ENVIRONMENTAL ASSESSMENT COVER PAGE
UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT
TAOS FIELD OFFICE

EA Name: Buckman Supplemental Wells EA EA No. NM020-03-021

Project Location: T. 17 & 18 N, R. 8 E., Sec. _____. Subdivision _____

Project Type: Water Supply Case File No. _____

Applicant's Name: City of Santa Fe, New Mexico

Applicant's Address: P.O. Box 909, 200 Lincoln Avenue, Santa Fe, NM 87504-0909

Date Prepared: March 7, 2003

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City of Santa Fe

Buckman Supplemental Wells

Environmental Assessment

March 7, 2003

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CHAPTER 1.0 PURPOSE AND NEED

1.1 Need for the Project

In accordance with the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [U.S.C.] 4321, et seq.) and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508), this Environmental Assessment (EA) is being conducted to assess the potential effects of constructing and operating four new supplemental wells on land administered by the U.S. Department of the Interior, Bureau of Land Management (BLM) near Buckman and the construction and operation of a new four million gallon water storage tank, called the La Tierra tank, on City of Santa Fe land near the communities of Tierra de Oro and La Mariposa. For the purposes of this EA, the name "La Tierra" is used to describe all the neighborhoods north of Camino La Tierra and neighborhoods on the south side of Camino La Tierra and east of Las Campanas. Public Law 107-206, August 2, 2002 directed the U. S. Bureau of Reclamation (Reclamation) to provide assistance to the City of Santa Fe for drilling emergency wells. Consequently, Reclamation is a cooperating agency in the NEPA process.

Recent experience has shown that the Santa Fe area has inadequate potable water supply during periods of watershed shortage and peak demand (i.e. summers of 1996, 2000, 2002). Potential future "dry years" would only compound the problem unless the issue is addressed quickly. The City of Santa Fe, Sangre de Cristo Water Division has identified construction and operation of four new supplemental wells (Nos. 10 – 13) near Buckman as necessary emergency measures to partially mitigate water shortages due to current and anticipated future drought conditions. In addition, the City needs to increase the water storage capacity in the distribution system to address difficulties in distributing water from the Buckman well-field.

The City is permitted by the New Mexico Office of the State Engineer (OSE) to pump 10,000 acre-feet per year (AFY) of groundwater from the Buckman area northwest of town near the Rio Grande (See Figures 1-1 and 1-2). The pipeline infrastructure for the Buckman well-field was originally designed and constructed to convey 10,000 AFY or 8.9 million gallons per day (mgd); however, the well-field currently has only enough mechanical pumping capacity to pump a little more than half this amount. The Buckman well-field is located on lands administered by the U.S. Forest Service (USFS) and the BLM. The supplemental Buckman wells would be constructed on land administered by the BLM and need to be on-line by approximately June 2003 in order to serve the summer peak demand. This schedule would be especially critical if the current drought conditions persist.

Drought conditions in 2002 resulted in the loss of surface water supplies from the Santa Fe River Reservoirs. The Santa Fe River Reservoirs represent approximately 40 percent of the water supply available to the City. Without the additional wells, Santa Fe would continue to be extremely vulnerable to drought conditions until the near-term project, a planned surface diversion from the Rio Grande (called the Buckman Direct Surface Diversion) is online (anticipated in late 2006 or early 2007). The surface diversion is currently under environmental review. It has not been authorized and its construction and operation are not assured.

The existing Buckman wells, in addition to the City's other sources of supply, are incapable of producing an adequate supply of water to meet daily peak demands under the drought conditions being experienced in the Santa Fe Region. Even with the four supplemental wells in place, the City would not be able to fully meet peak demand under drought conditions similar in magnitude to those experienced in the summer of 2002 (See Figure 1-3). The supplemental wells would, however, curtail the severity of emergency water restrictions imposed on City customers. Appendix A contains the water restriction ordinance and a description of Stage 2 and 3 Water Restrictions passed by the City Council. Stage 4 and 5 Water Restrictions are currently being rewritten and are not included; however, they would contain some form of restrictions on new construction (Ransom, 2003, pers. comm.) They would also reduce critical shortages in the water supply during the peak

demand period that could degrade the City's ability to provide enough water for the basic essential service of fire fighting.

The Buckman transmission pipeline has sufficient capacity available to transport the additional water produced by Wells 10 through 13 to points of use in the City and County. It is expected that use of the Buckman well-field would continue if the Rio Grande diversion is authorized and constructed, but at a scaled-back rate. The new supplemental wells would provide a measure of future regional drought protection and water supply reliability in the event that water is not available from the Santa Fe River Reservoirs or the proposed Buckman Direct Surface Diversion project.

1.2 Conformance with the Land Use Plan

The proposed action is in conformance with the approved Taos Resource Management Plan (RMP) and is consistent with BLM policy and guidance. The Taos RMP, completed October, 1988, states that right-of-way would be granted to qualified users to use the public lands. The proposed action is not located in any right-of-way avoidance or exclusion areas, and is therefore considered to be in conformance with Taos Field Office land use planning.

1.3 Relationship to Statutes, Regulations, or Other Plans

The City must obtain an amendment to its existing water pipeline easement permit NM 18720 from the BLM and a permit from the OSE to drill and operate the supplemental wells prior to construction of the proposed action. No increase in the appropriation of water authorized under OSE Permit No. RG-20516 is contemplated by the application to the OSE. The City of Santa Fe would offset the effects of pumping these wells on surface waters by utilizing existing City water rights dedicated to the Buckman wells and/or by acquiring any additional offsets required by the OSE, pursuant to conditions for Permit No. RG-20516, as amended. The proposed action does not conflict with any known state or local planning or zoning ordinances. A *Clean Water Act* (CWA) Section 404 permit would be required from the U.S. Army Corps of Engineers (ACOE) for the La Tierra pipeline prior to construction. The supplemental wells would not require the placement of fill in waters of the United States; therefore, a *Clean Water Act* (CWA) Section 404 permit would not be required from the ACOE prior to their construction. The proposed action would also be required to conform to the provisions of Section 7 of the *Endangered Species Act* as administered by the U.S. Fish and Wildlife Service and Section 106 of the *National Historic Preservation Act* as administered by the N.M. State Historic Preservation Officer. The engineering plans for the wells must be approved by the N.M. Environment Department prior to construction. The BLM authority for this action is the Federal Land Policy and Management Act of 1976.

1.4 Other Projects Considered in this EA under Cumulative Effects

The City and Santa Fe County are currently in the process of developing another project to better meet the water supply needs of the region in a sustainable manner. This other project is the proposed Buckman Direct Surface Diversion. This project proposes to directly divert San Juan-Chama surface-water from the Rio Grande at Buckman. Longer-term water-supply plans are purely speculative at this time and lack sufficient information to analyze. A comprehensive analysis of the environmental effects of longer-term water-supply plans (beyond 2010) will be performed in a separate NEPA document. The analysis in the cumulative effects section assumes the continued use of all existing stock-water wells in the area.

The proposed Buckman Direct Surface Diversion project, if authorized, would include the placement of a diversion structure along the eastern shore of the Rio Grande in the Buckman area. Two settling ponds, pumping facilities, and two new pipelines connecting to a pair of water treatment plants would be constructed nearby. The earliest this project would be able to provide water to the City is late 2006 or early 2007. At that

time, pumping from the Buckman well-field would be reduced to an average of approximately 1,000 AFY to allow recovery of the aquifer in the Buckman area. The utility of the proposed direct diversion project is independent from the proposed action in this EA; therefore, a comprehensive analysis of the environmental effects of the direct diversion would be performed in greater detail in a separate NEPA document for that project. The anticipated secondary and cumulative effects on water resources of the direct diversion in combination with the proposed action in this EA are described in Section 3.8.2.

