longer required could be claimed as benefits. The recommended plans do not contain more than 95% of those events, and no flood insurance benefits are claimed for alternatives providing protection for less than 95% of the 1% chance events. Table 9 notes the flood insurance benefits based on most recent administrative costs and the available statewide participation rate applied to the area under consideration.

B-11 Reasonableness of Project Benefits

Sensitivity runs were performed to verify the reasonableness of the project benefits. Assuming that all structures in the post-project floodplain were inundated to a residual depth of 1' starting at the 10% chance event, equivalent annual residual damages for the smallest project jump from $47,000 to $149,000 (February, 2004 price level). The equivalent annual benefits of Alternative 3 are $1,697,200, which indicates these higher residual damages wouldn't significantly alter the benefits attributable to the project. A similar sensitivity run was performed on Alternative 2, to ensure that the project benefits didn't significantly change. The post-project floodplain for Alternative 2 is essentially the same as Alternative 3. For purposes of this sensitivity analysis, then, Alternative 2 would perform exactly the same as Alternative 3. Paragraph B-13 of this appendix discusses the effects of these sensitivity runs on the benefit/cost ratio and the computation of net benefits.

B-12 Benefit-Cost Comparisons and Plan Selection:

Table 7 displays annualized equivalent annual benefit and cost information, discounting future benefits of flood control and amortizing those benefits over the project life. Table 7 shows the average annual benefits, average annual costs, net average annual benefits, for alternatives considered for project baseline +50 years. Benefits for project baseline year are expected to be substantially higher, but were not documented in an effort to save study time and money. Table 11 displays the benefit/cost ratio for alternatives considered, including the NED plan for those same time periods. Tables 10 and 11 also display confidence interval information for net benefits (Table 10) and the B/C ratio (Table 11).

Several alternatives with various sizes meet the Federal interest. The NED plan was determined to be an enlarged Isleta drain, and feeder structures at ponds IS06 to IS15 (10% chance). A hypothetical smaller plan was designed and costs were computed, noting that decreased storage capacity requires an increased conveyance capacity within the project design. Therefore, alternatives smaller than Alternative 3 would achieve cost savings in channel earthwork excavation, at the cost of increased costs to modify 11 road crossings. It's assumed that a smaller project would have higher residual damages, and therefore, fewer benefits, but for purposes of this analysis, the benefits from Alternative 3 were used. Figure 1 shows the optimization curve generated from the three formulated alternatives and this hypothetical smaller alternative (Alternative 4).

B-13 Reasonableness of Benefit/Cost Ratio and Net Benefits:

Using the information developed in the sensitivity runs described in paragraph B-11, above, sensitivity runs were conducted to measure the impact of residual damages on the benefit/cost (B/C) ratio and the net benefits attributed to Alternatives 3 and 2. The higher residual damages from the sensitivity run would lower the B/C ratio from 1.8, as reported in Table 7, to 1.7, and lowers the net benefits by roughly $102,000. The net benefits reported in Table 7 are $482,700 so applying 1' of flooding to the entire post-project floodplain starting at the 10% chance event doesn't adversely impact Federal interest. Given that Alternative 2 performs identically to Alternative 3, for purposes of this sensitivity analysis, at a higher cost, we see this sensitivity analysis also does not affect plan selection.

B-14 Project Performance: Besides a strict benefit/cost comparison, another measure of the effectiveness of flood protection is its ability to contain damaging floods where there was limited protection before. Limitations of the analysis package preclude a rigorous analysis of project performance, but inspection of the available data could provide decision makers a glimpse of the nature of the flood problem and how the project will act to contain it. Table 12 presents the likelihood of flood volumes being less than or equal to the start of damages volumes indicated for each damage center for the 10%, 4%, 1%, and 0.2% events, respectively. The higher volumes in the alternatives evaluated represent each alternative's ability to either temporarily store or convey flood waters prior to reaching the damage center, and was computed as the net volume reduction of the 0.2% chance event. Location IS15 was unique in that the volume reduction for the biggest alternative was slightly less than the volume reduction provided by Alternative 2, though Corps hydraulic engineers indicate that volume reduction for more frequent events is still more effective, as indicated by the following:

> **Alternative 3 -** IS-15 - Since the project reduces the 100-year flood plain from 148.55 Acre-ft to 45.54 Acre-ft use **VOLUME = 103.01 Acre-ft**

Alternative 2 - IS-15 - Since the project reduces the 100-year flood plain from 148.55 Acre-ft to 42.29 Acre-ft use **VOLUME = 106.26 Acre-ft**

Alternative 1 - IS-15 - Since the project eliminates the 100-year flood plain in this segment use **VOLUME = 148.55 Acre-ft**

Two scenarios were developed to describe the effectiveness of the various alternatives considered.

Vulnerable location identified - A reference point was selected in the without project scenario where the flood flow would exceed the start of damages first, or most often. Project performance was evaluated at that reference point for all project sizes that effect that location. For each alternative and project size, that reference point was selected in the protected area where residual flows for the events analyzed would exceed the start of damages most often, wherever that reference point may be. For purposes of this analysis, this reference point is important in that start of damages flows occur most frequently, thus the term "vulnerable location" is applied. The vulnerable location does not move to other reference points as various project sizes are applied to the floodplain. With that in mind, project performance tables indicate only where the preproject condition is worst, as there are several other reference points where project protection is much improved. In the preproject condition, any location excluding is14 represents the vulnerable location, as each location has roughly zero chance of containing the 10% event.

Tables 12-B presents the probability that the alternative, and various sizes of that alternative, would contain the specified events, for this vulnerable location (is10). Table 13 presents the probability that each evaluated alternative would be exceeded on an annual basis damaging flood events. Table 14-A presents the long-term risk of exceedance (likelihood that project will be exceeded over an extended time frame) for indicated time frames. This table answers the question, “What is the probability of project exceedance occurring once in the time period indicated, given the annual risk of failure shown?”

Worst case scenario - Given that each flood protection project could affect several of the reference points that collectively describe the flooding problem, a single reference point was selected where the flood flow would exceed the start of damages first, or most often. For each alternative and project size, a new reference point was selected in the protected area where residual flows for the events analyzed would exceed the start of damages most often, wherever that reference point might be. This scenario tends to discount expected performance of structural alternatives more than the vulnerable location scenario. In the preproject condition, any location excluding is14 represents the worst-case scenario. As Alternative 3 is applied, the worst case moves to is10, where it remains through Alternative 2. The worst-case scenario’s relevant damage center moves to is08 when Alternative 1 is applied. Interestingly, when the project performance is considered as an annual risk of failure, Alternative 1’s worst-case scenario is is15, as the annual risk of failure for is08 (0.017) is slightly less than the annual risk of failure for is15 (0.025).

Table 12-C presents the probability that the alternative, and various sizes of that alternative, would contain the specified events, for the specified scenarios. Table 13 presents the probability that each evaluated alternative would be exceeded on an annual basis damaging flood events. Tables 14-B present the long-term risk of exceedance (likelihood that project will be exceeded over an extended time frame) for indicated time frames. This table answers the question, “What is the probability of project exceedance occurring once in the time period indicated, given the annual risk of failure shown?”

B-15 Plan for Updating Project Benefits in the Future:

At the time that a project update is required, the significant assumptions regarding hydrology and hydraulics will be reviewed. All pertinent economic assumptions shall be reviewed. After determining whether there have been changes in the basic assumptions, the following shall be analyzed:

Residential neighborhoods shall be sampled to determine current values. Real estate agents, appraisers and the Marshall and Swift Valuation Service will be used in updating residential values.

Discussions with local realtors and businessmen combined with field sampling will be made to determine if major changes have occurred to businesses existing at the time of the initial inventory. Important changes affecting structure or content values will be included in the update. As is the case of residential values, the Marshall and Swift Valuation Service and local appraisers and realtors will be contacted regarding commercial values.

After consultation with city planners and examining city building permits; residential, public and commercial growth since the inventory was taken shall be sampled as needed within the flood plain. The growth shall be included, as appropriate, in the updated benefit computations.

The results of the reanalysis shall be documented in a "Special Evaluation Report" (SER).

TABLES:

Table 1

DEPTH-DAMAGE RELATIONSHIPS

(expressed as proportion of property value)

Stage (ft.)	1	2	3	4	5	6	7	8	9	10
Structures										
1 story no bsmt.	0.23	0.32	0.40	0.47	0.53	0.59	0.63	0.67	0.71	0.73
1 story no bsmt. (comm./public)	0.14	0.21	0.26	0.29	0.30	0.41	0.43	0.44	0.45	0.46
1 story w/ bsmt.	0.32	0.39	0.46	0.52	0.59	0.65	0.70	0.74	0.78	0.80
2 story no bsmt.	0.15	0.21	0.26	0.31	0.36	0.41	0.45	0.49	0.52	0.56
2 story no bsmt. (comm./public)	0.16	0.28	0.37	0.43	0.47	0.49	0.50	0.51	0.55	0.58
2 story w/ bsmt.	0.22	0.27	0.32	0.37	0.42	0.47	0.52	0.56	0.61	0.65
Mobile home	0.44	0.64	0.73	0.78	0.80	0.81	0.82	0.84	0.86	0.88
Metal	0.07	0.10	0.15	0.18	0.20	0.23	0.28	0.33	0.37	0.40
Outbuilding	0.25	0.35	0.41	0.46	0.54	0.65	0.71	0.80	0.85	0.90
Contents										
1 story no bsmt. (Residential)*	0.13	0.18	0.22	0.26	0.29	0.32	0.34	0.36	0.37	0.38
2 story no bsmt. (Residential)*	0.09	0.12	0.16	0.19	0.21	0.24	0.26	0.28	0.30	0.32
1 story w/ bsmt. (Residential)*	0.19	0.22	0.25	0.27	0.30	0.32	0.35	0.36	0.38	0.39
2 story w/ bsmt. (Residential)*	0.14	0.16	0.18	0.20	0.22	0.24	0.27	0.29	0.32	0.34
Mobile home (Residential)**	0.27	0.50	0.64	0.70	0.76	0.78	0.79	0.81	0.83	0.92
Motel, Office, Church (1 story)**	0.35	0.50	0.60	0.68	0.74	0.78	0.81	0.83	0.85	0.87
Motel, Office, Church (2 story)**	0.26	0.39	0.48	0.55	0.61	0.67	0.73	0.78	0.83	0.87
Food Related**	0.55	0.70	0.85	0.90	0.95	0.95	0.95	0.95	0.95	0.95
Gas Station, Car Service**	0.22	0.43	0.70	0.92	0.95	0.95	0.95	0.95	0.95	0.95
Retail (1 story)**	0.18	0.30	0.59	0.70	0.90	0.95	0.95	0.95	0.95	0.95
Retail (2 story)**	0.12	0.22	0.34	0.54	0.74	0.83	0.87	0.91	0.93	0.95
Clothing Store**	0.35	0.45	0.67	0.83	0.95	0.95	0.95	0.95	0.95	0.95
Car Dealership**	0.10	0.72	0.80	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Furniture Store**	0.75	0.85	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Outbuilding Contents**	0.30	0.51	0.62	0.67	0.69	0.71	0.80	0.85	0.90	0.95
Vehicles	0.05	0.17	0.20	0.75	0.80	0.85	0.90	0.95	0.95	0.95