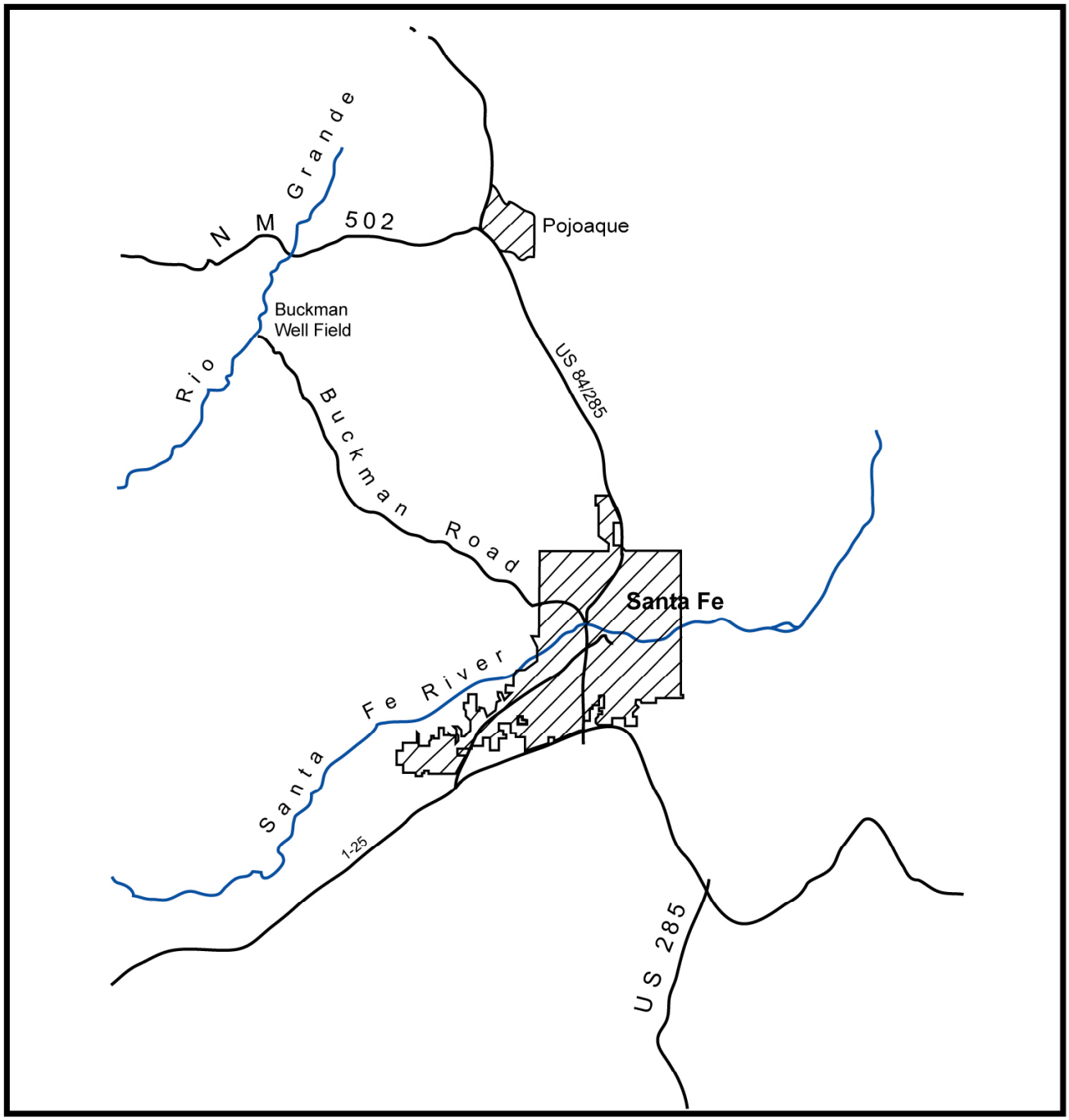


Figure 1-1 Regional Map of the Project Area.

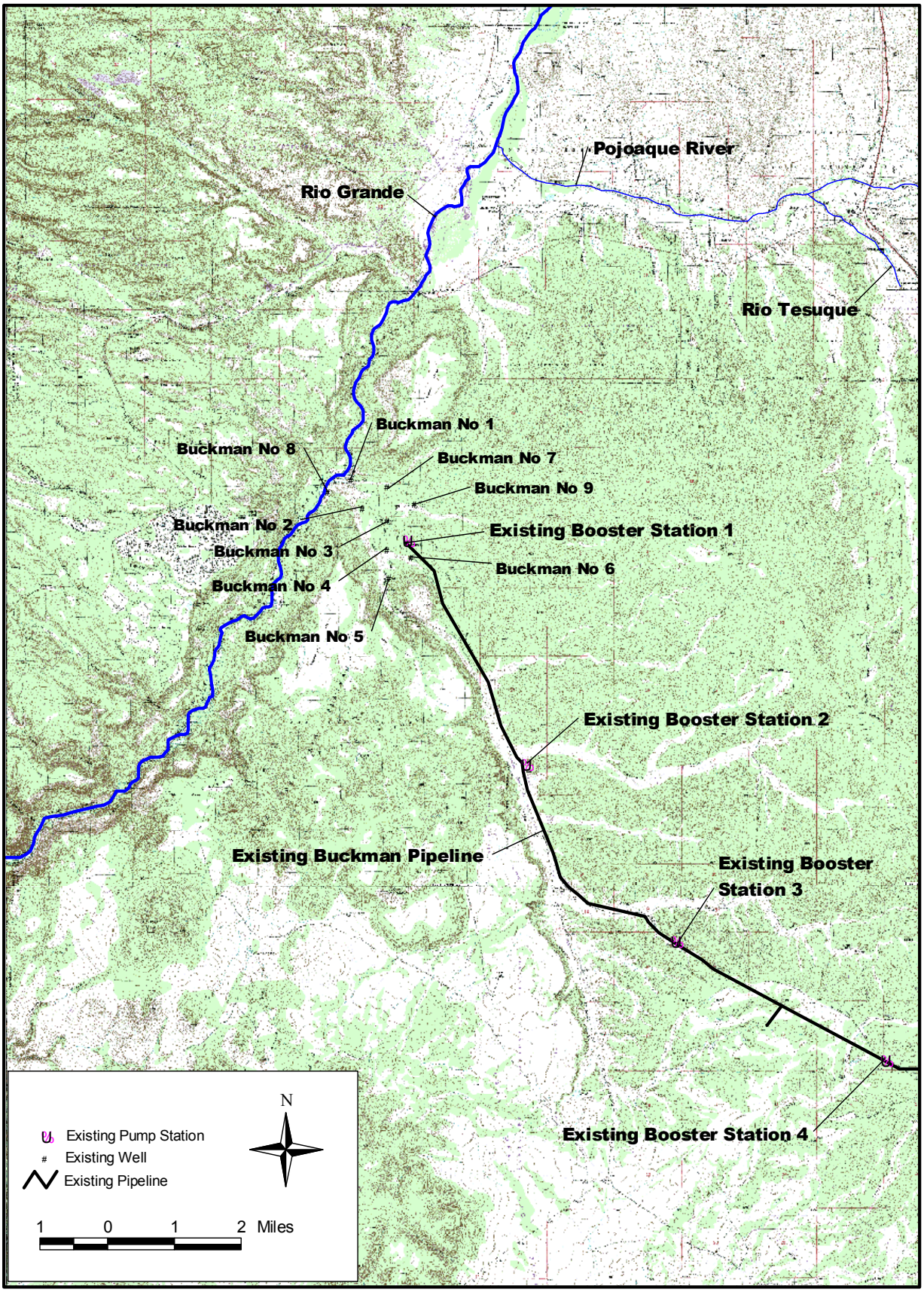


Figure 1-2 Map of the Buckman Area.

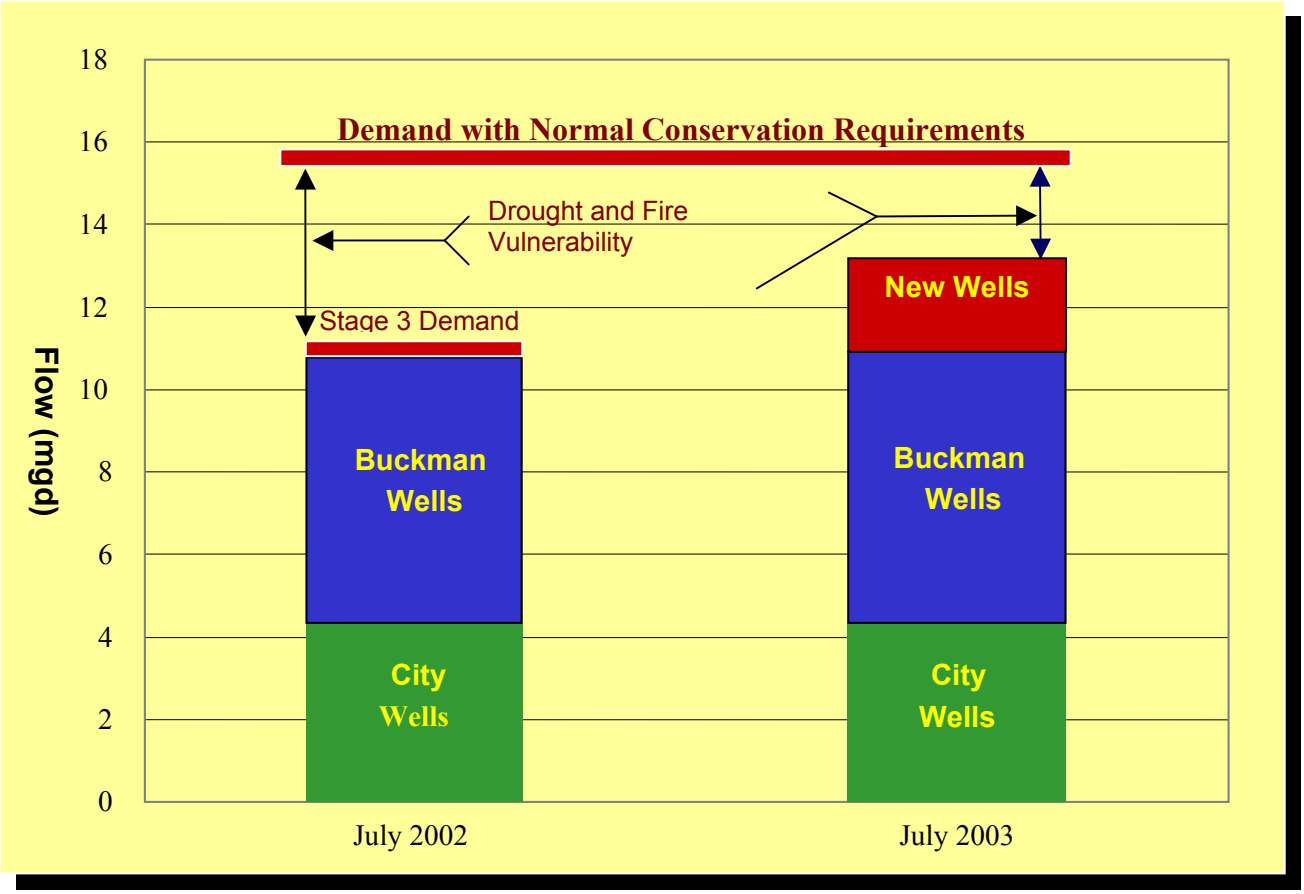


Figure 1-3 Drought and Fire Vulnerability (Demand minus Supply) under Stage 3 Restrictions, with and without the Supplemental Wells.