* Content stage-damage function expressed as a percentage of structure value.

** Content stage-damage function expressed as a percentage of content value.

Table 2A

NUMBER OF STRUCTURES
WITHOUT PROJECT CONDITIONS (YEAR 1)
SOUTHWEST VALLEY FLOODPLAIN

Land Use Category	EVENT							
	10%		4%		1%		0.20%	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Residential	432.26	2.04	449.98	2.07	492.58	2.25	510.04	2.15
Commercial	0.00	0.00	0.47	0.27	0.47	0.27	0.51	0.27
Public	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Apartments	5	0	5	0	5	0	5	0
TOTAL STR.	437.26	2.0366719	455.45	2.0966489	498.05	2.2706388	515.55	2.1598643

Table 2B

NUMBER OF STRUCTURES
WITHOUT PROJECT CONDITIONS (YEAR 27)
SOUTHWEST VALLEY FLOODPLAIN

Land Use Category	EVENT							
	10%		4%		1%		0.20%	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Residential	588.24	3.82	613.40	3.65	699.44	3.40	733.28	2.85
Commercial	0.74	0.30	0.92	0.38	1.17	0.36	2.37	0.30
Public	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.08
Apartments	5	0	5	0	5	0	5	0
TOTAL STR.	593.98	3.84	619.31	3.69	705.61	3.42	740.80	2.85

Table 3A

VALUE OF DAMAGEABLE PROPERTY
WITHOUT PROJECT CONDITIONS (YEAR 1)
SOUTHWEST VALLEY FLOODPLAIN

(x $1,000 February, 2004 price level)

Land Use Category	EVENT							
	10%		4%		1%		0.20%	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Residential	30,324	301	31,723	310	34,865	312	36,078	312
Res. Content	16,678	165	17,448	170	19,176	169	19,843	174
Commercial	0	0	26	16	26	16	28	16
Comm. Content	0	0	28	18	28	18	28	16
Public	0	0	0	0	0	0	0	0
Pub. Content	0	0	0	0	0	0	0	0
Apartments	402	29	402	29	402	28	402	29
Apt. Contents	221	16	221	16	221	16	241	14
Total	**47,625**		**49,847**		**54,717**		**56,620**	

Standard deviations for Total Structures and Contents not computed.

Table 3B

VALUE OF DAMAGEABLE PROPERTY WITHOUT PROJECT CONDITIONS (YEAR 27) SOUTHWEST VALLEY FLOODPLAIN

(x $1,000 February, 2004 price level)

Land Use Category	EVENT							
	10%		4%		1%		0.20%	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Residential	41,871	425	43,363	406	49,903	418	52,504	410
Res. Content	23,029	226	23,850	222	27,446	226	28,873	230
Commercial	36	17	64	29	89	29	177	32
Comm. Content	32	19	45	22	55	23	75	32
Public	0	0	0	0	0	0	171	93
Pub. Content	0	0	0	0	0	0	61	54
Apartments	502	35	502	36	502	34	502	35
Apt. Content	276	20	276	19	276	20	276	20
Total	**64,967**		**67,321**		**77,493**		**81,862**	

Standard deviations for Total Structures and Contents not computed.

Table 4A

SINGLE OCCURRENCE DAMAGES
WITHOUT PROJECT CONDITIONS (YEAR 1)
SOUTHWEST VALLEY FLOODPLAIN

(x $1,000 February, 2004 price level)

Land Use Category	EVENT							
	10%		4%		1%		0.20%	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Residential	4,230	59	4,648	62	5,457	67	6,248	70
Res. Content	2,537	39	2,772	40	3,229	42	3,656	44
Commercial	0	0	2	2	2	2	3	2
Comm. Content	0	0	2	2	2	2	2	2
Public	0	0	0	0	0	0	0	0
Pub. Content	0	0	0	0	0	0	0	0
Apartment	54	8	54	8	62	8	72	8
Apt. Content	33	5	33	5	37	5	42	5
Subtotal - Structures	4,284	59	4,705	63	5,521	68	6,323	70
Subtotal - Contents	2,570	39	2,807	40	3,268	43	3,701	44
Subtotal - Structures and Contents	6,854		7,513		8,790		10,024	
Streets	68		106		199		550	
Utilities	0		495		769		1,248	
Vehicles	41		79		155		379	
Total	**6,963**		**8,192**		**9,912**		**12,201**	

Table 4B

SINGLE OCCURRENCE DAMAGES
WITHOUT PROJECT CONDITIONS (YEAR 27)
SOUTHWEST VALLEY FLOODPLAIN

(x $1,000 February, 2004 price level)

Land Use Category	EVENT							
	10%		4%		1%		0.20%	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Residential	5,523	72	6,240	75	7,799	81	9,623	92
Res. Content	3,321	45	3,714	48	4,601	52	5,588	58
Commercial	3	2	6	3	20	5	20	5
Comm. Content	3	2	4	2	13	6	13	6
Public	0	0	0	0	0	0	14	8
Pub. Content	0	0	0	0	0	0	4	3
Apartment	111	11	111	11	122	12	276	20
Apt. Content	64	7	64	7	69	7	140	13
Subtotal - Structures	5,637	73	6,358	76	7,930	82	9,797	93
Subtotal - Contents	3,388	45	3,782	49	4,676	52	5,684	59
Subtotal - Structures and	9,025		10,140		12,607		15,481	
Streets	90		143		286		850	
Utilities	0		669		1,102		1,927	
Vehicles	53		106		222		585	
Total	**9,168**		**11,058**		**14,234**		**19,041**	

Table 5A

AVERAGE ANNUAL DAMAGES (YEAR 1) BY LAND USE CATEGORY

(x $1,000 February, 2004 price level)

LAND USE CATEGORY	Average Annual Damages (x $1,000 February, 2004 price level)					
		Probability Avg. Ann. Damages Exceed Indicated Amount				
		0.95	0.75	0.5	0.25	0.05
Residential	733.91	697.58	719.43	734.16	749.08	769.24
Res. Contents	456.52	434.63	447.23	456.61	465.74	478.93
Commercial	0.27	0.20	0.24	0.27	0.30	0.35
Comm. Contents	0.39	0.25	0.33	0.38	0.43	0.54
Public	0.00	0.00	0.00	0.00	0.00	0.00
Pub. Contents	0.00	0.00	0.00	0.00	0.00	0.00
Apartment	11.64	10.72	11.23	11.68	12.05	12.41
Apt. Contents	7.36	6.82	7.12	7.40	7.61	7.83
Subtotal - Structures	745.82	709.61	731.48	746.29	761.14	781.21
Subtotal - Contents	464.27	442.35	455.00	464.40	473.49	486.74
Subtotal - Structures and Contents	1,210.09	1,168.25	1,193.59	1,209.92	1,227.34	1,251.80
Streets, roads	10.63					
Utilities	59.99					
Vehicles	6.90					
Emergency Costs	19.31					
TOTAL	**1,306.92**					

Table 5B

AVERAGE ANNUAL DAMAGES (YEAR 27) BY LAND USE CATEGORY

(x $1,000 February, 2004 price level)

LAND USE CATEGORY	Average Annual Damages (x $1,000 February, 2004 price level)					
		Probability Avg. Ann. Damages Exceed Indicated Amount				
		0.95	0.75	0.5	0.25	0.05
Residential	1406.29	1356.25	1384.06	1405.08	1428.28	1458.50
Res. Contents	829.67	799.34	817.53	829.12	841.30	860.45
Commercial	0.66	0.54	0.61	0.67	0.72	0.79
Comm. Contents	1.81	1.47	1.68	1.81	1.93	2.15
Public	0.17	0.02	0.08	0.15	0.24	0.36
Pub. Contents	0.07	0.01	0.03	0.06	0.10	0.18
Apartments	13.12	11.37	12.53	13.20	13.77	14.51
Apt. Contents	8.73	7.70	8.36	8.77	9.09	9.65
Subtotal - Structures	1,420.25	1,370.23	1,398.18	1,419.32	1,442.33	1,472.16
Subtotal - Contents	840.28	810.03	828.50	839.74	852.08	871.02
Subtotal - Structures and Contents	2,260.52	2,200.69	2,236.14	2,260.34	2,284.59	2,319.54
Streets, roads	16.66					
Utilities	94.05					
Vehicles	10.81					
Emergency Costs	35.73					
TOTAL	**2,417.78**					

Table 5C

EQUIVALENT ANNUAL DAMAGES BY LAND USE CATEGORY

(x $1,000 February, 2004 price level)