The red horizontal bar at the top of Figure 1-3 shows the existing demand for water during peak usage in Santa Fe. This is the demand that occurs under normal conservation requirements. In 2002, the graph shows that the supply of water in July was approximately 11 mgd. The demand was lowered by the imposition of Stage 3 water restrictions, which leave the City vulnerable to additional drought and potential fire danger. In July 2003, the graph shows that with the supplemental wells added to the system, there is still a gap between demand under normal conservation requirements and the supply of water under drought conditions. Drought conditions assumes that little or no water would be available from the Santa Fe Basin.

CHAPTER 2.0 ALTERNATIVES

2.1 No Action

The no action alternative in this EA is defined as no new supplemental wells or pipelines being constructed and no new four million gallon water storage tank at La Tierra and connecting pipeline or improvements to the existing utility access road to the proposed tank site. Without the construction of the wells, there would be no increased withdrawal of water from the aquifer at Buckman, and no temporary or permanent easements for the proposed wells and pipeline. Without construction of the new storage tank, there would be no additional storage capacity in the distribution system near La Tierra, no additional water pressure, and flow in La Tierra may be lower than needed at high demand periods. The amendment application for permit NM 18720 would be rejected. Additionally under the no action alternative, vegetation within the project area would not be removed, and neither soil nor wildlife would be disturbed.

2.2 Proposed Action

Supplemental Wells

On July 26, 2002 the City filed an amendment application for permit NM 18720 with the BLM. The City proposes to drill four new 16-inch diameter supplemental water wells on land administered by the BLM. The new wells would be drilled at locations along Buckman Road from Booster Station No. 2 to Booster Station No. 3. Well #10 would be located inside the existing fence for Booster Station No. 2. Well #13 would be located on the southeast side of Booster Station No. 3 just outside of the existing fence. Wells #11 and #12 would be located at intermediate points between Wells #10 and #13. All four wells are expected to be drilled to a depth of up to approximately 2,000 feet. The map in Figure 2-1 identifies the locations of the proposed new wells and their attendant pipelines.

The well sites would each have a 6-foot-high chain-link fence around the perimeter for security. The gates would be locked to impede unauthorized entrance. Each of the four wells would include a temporary 0.7-acre municipal water well-site for construction, which would be reduced to 0.25 acre of land for the permanent well-site. The permanent 0.25 acre required for the construction of Well #10 would be entirely within the existing fenced area at Booster Station No. 2, but a rectangular area of approximate dimensions 50 X 150 feet north of the existing permanent fence and a rectangular area of approximately 50 X 165 feet east of the existing permanent fence would be used temporarily during construction. The permanent 0.25 acre for Well #13 would be an extension to the east of the existing fenced area at Booster Station No. 3. The existing fence would be modified to include an additional area of approximately 75 feet by 144 feet. Wells #11 and #12 would require a temporary 50-foot wide and permanent 25-foot wide roadway and utility easement from the permanent well-sites to the Buckman Road. These road and utility easements would be 150 feet and 200 feet long for Wells #11 and #12, respectively. In the effects analysis of this EA, the well-sites, access roads, and utility easements are treated as a single unit.

The well-sites are located in Sections 20, 28, and 33, of Township 18 North, Range 8 East, and Section 3 of Township 17 North, Range 8 East of the New Mexico Principal Meridian (NMPM), in Santa Fe County, New Mexico. The federal action would be to grant the amendment to permit NM 18720 and the requested easements on BLM land and the contribution of federal funds to defray part of the construction cost of the wells as provided in Public Law 107-206, August 2, 2002, which directed Reclamation to provide assistance to the City of Santa Fe for drilling emergency wells. The Buckman well-field currently consists of eight sequentially numbered wells plus a ninth well recently completed. The OSE would issue a permit for the new supplemental wells, which would require annual reporting by the City to the OSE of the volume of water pumped from each well during the previous year. The permit would also require the City to provide sufficient

water in the Rio Grande, Rio Pojoaque, and Tesuque Creek to offset flows that are depleted by pumping from the Buckman well-field on an annual basis.

La Tierra Tank

A four million gallon water storage tank would be constructed on City land approximately 6,500 feet southwest of the existing 10 million gallon tank located on Camino de los Montoyas. Access to the tank site is currently possible by way of a utility road that connects to Camino de los Montoyas at the 10 million gallon tank. The tank would be round with a diameter of 154 to 169 feet and a height of approximately 25 to 30 feet. The tank would be completely buried to reduce its visibility. A 16 to 24-inch PVC or ductile iron pipeline (La Tierra pipeline) would be constructed from the tank following the utility road west for 7,100 feet, where it would tie into the distribution system near an existing pressure reducing valve (PRV). The PRV is located in Section 8 of Township 17 North, Range 9 East NMPM – just north of and 140 feet west of the intersection of Sections 8, 9, 16, and 17. The map in Figure 2-2 shows the proposed location of the tank and its attendant pipeline.

2.2.1 Construction

Supplemental Wells

The new wells would be housed in single-story buildings of a dark-colored prefabricated stucco-like materials on the outside, approximately 30 X 30 feet in size. Electrical transformers and switchgear would be surrounded for protection by dark-colored prefabricated stucco-like walls approximately 31(W) X 43(L) X 7(H) feet in size. The two constant speed pumps within each of the four booster stations along the Buckman water transmission line would be retrofitted with variable frequency drives to allow the booster stations to efficiently operate under the anticipated range of flows and reduce existing pump cycling and operating problems. A traffic control plan would be developed as part of the engineering plans for the wells. This plan would include such things as warning signs on Buckman Road and maintaining bidirectional traffic flow around the construction sites.

The wells would be drilled two at a time. The construction of the four wells would take approximately four months to complete. Upon receiving notice to proceed, the sites would be graded and vegetation would be removed to make room for the equipment. This process would take less than one week.

Upon completion of site preparation, a drilling contractor would move onto the sites and begin drilling the wells. It would take approximately 45 days for the site improvements and for the wells to be drilled and tested. The results of the testing would determine the actual production capacity of each well and provide the data necessary to design the pumping equipment. Test water would be piped across Buckman Road and discharged into an energy dissipater from which it would be allowed to flow out onto the ground or into an arroyo. Because of the high quality and the small quantity of the water, and the short duration of testing, a National Pollution Discharge Elimination System (NPDES) permit would not be required. Design of the pumps along with procurement and fabrication of the equipment would take approximately one month.

Installation of the electric pumps would require approximately three weeks. Construction of the well houses, and the modifications to the booster pump stations would be performed while the wells are being drilled and the pumps are being fabricated and installed.

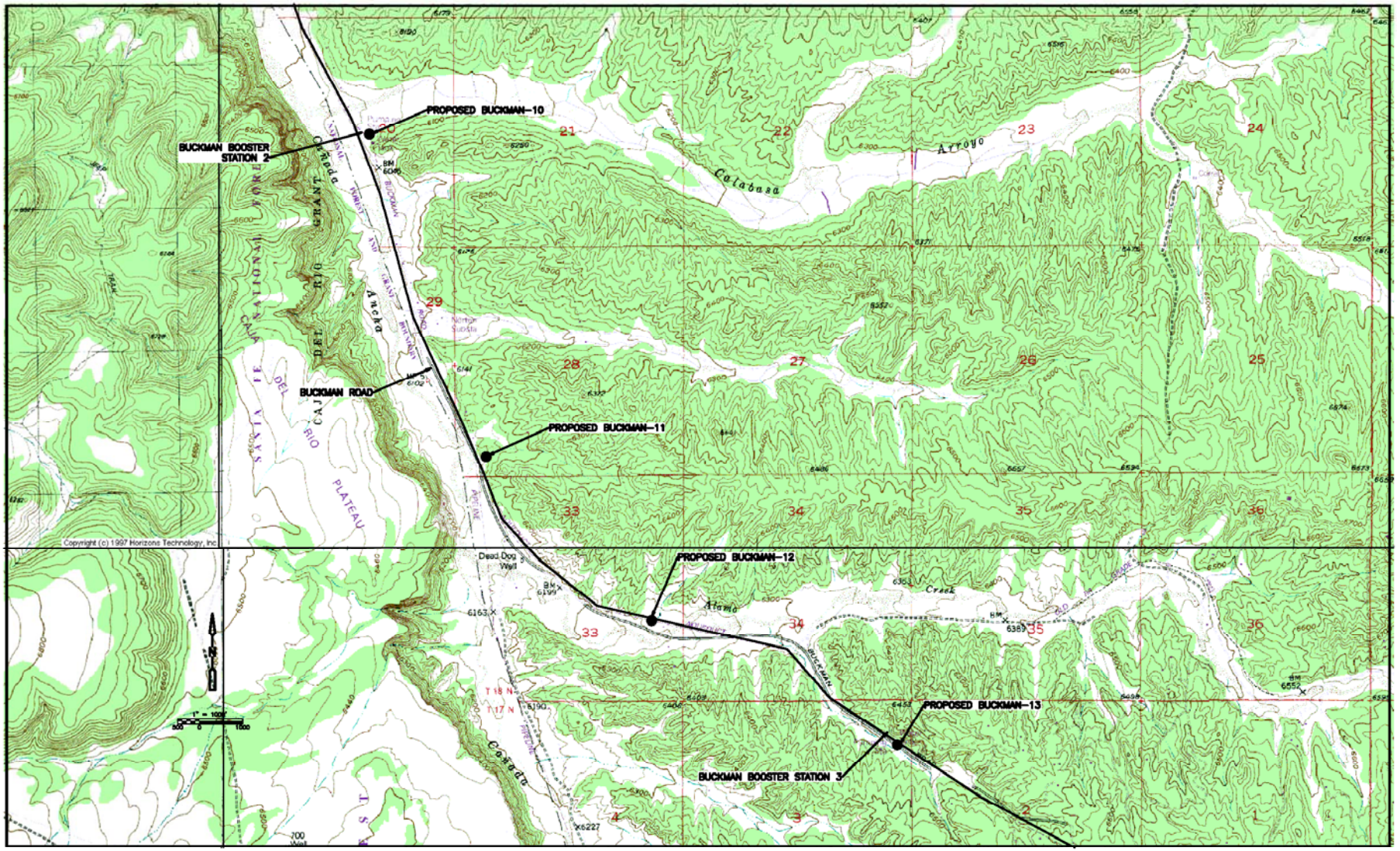


Figure 2-1 Map of the Proposed Supplemental Well Locations.

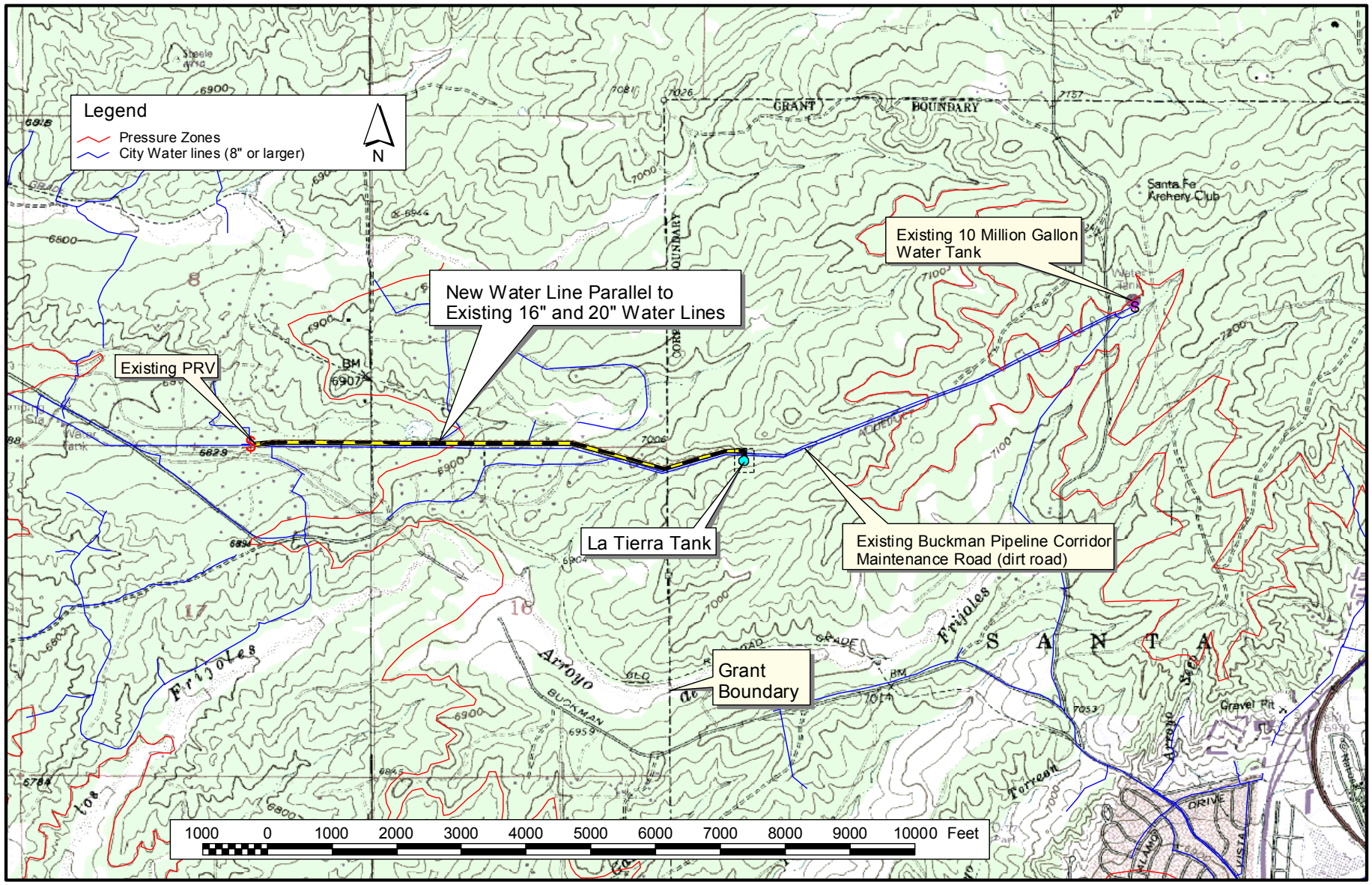


Figure 2-2 Map of the Proposed Four Million Gallon Tank and Connector Pipeline Location.

Electrical power would be supplied to the new wells by buried cables, which would be connected directly to an existing power supply cable buried adjacent to the Buckman water transmission pipeline and proposed well-sites. The cables would be installed by the Public Service Company of New Mexico (PNM). The wells, pump-houses, pumps, controls, and fences, would all be authorized in the easement granted to the City by the BLM. The power supply line would be authorized in an easement granted to the Public Service Company of New Mexico (PNM). After the sites have been cleaned up they would be reseeded with native plant seeds as recommended by the BLM. BLM would require the employment of both temporary (during construction) and permanent best management practices to reduce erosion. Appendix B contains regulatory information regarding best management practices.

La Tierra Tank

In the first week, the access road from the ten million gallon tank to the site for the new tank would be graded and gravel would be placed over it. A traffic control plan would be developed as part of the engineering plans for the tank. This plan would include such things as warning signs on Buckman Road and maintaining traffic flow around the construction site. The site for the tank would be cleared and grubbed to prepare it for excavation. Heavy earth-moving equipment would then be used to remove the soil from the site and prepare a compacted surface on which the tank would be constructed. Excavated soil would be stockpiled on the site and reused after the tank has been constructed to bury the tank to reduce its visibility. Adjacent to the tank would be a small water treatment facility, approximately 15 X 40 feet in size, which would disinfect the water as it goes into the tank and fluoridate it as it goes out to the distribution system.

A new 16 to 24-inch PVC or ductile iron pipeline would be installed in the existing utility road between the new tank and the distribution system to the west. This pipeline would be approximately 7,100 feet long and would be buried with four feet of cover. The new pipeline would be buried adjacent to an existing 16-inch pipeline and tie into the distribution system near the same location. The pipeline would cross beneath Fin Del Sendero Road. A traffic control plan, which would ensure continuous traffic flow on this road, would be developed as part of the engineering plans. Power would be supplied by PNM to the treatment facility by cable buried adjacent to the new 16 to 24-inch water pipeline by PNM, possibly in the same trench. As the trench is dug the pipeline would be installed and covered. The existing pipeline follows a 40-foot-wide easement from the 10 million gallon tank to the distribution system near the east end of Dandelion Circle at Tierra de Oro. This is the same easement that contains the Buckman water transmission pipeline from Booster Station No. 1 to the 10 million gallon tank. No trees are expected to be removed for the installation of the pipeline and power cable.

2.2.2 Operations

Once the wells are fully operational they would begin pumping groundwater to the surge tanks at Booster Stations No. 2 and 3. Operation of these wells is expected to bring the reliable peak-day supply of water originating at Buckman from 5.96 million gallons per day (mgd) (Wells 1 through 9, with the largest well offline for maintenance) to 8.9 mgd (Wells 1 through 13, with the largest well offline for maintenance). For the purposes of analysis, it is assumed that the wells would be operated at their peak capacity during periods of high demand and at the capacity necessary during periods of lower demand, up to the maximum annual capacity allowed by the OSE through 2060.