LAND USE CATEGORY	Equivalent Annual Damages (x $1,000 February, 2004 price level)
Residential	1073.24
Res. Contents	644.84
Commercial	0.47
Comm. Contents	1.10
Public	0.08
Pub. Contents	0.03
Apartment	12.39
Apt. Contents	8.05
Subtotal - Structures	1,086.18
Subtotal - Contents	654.03
Subtotal - Structures and Contents	1,740.21
Streets, roads	13.67
Utilities	77.18
Vehicles	8.87
Emergency Costs	27.60
TOTAL	**1,867.53**

Table 6

NUMBER OF STRUCTURES
PREPROJECT CONDITIONS

Project Area	EVENT							
	10%		4%		1%		0%	
Land Use Category	Mean	SD*	Mean	SD*	Mean	SD*	Mean	SD*
10 yr project								
Residential	588.24	3.82	613.40	3.65	699.44	3.40	733.28	2.85
Commercial	0.74	0.30	0.92	0.38	1.17	0.36	2.37	0.30
Public	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.08
Apartments	5.00	0.00	5.00	0.00	5.00	0.00	5.00	0.00
Total	593.98	3.8424908	619.31238	3.68538331	705.6108	3.4188719	740.8001	2.85413966
25 yr project								
Residential	588.24	3.82	613.40	3.65	699.44	3.40	733.28	2.85
Commercial	0.74	0.30	0.92	0.38	1.17	0.36	2.37	0.30
Public	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.08
Apartments	5.00	0.00	5.00	0.00	5.00	0.00	5.00	0.00
Total	593.979	3.8424908	619.31238	3.68538331	705.6108	3.4188719	740.8001	2.85413966
100 yr project								
Residential	588.24	3.82	613.40	3.65	699.44	3.40	733.28	2.85
Commercial	0.74	0.30	0.92	0.38	1.17	0.36	2.37	0.30
Public	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.08
Apartments	5.00	0.00	5.00	0.00	5.00	0.00	5.00	0.00
Total	593.979	3.8424908	619.31238	3.68538331	705.6108	3.4188719	740.8001	2.85413966
Residential	**588.24**	**3.8220909**	**613.40**	**3.65410542**	**699.44**	**3.4011436**	**733.28**	**2.85004689**
Commercial	**0.74**	**0.3042944**	**0.92**	**0.37605407**	**1.17**	**0.3577787**	**2.37**	**0.30012878**
Public	**0.00**	**0**	**0.00**	**0**	**0.00**	**0**	**0.15**	**0.08207239**
Apartments	**5.00**	**0**	**5.00**	**0**	**5.00**	**0**	**5.00**	**0**
TOTAL STR.	**593.98**	**3.8424908**	**619.31**	**3.68538331**	**705.61**	**3.4188719**	**740.80**	**2.85413966**

*Locations with multiple damage centers weren't resampled to provide collective standard deviations.

Table 7

Comparison of Costs and Equivalent Annual Benefits for the Proposed Project SOUTHWEST VALLEY FLOODPLAIN (x $1,000 February, 2004 price level)				
	Alt. 4	Alt. 3	Alt. 2	Alt. 1
Construction Cost	13,982.24	13,705.90	14,282.59	20,998.45
Real Estate	2,800.00	2,800.00	2,800.00	2,800.00
PED	1,176.59	987.70	1,201.86	1,766.99
Total First Cost	17,958.83	17,493.60	18,284.45	25,565.45
IDC, Construction (30 months, 5-5/8%)*	1,274.35	1,286.64	1,297.59	1,817.27
Total, Interest During Construction	1,274.35	1,286.64	1,297.59	1,817.27
Total Investment	19,233.18	18,780.24	19,582.04	27,382.72
Avg. Ann. Cost (5 5/8%, 50 yr. project life)	1,156.85	1,129.60	1,177.83	1,647.03
OMRR&R	85.00	85.00	85.00	105.00
Total Avg. Ann. Cost	1,241.85	1,214.60	1,262.83	1,752.03
Equivalent Avg. Ann. Benefits	1697.2	1697.2	1699.2	1703.0
Benefit/Cost Ratio	1.4	1.4	1.3	1.0
Net Benefits	455.4	482.6	436.3	-49.0

Table 7A

Sample IDC Calculation for NED plan

Annual Interest Rate	5.625%
Principal	$17,493.60
Pay Periods	30
Compounded Monthly Interest*	0.469%
Principal and Interest Paid at the End of the Month	
Principal	$17,493.60
Interest During Construction**	$1,330.55
Total***	$18,824.15
Principal and Interest Paid at the Beginning of the Month	
Principal	$17,493.60
Interest During Construction**	$1,242.72
Total***	$18,736.32
Principal and Interest Paid Midmonth	
Principal	$17,493.60
Interest During Construction****	$1,286.64
Total***	$18,780.24

*Annual Interest Rate/12
**Total less Principal
***Future Value of Principal at end of Pay Periods months compounding at Compounded Monthly Interest
****Mean of Total-End of Month and Total-Beginning of Month

Average Annual Benefits = structures and contents total from Table 5-C (repeated in Tables 8-A to 8-C) less residuals (structures and contents) in Tables 8-A to 8-C.