The effects of the proposed Buckman Direct Surface Diversion project, which, if authorized, could become operational at the end of 2006 or early in 2007, are analyzed in Section 3.8.2 Cumulative Effects. If the diversion is authorized and constructed and begins supplying water to the City, groundwater pumping by the entire Buckman well-field would be reduced. For the purposes of cumulative effects analysis, it is assumed that the total well-field production would be scaled back to an average of approximately 1,000 AFY.

2.3 Alternatives Considered, but Eliminated from Detailed Analysis

A number of alternatives were studied prior to selecting the proposed action. Several of those alternatives looked at different numbers of new supplemental wells. The Buckman transmission pipeline was designed and constructed to deliver up to 100 percent of the permitted 10,000 AFY or the equivalent of 8.9 mgd. The reliable supply (with the largest well offline for maintenance) of water from Buckman Wells #1 through #9 is expected to be approximately 5.94 mgd. The existing Buckman transmission pipeline has an estimated capacity of 8.9 mgd. The new supplemental wells, therefore, must be capable of delivering up to 2.96 mgd to fully utilize the capacity of the existing pipeline to help meet peak-day demands. In a report by CDM (2002b), information about the yields of the other wells in the Buckman well-field indicate a reliable average capacity of 0.81 mgd per well; however, recent testing of Buckman Well #9 has shown that a reliable average may be closer to 0.78 mgd. Table 2-1 below was adapted from that report and the recent test data from Buckman Well #9.

It is unlikely that two new wells would each consistently produce the 1.48 mgd that would be needed. If only three supplemental wells were installed, each well would need to be capable of producing 0.99 mgd, slightly higher than the average capacity of the existing wells. With four supplemental wells, the production capacity of each well would need to be 0.74 mgd, which is just below the average for the existing wells. Five supplemental wells would only be necessary if the production rates for the new wells were substantially lower than those of the existing Buckman wells.

Table 2-1 Comparison of Average Well Production for Existing and Supplemental Wells.

Scenario	Average Well Production Capacity (mgd)
Average production per well	0.81
Required capacity each for two new wells to produce 2.96 mgd	1.48
Required capacity each for three new wells to produce 2.96 mgd	0.99
Required capacity each for four new wells to produce 2.96 mgd	0.74
Required capacity each for five new wells to produce 2.96 mgd	0.59

Based on available geohydrology data in the areas proposed for the new wells (Section 2 of the CDM 2002b report), and the fact that the proposed location for supplemental wells is largely out of the existing Buckman well-field zone of influence on groundwater levels, it is expected that the supplemental wells would be capable of producing at least 0.74 mgd. It was therefore determined that two or three new supplemental wells would be insufficient to meet the purpose and need for the project. Five new supplemental wells would be more than necessary.

Site selection for the new supplemental wells was limited to the Buckman area by the need to use the existing Buckman infrastructure. Construction of the new wells nearer to the existing wells was eliminated from detailed analysis because of the draw-down of the aquifer in that area. Although the new wells could have been sited nearer to the existing wells, the yields and instantaneous pumping capacities may be higher farther away from the existing wells. Also, there is a long-term benefit of locating the new wells farther away from the existing wells in that by spreading the well-field out over a larger area provides greater flexibility in managing the effects to the aquifer.

The Buckman area has few access roads. One of the project design goals was to site the wells in locations that would result in the disturbance of as little new ground as possible. Another goal was to keep the wells within the existing utility corridor and easements, where other similar facilities already exist. Placement of the new supplemental wells anywhere else but along the Buckman Road would have resulted in the need for new access roads, an expansion of the utility corridor, and the penetration of areas currently undisturbed by development.

CHAPTER 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Land Resources

3.1.1 Topography

Existing Conditions

Santa Fe County is located in northern New Mexico between the volcanic Jemez mountains to the west and the Sangre de Cristo mountains to the east-northeast. Santa Fe County is characterized by elevations between 5,600 feet along the Rio Grande valley in the northwestern corner and 12,500 feet in the Sangre de Cristo mountains. The topography varies from eroded foothills and valleys to open plains and mesas to high mountains. The terrain from Booster Station No. 2 to Booster Station No. 3, and surrounding the proposed location for the La Tierra tank, is characterized by low rolling hills with a dendritic drainage pattern and broad arroyos. The slope into which the La Tierra tank would be buried has an eight percent grade.

Recent observations in the vicinity of the Buckman well-field have identified a shallow surface fracture that extends for about a half-mile and is up to six inches wide. Its proximity to the well-field has raised concerns that the fracture may be a result of pumping from the well-field. Pumping can lead to compaction of subsurface deposits which can, when significant enough, lead to subsidence of the land surface and surface fracturing. Examples of this are in the San Juaquin Valley of California, near New Orleans and in the Houston area. A literature search was conducted for other cases of subsidence that resulted from groundwater pumping in the intermountain west near cities similar in size to Santa Fe; however, none were found.

At this time it is not known what created the surface fracture in the Buckman wellfield area. There are several possible reasons for the development of the fracture. One is that it is the result of drying out, or dessication, of the land surface during the excessively dry conditions that existed in the area in 2002. Another is that the fracturing is the result of structural extension, the stress-relief unloading associated with the removal of sediments that once occupied the gorge that the Rio Grande has excavated. Another is that the pumping has caused land subsidence and the surface fracture. A detailed series of studies have been initiated by the USGS to try to identify the cause of the fracture. The results of these studies will not be available for several years and should help in assessing what, if anything, should be done to reduce the potential for further fracturing. There have been no indications of surface fracturing in the project area.

Effects of No Action

There would be no effects to topography under this alternative unless subsidence is, in fact, occurring as a result of pumping from the existing Buckman wells. In this case, additional subsidence may potentially occur, although the amount of subsidence would probably be limited ultimately by the geophysical properties of the subsurface geologic formations.

Effects of the Proposed Action

Full burial of the La Tierra tank would result in some modifications of the topography on the tank site. The soil placed over the tank would have a very shallow grade of less than one percent. This would contrast with the eight percent slope of the hillside into which it would be constructed. All permanent earthwork would be contoured to minimize erosion and ensure proper runoff. Temporary best management practices would be used to prevent down-cutting and incising during rainstorms or rapid snow melts. No adverse effects to topography are expected as a result of implementing this alternative.

The lack of any completed studies of potential subsidence in the vicinity of the Buckman well-field makes it difficult to analyze the potential effects of the proposed action. Assuming that land subsidence has resulted from the operation of the existing Buckman wells since their construction in the early 1970's and that long-term pumping at high rates from the proposed new supplemental wells would be limited by the OSE, it seems highly unlikely that the operation of the new wells would result in land subsidence. If anything, implementation of the proposed action would allow the City to shift pumping away from Buckman Wells #1 to #9 during periods of lower demand, thus reducing additional potential for subsidence in the area of the existing fracture. This analysis is purely speculative at present; however, it appears that if subsidence is occurring in the vicinity of the Buckman well-field, it is happening so slowly that it has not resulted in any adverse or catastrophic effects to any surface resources in the area. Also, implementation of the proposed action would allow the City to shift pumping away from Buckman Wells #1 to #9 during periods of lower demand, thus reducing additional potential for subsidence. Appendix C contains a technical memo prepared by CDM that provides more detail on this subject.

Environmental Commitments

All permanent earthwork would be contoured to minimize erosion and ensure proper runoff. Temporary best management practices would be employed in the handling of hazardous materials such as fuel, lubricants, and other chemicals typically used for construction. They would also be used to prevent down-cutting and incising during rainstorms or rapid snowmelts. The construction contractor would be required to develop and maintain on-site a Stormwater Management Plan, which would include all the best management practices that would be employed during construction.

3.1.2 Soils

Existing Conditions

The proposed well-sites, pipeline, and La Tierra tank are located in soils classified as the Pojoaque-Rough broken land complex, Fivemile loam, Cerrillos fine sandy loam, and Bluewing gravelly sandy loam. These soils are part of the Pojoaque, Fivemile, Cerrillos, and Bluewing series, respectively.

The Pojoaque-Rough broken land complex consists of about 50 percent Pojoaque sandy clay loam and 40 percent Rough broken land that is hilly. This soil type is associated with Panky, Fivemile, and Bluewing soils. Permeability is moderate and runoff is rapid. The hazard of erosion is severe. Effective rooting depth is about 60 inches and available water holding capacity is 8 to 9.5 inches. The Pojoaque-Rough broken land complex is used for range, community development, water supply, and wildlife habitat (SCS 1975).

The Fivemile loam is level to gently sloping. Permeability of this soil is moderate, runoff is medium, and the hazard of erosion is moderate. Effective rooting depth is about 60 inches and the available water holding capacity is 11 to 12 inches. This soil is used for range, wildlife habitat, and for water supply.

The Bluewing gravelly sandy loam soil is level to gently sloping. The permeability of this soil is rapid, runoff is medium, and the hazard for erosion is severe. Effective rooting depth is about 60 inches and the available water holding capacity is 3 to 4 inches. This soil is also used for range, wildlife habitat, and water supply. It is also a good source of building sand.

The Cerrillos fine sandy loam is level to gently sloping. The permeability of this soil is moderate and runoff is medium. The hazard of erosion is also moderate. Effective rooting depth to the layer high in lime content is 10 to 20 inches and the available water holding capacity is 1.5 to 2.5 inches. This soil is used for range, wildlife habitat, community development, and for water supply.