Figure 1

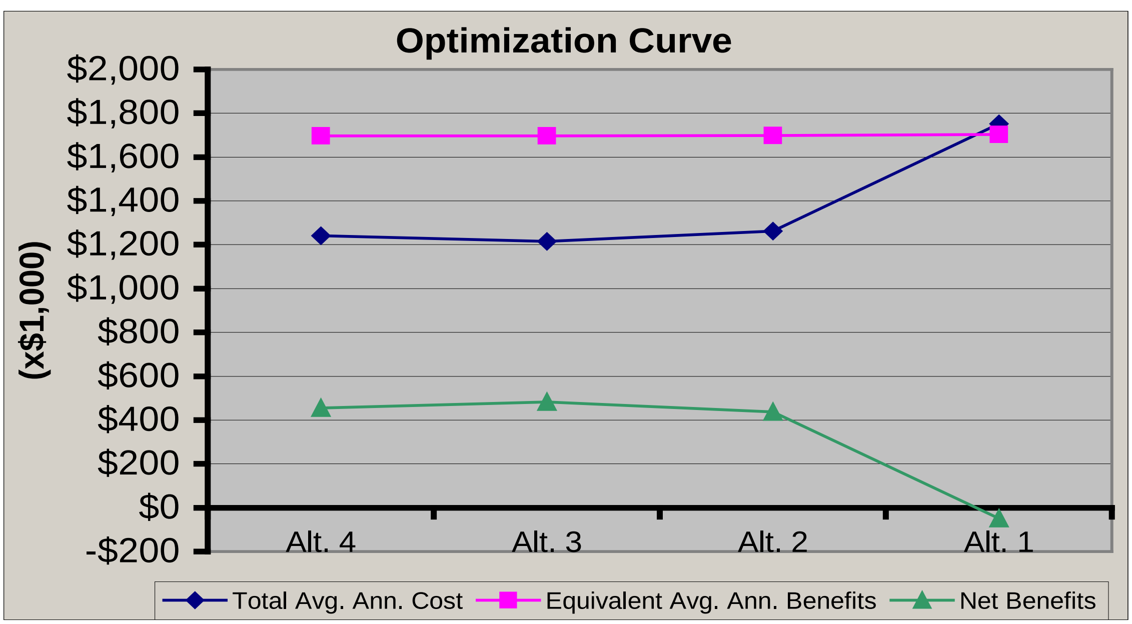

Table 8-A

EQUIVALENT ANNUAL BENEFITS BY LAND USE CATEGORY

Alternative 3

LAND USE CATEGORY	Average Annual Benefits (x $1,000 February, 2004 price level)							
				Probability Avg. Ann. Damages Exceed Indicated Amount				
	EAD	Residual Damages	Benefits	0.95	0.75	0.5	0.25	0.05
Residential	1073.24	26.68	1046.56	19.91	23.46	26.43	29.72	34.41
Res. Contents	644.84	15.71	629.13	11.77	14.01	15.56	17.31	19.85
Commercial	0.47	0.04	0.43	0.02	0.03	0.04	0.06	0.08
Comm. Contents	1.10	0.16	0.94	0.06	0.11	0.15	0.20	0.29
Public	0.08	0.01	0.07	0.00	0.00	0.00	0.00	0.06
Pub. Contents	0.03	0.01	0.03	0.00	0.00	0.00	0.00	0.03
Apartments	12.39	0.24	12.15	0.03	0.13	0.22	0.32	0.48
Apt. Contents	8.05	0.15	7.90	0.03	0.09	0.14	0.20	0.30
Subtotal - Structures	1086.18	26.97	1059.21					
Subtotal - Contents	654.03	16.03	638.00					
Subtotal - Structures and Contents	1740.21	43.00	1697.21					
Streets, roads	13.67	0.45	13.22					
Utilities	77.18	2.52	74.66					
Vehicles	8.87	0.29	8.58					
Emergency Costs	27.60	0.90	26.70					
TOTAL	**1867.53**	**47.15**	**1820.38**					

Table 8-B

EQUIVALENT ANNUAL BENEFITS BY LAND USE CATEGORY

Alternative 2

LAND USE CATEGORY	Average Annual Benefits (x $1,000 February, 2004 price level)							
				Probability Avg. Ann. Damages Exceed Indicated Amount				
	EAD	Residual Damages	Benefits	0.95	0.75	0.5	0.25	0.05
Residential	1073.24	25.41	1047.83	18.84	22.23	25.20	28.40	33.01
Res. Contents	644.84	15.13	629.71	11.32	13.42	14.99	16.70	19.26
Commercial	0.47	0.04	0.43	0.02	0.03	0.04	0.06	0.08
Comm. Contents	1.10	0.16	0.94	0.06	0.11	0.15	0.20	0.29
Public	0.08	0.01	0.07	0.00	0.00	0.00	0.00	0.06
Pub. Contents	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.02
Apartments	12.39	0.17	12.22	0.01	0.04	0.14	0.26	0.41
Apt. Contents	8.05	0.11	7.94	0.01	0.05	0.10	0.17	0.26
Subtotal - Structures	1086.18	25.64	1060.55					
Subtotal - Contents	654.03	15.41	638.63					
Subtotal - Structures and Contents	1740.21	41.04	1699.17					
Streets, roads	13.67	0.43	13.24					
Utilities	77.18	2.41	74.77					
Vehicles	8.87	0.28	8.60					
Emergency Costs	27.60	0.86	26.74					
TOTAL	**1867.53**	**45.01**	**1822.52**					

Table 8-C

EQUIVALENT ANNUAL BENEFITS BY LAND USE CATEGORY

Alternative 1

LAND USE	Average Annual Benefits (x $1,000 February, 2004 price level)							
				Probability Avg. Ann. Damages Exceed Indicated Amount				
	EAD	Residual Damages	Benefits	0.95	0.75	0.5	0.25	0.05
Residential	1073.24	22.93	1050.31	16.27	19.87	22.78	25.93	30.35
Res. Contents	644.84	13.51	631.33	9.76	11.86	13.46	15.07	17.57
Commercial	0.47	0.02	0.45	0.00	0.01	0.01	0.02	0.04
Comm. Contents	1.10	0.15	0.95	0.05	0.10	0.14	0.19	0.28
Public	0.08	0.01	0.07	0.00	0.00	0.00	0.00	0.06
Pub. Contents	0.03	0.01	0.03	0.00	0.00	0.00	0.00	0.03
Apartments	12.39	0.35	12.04	0.03	0.25	0.34	0.48	0.62
Apt. Contents	8.05	0.22	7.84	0.04	0.14	0.21	0.28	0.38
Subtotal - Structures	1086.18	23.31	1062.88					
Subtotal - Contents	654.03	13.88	640.15					
Subtotal - Structures and Contents	1740.21	37.18	1703.03					
Streets, roads	13.67	0.38	13.29					
Utilities	77.18	2.16	75.02					
Vehicles	8.87	0.25	8.62					
Emergency Costs	27.60	0.77	26.83					
TOTAL	**1867.53**	**40.75**	**1826.78**					

Table 9: Expected Value and Probabilistic Values of EAD and EAD Reduced for Proposed Projects

Plan	Expected Annual Damage (x $1,000)			Probability Residual Damages Exceeds Indicated Amount (x $1,000)				
	Without Plan*	With Plan**	Benefits	0.95	0.75	0.5	0.25	0.05
No Action	1,740.21	1,740.21	0.00					
Alternative 3	1,740.21	43.00	1,697.21	34.68	39.36	42.64	46.34	52.27
Alternative 2	1,740.21	41.04	1,699.17	32.84	37.49	40.70	44.46	50.21
Alternative 1	1,740.21	37.18	1,703.03	29.20	33.79	37.05	40.37	46.13

Alternative 1 doesn't include flood insurance savings of $11.26 for 706 structures

* From Subtotal - Structures and Contents in Table 5C.

** Residual damages for Structures and Contents.

Table 10: Expected Value and Probabilistic Values of Net Benefits for Proposed Projects

Plan	Expected Annual NED Benefit and NED Cost (x $1,000)			Probability Net Benefit Exceeds Indicated Amount (x $1,000)				
	Benefits*	Cost	Net Benefits	0.05	0.25	0.5	0.75	0.95
No Action	0.00	0.00	0.00					
Alternative 3	1,697.21	1,214.60	482.61	1,705.54	1,700.86	1,697.57	1,693.87	1,687.94
Alternative 2	1,699.17	1,262.83	436.34	1,707.37	1,702.72	1,699.52	1,695.75	1,690.00
Alternative 1	1,703.03	1,752.03	-49.00	1,711.02	1,706.42	1,703.16	1,699.84	1,694.08

* From Benefits in Table 9.

Table 11: Expected Value and Probabilistic Values of Benefit/Cost Ratios for Proposed Projects

Plan	Expected Benefit/Cost Ratio	Probability Benefit/Cost Ratio Exceeds Indicated Value				
		0.05	0.25	0.5	0.75	0.95
No Action						
Alternative 3	1.40	1.40	1.40	1.40	1.39	1.39
Alternative 2	1.35	1.35	1.35	1.35	1.34	1.34
Alternative 1	0.97	0.98	0.97	0.97	0.97	0.97

Table 12-A
Conditional Probability of Design Non-Exceedance by Event and Damage Center
Southwest Valley