Effects of No Action

There would be no effects to soils under this alternative.

Effects of the Proposed Action

Initially, soils at the well-sites (including the access roads and utility easements), La Tierra tank, and along the pipeline corridor would be affected by construction activities. The moderate to high erosion potential of the soils in the project area indicates that measures to prevent adverse effects to local soil resources would need to be employed so that no adverse effects to soil resources would occur as a result of implementing this alternative.

Environmental Commitments

Temporary erosion control measures (i.e. silt fencing, etc.) would be employed during construction to prevent erosion until more permanent measures have been installed. Permanent measures include re-seeding the well-sites, tank site, and pipeline corridor, and installing gabion mats or concrete pads in areas where stormwater flowing across the access road to the proposed tank site may result in incision and down-cutting. Best management practices would be employed by construction contractors to mitigate fugitive dust and erosion resulting from soil disturbance. Should the pipelines ever become exposed as a result of erosion, the City would ensure that they are re-buried in a timely manner. The construction contractor would be required by the BLM to develop and maintain on-site a Stormwater Management Plan, which would include all the best management practices that would be employed during construction.

3.1.3 Geologic Setting and Mineral Resources

Existing Conditions

The Buckman area and proposed La Tierra tank location lies in the Española Basin. This part of the Española Basin contains a geologic unit known as the Santa Fe Group, which is comprised of the Tesuque, Puye, and Ancha Formations of Tertiary age (McAda and Wasiolek 1988). The Tesuque Formation is the main aquifer in the Santa Fe area. The sediments of this formation consist of "several thousand feet of pinkish-tan soft granite wash, silty sandstone and minor conglomerate and siltstone." The Puye Formation lies exclusively on the western side of the Rio Grande, across from the project area. The Ancha Formation is a high, gently sloped layer of gravel deposited on top of the Tesuque Formation. This formation extends from the Buckman area to the north and east beneath Santa Fe. It consists of pinkish-tan, angular and sub-angular fine to coarse pebble gravels that are mostly derived from granite and mixed with minor amounts of silt and sand. Data from well logs show that this formation is up to 300 feet thick in some areas.

Effects of No Action

There would be no effects to geologic formations or mineral resources under this alternative.

Effects of the Proposed Action

The lack of any known faults in the vicinity of the proposed well-sites, La Tierra tank, and connector pipeline indicates that damage to the new infrastructure as a result of seismic activity is unlikely. This alternative would not affect the geologic setting. Mineral resources found within the project area are abundant throughout the region; therefore, the proposed action would not affect them.

Environmental Commitments

No commitments are required.

3.1.4 Floodplains, Wetlands, and Riparian Zones

The effects analysis in this section is directly related to the Water Resources analysis. For a more detailed explanation of the effects of pumping water from the Buckman well-field on the Rio Pojoaque and Tesuque Creek, see please refer to Section 3.2.

Existing Conditions

Panels 350069 0150 B and 350069 0175 B of the Federal Emergency Management Agency Flood Insurance Rate Map (FIRM) for Santa Fe County dated 1988 indicate that the four well-sites are not located in a 100-year floodplain. A 100-year flood means that there is a one percent chance of a flood occuring in any given year. The pipeline heading west from the La Tierra tank crosses an unnamed arroyo that is likely subject to 100-year floods.

No wetlands or riparian zones were observed in the project area by biologists during the biological surveys. There are no springs or seeps, and no vegetation that would indicate the presence of wetlands or riparian zones located in the immediate vicinity of the well-sites, pipeline, or La Tierra tank. There are some wetlands and riparian areas associated with the Rio Pojoaque and Tesuque Creek, which are tributaries to the Rio Grande. The size and location of these areas have not been specifically identified.

Effects of No Action

In the future, the City will purchase water rights in the Rio Pojoaque and Tesuque Creek to offset depletions of these tributaries caused by long-term pumping from the existing wells in the Buckman well-field, then there may potentially be some small incremental effect on their associated wetlands and riparian zones to the extent that the rights purchased were not previously being used. When the City purchases and retires acequia water rights for the purpose of offsetting depletions in the Rio Pojoaque and Tesuque Creek, the OSE determines the percentage of the purchase that may actually be consumptively used as offsets. The amount of water required to irrigate one acre of land during one growing season with water from the Rio Pojoaque or Tesuque Creek is 3.35 AF. Of this amount, 1.84 AF per acre are consumed by the crop, evaporation, and evapotranspiration, with the remaining amount returning to the streams via seepage back into the ground. When a farmer enters into an agreement with the City to stop irrigating his land by selling his irrigation water rights, the City only receives credit for the 1.84 AF of water that was originally consumed per acre the farmer was irrigating. Also, because the amount of water in these tributaries available for irrigation was originally over appropriated, the OSE further reduces the credit by approximately 20 to 30 percent in an effort to correct this historical shortage. The net result is that for each acre of land taken out of irrigation, which previously required 3.35 AF per acre to irrigate annually, the City only receives offsetting credit for approximately 70 to 80 percent of the 1.84 AF of water per acre retired (Young 2003, pers. comm.). The extent of the potential effects on wetlands and riparian zones associated with the Rio Pojoaque and Tesuque Creek would be difficult, if not impossible to quantify; however, they would be expected to be minor.

Effects of the Proposed Action

The La Tierra tank connector pipeline would be buried to a depth of 4 feet; therefore, it would not affect discharges down any arroyos it crosses. In the unlikely event that the pipeline is exposed during a flood, the City would ensure that it is re-buried in a timely manner. A CWA Section 404 permit would be obtained from the ACOE prior to construction of the pipeline. The project may possibly be authorized under

Nationwide Permit No. 12, Utility Line Activities, provided the work complies with the terms and conditions of the permit. Given the planned 4-foot depth of the pipeline, there would be no effects to existing watercourses from the proposed action.

The cone of depression resulting from the proposed action is not expected to extend far enough to affect springs or seeps in the general area. It would be very difficult, if not impossible, to predict with any degree of certainty what overall effect the proposed action might have on seeps and springs beyond the project area. In the future, the City would purchase water rights in the Rio Pojoaque and Tesuque Creek to offset depletions of these tributaries caused by long-term pumping from the existing wells in the Buckman well-field, then there may potentially be some small incremental effect on their associated wetlands and riparian zones to the extent that the rights purchased were not previously being used. When the City purchases and retires acequia water rights for the purpose of offsetting depletions in the Rio Pojoaque and Tesuque Creek, the OSE determines the percentage of the purchase that may actually be consumptively used as offsets. The amount of water required to irrigate one acre of land during one growing season with water from the Rio Pojoaque or Tesuque Creek is 3.35 AF. Of this amount, 1.84 AF per acre are consumed by the crop, evaporation, and evapotranspiration, with the remaining amount returning to the streams via seepage back into the ground. When a farmer enters into an agreement with the City to stop irrigating his land by selling his irrigation water rights, the City only receives credit for the 1.84 AF of water that was originally consumed per acre the farmer was irrigating. Also, because the amount of water in these tributaries available for irrigation was originally over appropriated, the OSE further reduces the credit by approximately 20 to 30 percent in an effort to correct this historical shortage. The net result is that for each acre of land taken out of irrigation, which previously required 3.35 AF per acre to irrigate annually, the City only receives offsetting credit for approximately 70 to 80 percent of the 1.84 AF of water per acre retired (Young 2003, pers. comm.). The extent of the potential effects on wetlands and riparian zones associated with the Rio Pojoaque and Tesuque Creek would be difficult, if not impossible to quantify; however, they would be expected to be minor.

Environmental Commitments

Any mitigation would be identified by the ACOE during the permitting process prior to construction of the La Tierra connector pipeline. The City is currently studying other means of offsetting depletions of the Rio Pojoaque and Tesuque Creek, such as transporting water to them via truck or pipeline. This study is part of the City's long-term water management program, which will be analyzed in a separate NEPA document. The use of other means such as these would eliminate any potential adverse effects to wetlands and riparian zones.

3.1.5 Wild and Scenic Rivers

Existing Conditions

The three rivers nearest the project site are the Pojoaque, Tesuque, and Rio Grande. The Cañada Ancha, which lies to the south of the project site only flows intermittently when conveying stormwater runoff to the Rio Grande. No portions of the Pojoaque or the Tesuque rivers have been designated as Wild or Scenic under the Wild and Scenic Rivers Act (WSRA) (P.L. 90-452, as amended; 16 U.S.C. 1271-1287). The nearest downstream segment of the Rio Grande that is protected from development under the WSRA is in the Big Bend National Park in southwest Texas. Upstream on the Rio Grande, the Taos Rio Grande Gorge has been protected from development under the WSRA. The nearest river in New Mexico with any segments protected under the WSRA is the Jemez river. The headwaters of this river lie over twenty miles east of the project site in the Valles Grande Caldera of the Jemez mountains and would therefore not be given further consideration in this EA.

Effects of No Action

There would be no effects to wild and scenic rivers under this alternative.

Effects of the Proposed Action

There would be no effects to wild and scenic rivers under this alternative.

Environmental Commitments

No commitments are required.

3.1.6 Indian Trust Assets

Indian Trust Assets (ITAs) or resources are defined as legal interests in assets held in trust by the U.S. Government for native American Indian tribes or individual tribal members. Examples of ITAs are lands, minerals, water rights, other natural resources, money, or claims. An ITA cannot be sold, leased, or otherwise alienated without the approval of the Federal government

Existing Conditions

There are no native American Indian Trust lands or assets in the vicinity of the proposed well-sites or the proposed La Tierra tank site. Consultation with the tribes listed in Chapter 5 revealed no claims to Indian Trust Assets in the project area.

Effects of No Action

There would be no effects to Indian Trust Assets under this alternative.

Effects of the Proposed Action

There would be no effects to Indian Trust Assets under this alternative.

Environmental Commitments

No commitments are required.

3.1.7 Visual Resources

Existing Conditions

Visual resources include the natural and manmade physical features that give a particular landscape its character and value as an environmental factor. Although the Taos Resource Management Plan does not identify visual resource management (VRM) objectives for the area around Buckman Road, the fact that it is a well-developed utility corridor indicates that the landscape characteristics would most likely fall into VRM Class III objectives. A visual resource inventory by the BLM is in process. Preliminary results indicate Buckman Road south of Diablo Canyon may be managed to meet the VRM Class III objectives.

The VRM Class III objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The photographs on the next three pages are some of the over 30 existing above-ground utility structures in the Buckman area, most of which are visible in the foreground from Buckman Road. Pictures 24 and 27 are of the utility structures where Wells #10 and #13 would be located. Pictures 25 and 26 are of the location where Wells #11 and #12 would be located. The well-sites are visible from Buckman Road, but not visible from the White Rock area on the west side of the Rio Grande.

As can be seen in the pictures, the terrain is relatively open. Views of the well-sites from Buckman Road are characterized by a flat to sloping foreground with small rolling hills in the middleground, often obstructing any background view. The sandy earth-tones of the ground are broken up by varying densities of shrubby chamisa lending a grey-green hue and piñon pines and junipers creating a polymorphic patchwork of dark to medium green and rusty brown colors against the landscape. There are few, if any, locations where the tall, linear shapes of electric power transmission lines are not visible. These structures and the wires strung between them follow the corridor where the well-sites are located and are highly visible in the foreground and middleground. The booster stations, surge tanks, and chain-link fences located at well-sites #10 and #13 are also highly visible in the foreground from Buckman Road.

The proposed location for the La Tierra tank is below the local topographic high points and is fully visible only from the utility access road that leads to it. The site may be partially visible to one or two residences located to the west/southwest in the Tierra de Oro neighborhood. Views from these residences toward the proposed tank location are of the utility access road and densely spaced piñon pine and juniper trees. Above the skyline in the distant background is a view of the Sangre de Cristo mountains.

Effects of No Action

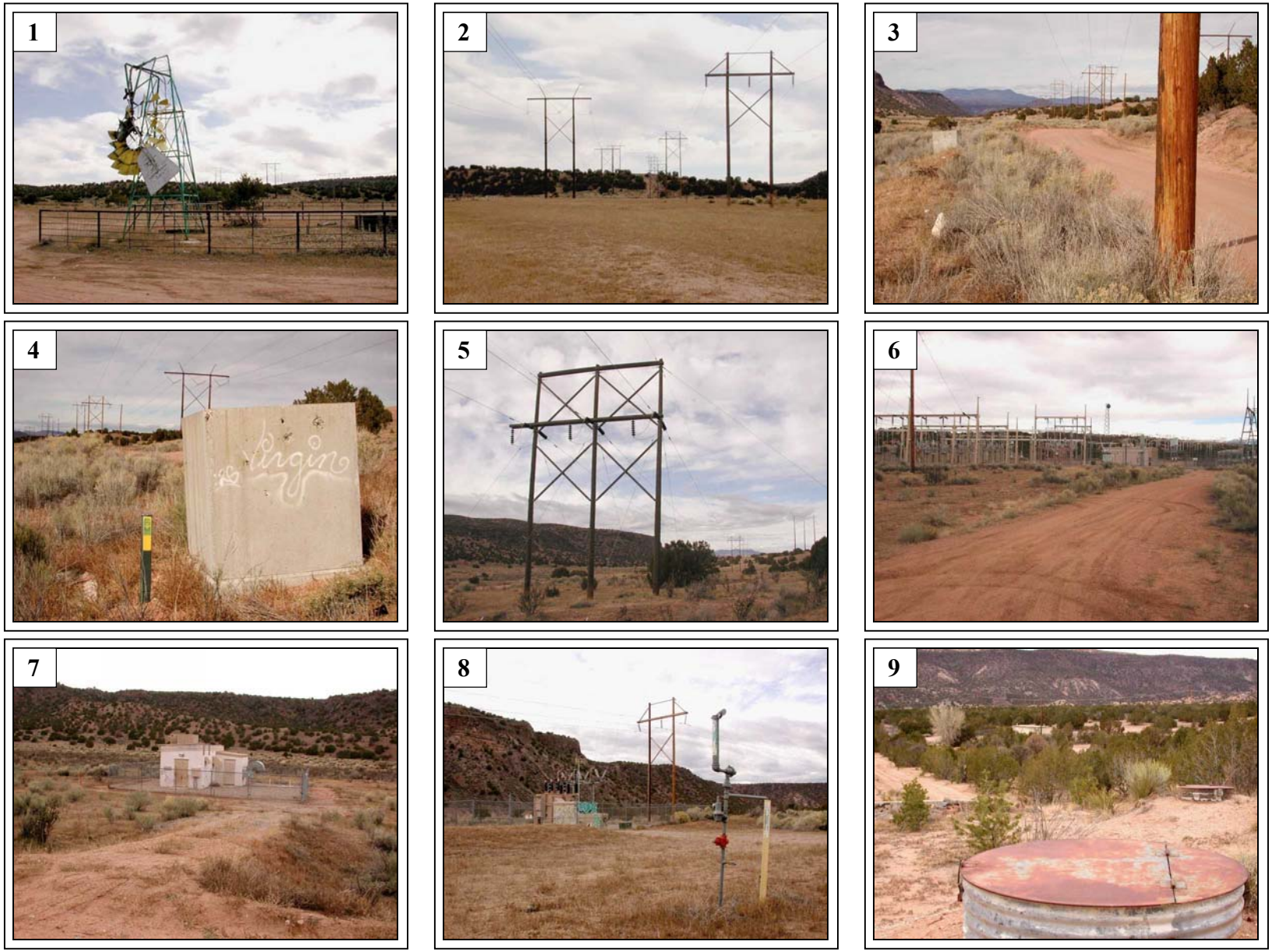
There would be no effects to visual resources under this alternative.

Effects of the Proposed Action

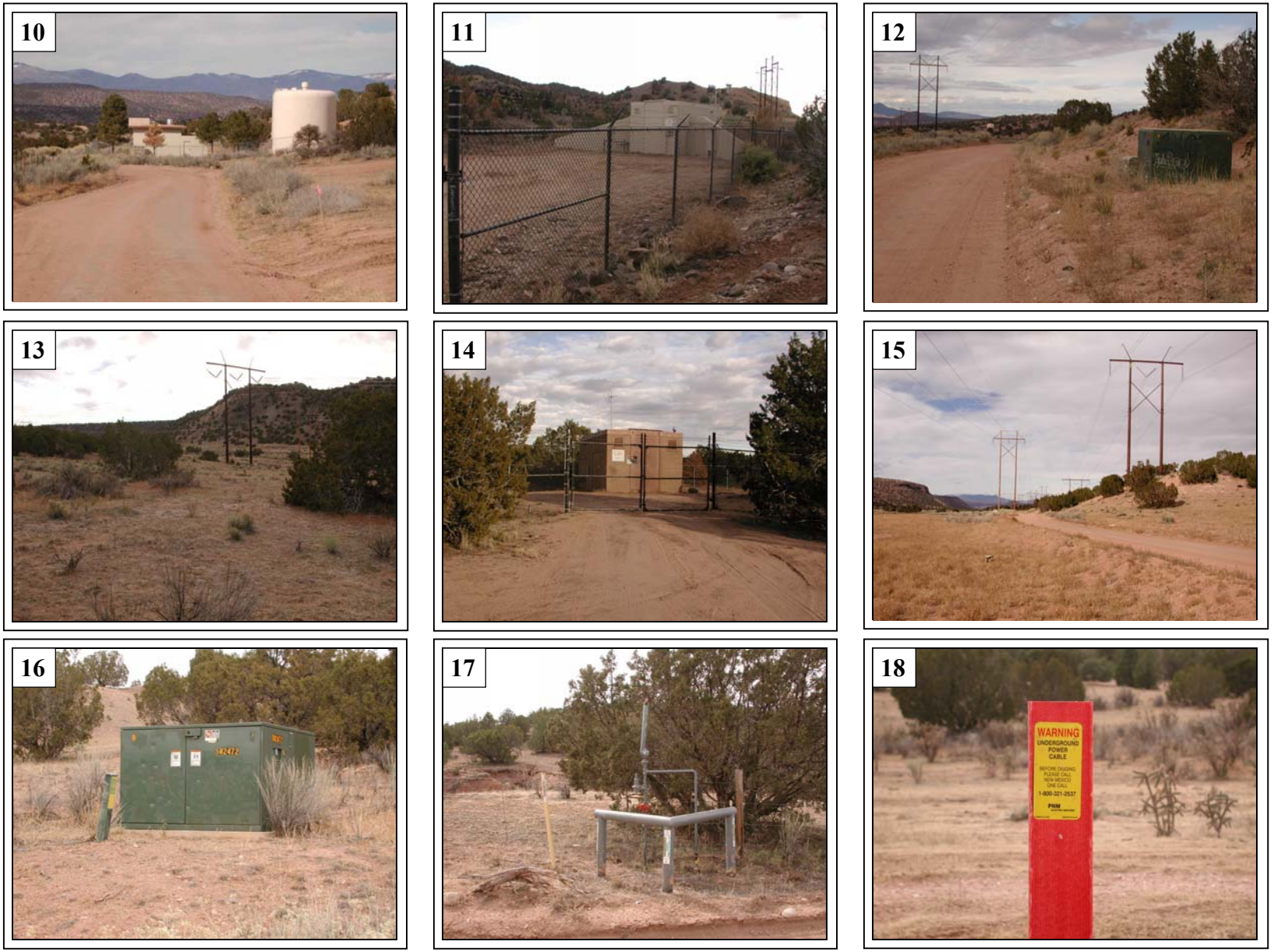
The construction of Wells #10 and #13 adjacent to Booster Stations No. 2 and 3 would not alter the existing visual character of these locations. The construction of Wells #11 and #12 between the two booster stations would alter the visual characteristics of the foreground when viewed from Buckman Road. These alterations, however, meet VRM III guidelines and would not change the overall visual character of the area along Buckman Road. Site, and access road and utility easement, clearing at the beginning of construction would create a large blank spot of sandy earth-tones on the ground in the foreground. The access road and utility easement would introduce a new, short linear feature between Buckman Road and the well-sites. Soil disturbance from this activity would be visible until native herbaceous vegetation has become re-established. Vertical and horizontal lines would be introduced as well as smooth textures and metallic tones. All disturbed areas, except for established roadbeds, would be reseeded with native species.