Damage Center	Event	Preproject Start of Damages (acre-ft.)	Preproject Non-Exceedance Probability (decimal)	Alt. 3 Start of Damages (acre-ft.)	Alt. 3 Non-Exceedance Probability (decimal)	Alt. 2 Start of Damages (acre-ft.)	Alt. 2 Non-Exceedance Probability (decimal)	Alt. 1 Start of Damages (acre-ft.)	Alt. 1 Non-Exceedance Probability (decimal)
is06	10%	**1.08**	0	**12.53**	1	**12.53**	1	**12.53**	1
future	4%		0		1		1		1
	1%		0		1		1		1
	0.20%		0		0.501		0.501		0.501
is07	10%	**2.85**	0	**103.33**	0.998	**103.33**	0.998	**103.33**	0.998
future	4%		0		0.925		0.925		0.925
	1%		0		0.674		0.674		0.674
	0.20%		0		0.501		0.501		0.501
is08	10%	**0.38**	0	**108.27**	0.991	**108.27**	0.991	**109.67**	0.992
future	4%		0		0.845		0.845		0.85
	1%		0		0.638		0.638		0.645
	0.20%		0		0.493		0.493		0.501
is09	10%	**21.73**	0	**144.36**	0.99	**144.36**	0.99	**191.02**	0.999
future	4%		0		0.841		0.841		0.964
	1%		0		0.649		0.649		0.871
	0.20%		0		0.251		0.251		0.501
is10	10%	**3.95**	0	**11.53**	0.897	**11.53**	0.897	**29.5**	1
future	4%		0		0.501		0.501		1
	1%		0		0.122		0.122		0.986
	0.20%		0		0.004		0.004		0.501
is11	10%	**96.21**	0	**422.88**	0.997	**422.88**	0.997	**440.04**	0.999
future	4%		0		0.919		0.919		0.94
	1%		0		0.501		0.501		0.557
	0.20%		0		0.196		0.196		0.234
is12	10%	**103.76**	0	**117.32**	1	**117.32**	1	**117.32**	1
future	4%		0		1		1		1
	1%		0		1		1		1
	0.20%		0		0		0		0
is13	10%	**0.33**	0	**8.83**	1	**8.83**	1	**18.03**	1
future	4%		0		1		1		1
	1%		0		0		0		0.982
	0.20%		0		0		0		0.501
is14	10%	**0.05**	0.501	**11.21**	1	**13.95**	1	**16.69**	1
future	4%		0.119		1		1		1
	1%		0.001		0.756		0.756		0.756
	0.20%		0.001		0.658		0.658		0.658
is15	10%	**100.49**	0	**205.8**	1	**228.3**	1	**148.55**	1
future	4%		0		1		1		1
	1%		0		1		1		0
	0.20%		0		0		0		0

Non-exceedance probability is the likelihood of events being less than or equal to the start of damages volume.
is15 Alt. 1 project is less effective at containing the 0.2% event, but is more effective than smaller projects at containing more frequent events.

Table 12-B: Conditional Probability of Design Non-Exceedance
Southwest Valley

Plan	Conditional Probability of Design Containing Indicated Event (vulnerable location identified)			
	10%	4%	1%	0.20%
No Action	0.000	0.000	0.000	0.000
Alternative 3	0.897	0.501	0.122	0.004
Alternative 2	0.897	0.501	0.122	0.004
Alternative 1	1.000	1.000	0.986	0.501

Table 12-C: Conditional Probability of Design Non-Exceedance
Southwest Valley

Plan	Conditional Probability of Design Containing Indicated Event (worst case scenario)			
	10%	4%	1%	0.20%
No Action	0.000	0.000	0.000	0.000
Alternative 3	0.897	0.501	0.000	0.000
Alternative 2	0.897	0.501	0.000	0.000
Alternative 1	0.992	0.850	0.000	0.000

Table 13: Conditional Probability of Design Non-Exceedance
Southwest Valley

Plan	Annual Performance (Expected Annual Probability of Design Being Exceeded - vulnerable location)	Annual Performance (Expected Annual Probability of Design Being Exceeded - worst case scenario)
No Action	0.100	0.100
Alternative 3	0.048	0.048
Alternative 2	0.048	0.048
Alternative 1	0.003	0.025

Table 14-A: Annual Performance and Equivalent Long-term Risk
Southwest Valley

Plan	Annual Performance (Expected Annual Probability of Design being Exceeded - vulnerable location identified)	Equivalent Long-term Risk (Probability of Exceedance Over Indicated Time Period)				
		10 years	20 years	25 years	30 years	50 years
No Action	0.100	0.651	0.878	0.928	0.958	0.995
Alternative 3	0.048	0.390	0.628	0.709	0.773	0.915
Alternative 2	0.048	0.390	0.628	0.709	0.773	0.915
Alternative 1	0.003	0.032	0.063	0.078	0.093	0.151

Table 14-B: Annual Performance and Equivalent Long-term Risk
Southwest Valley

Plan	Annual Performance (Expected Annual Probability of Design being Exceeded - worst case scenario)	Equivalent Long-term Risk (Probability of Exceedance Over Indicated Time Period)				
		10 years	20 years	25 years	30 years	50 years
No Action	0.100	0.651	0.878	0.928	0.958	0.995
Alternative 3	0.048	0.390	0.628	0.709	0.773	0.915
Alternative 2	0.048	0.390	0.628	0.709	0.773	0.915
Alternative 1	0.025	0.224	0.397	0.469	0.532	0.718