The fence surrounding the sites would be clearly visible in the foreground. The well pump-houses and the walls around the electrical equipment would be constructed with dark colored prefabricated stucco-like materials on the outside, which would blend in better with the background and reduce the visibility of the inevitable graffiti and accommodate repainting periodically. The City would periodically paint the well pump-houses with a color selected by the BLM to cover any graffiti that accumulates on them. The roof would be a flat concrete slab, rather than pitched metal.

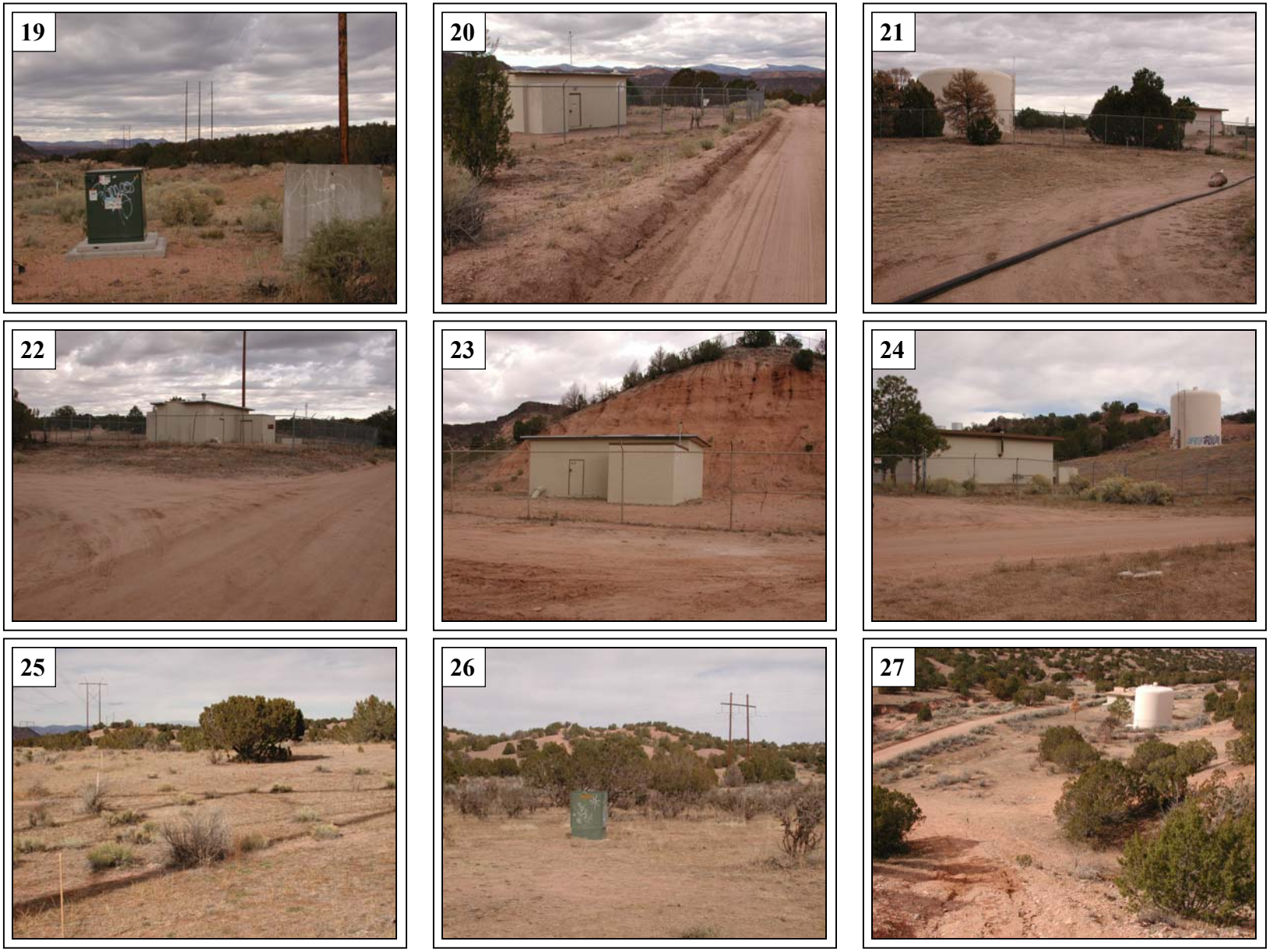
The construction and installation of the 16-inch pipeline from the new La Tierra tank would be visible to some residents of the Tierra de Oro and La Mariposa neighborhoods. The construction period for this pipeline would be brief, as up to 500 feet of the pipeline would be constructed and buried each day. Soil disturbance from this activity would create a linear pattern along the ground with a sandy earth-tone color. It would be visible until native herbaceous vegetation has become re-established.



Pictures 1-9 Existing Utility Structures In The Buckman Area.



Pictures 10-18 Existing Utility Structures In The Buckman Area.



Pictures 19-27 Existing Utility Structures In The Buckman Area.

The La Tierra tank would not be visible by residents to the west because it would be fully buried and hidden from view. After construction, the location of the tank would be visible from at least one house in the neighborhood to the west; however, it would simply appear to be an open area in an otherwise dense stand of piñon pines and junipers. The crane that would be used during construction of the tank would be visible to the neighborhoods to the west. This effect would be temporary for the duration of construction. The small disinfection and fluoridation building located by the utility access road may be visible to one residence in the neighborhood to the west. It would be designed and located to minimize this visibility. Over time, the area disturbed for construction of the tank would become revegetated. Immediately following completion of construction, the site would be reseeded with native species.

Environmental Commitments

Disturbed areas would be reseeded and any trees that must be removed for construction of the wells would be replanted according to an approved vegetation plan. The well pump-houses and disinfection/fluoridation building would be constructed with dark colored prefabricated stucco-like materials on the outside, which would blend in better with the background and reduce the visibility of the inevitable graffiti and facilitate periodic repainting. The City would periodically paint these structures with a color selected by the BLM to cover any graffiti that accumulates on them. Other water management structures in the Buckman area currently maintained by the City would be repainted as necessary to cover graffiti with the same dark color approved by the BLM. During operations, the handling of hazardous materials would employ best management practices and comply with all applicable laws and regulations. Immediately following completion of construction, the sites would be reseeded with native species.

3.2 Water Resources

Data from the CDM technical report (2002b) for the supplemental wells was used for the water resources effects analysis. This data was developed prior to testing of Buckman Well #9. Recent testing has revealed that the actual yield of Buckman Well #9 is 0.23 mgd less than the amount that was assumed in the CDM report. Consequently, the water resource effects analysis in this EA is more conservative, and the predicted effects are greater, than what they would be if the new test data from Buckman Well #9 were used. Given the emergency nature of the proposed action, and the fact that the effects presented below represent a conservative bounding condition, the interdisciplinary team for this EA concluded that re-running the computer model with the new yield data for Buckman Well #9 was not necessary.

Existing Conditions

The Buckman area has served as a source of water for the Santa Fe area since 1972. The Buckman well-field, which currently consists of eight wells, with a ninth well completed in early 2003, and a transmission pipeline designed to convey up to 8.9 mgd, supplies as much as 40 percent of the water supply for the Santa Fe area. Surface water from the Santa Fe watershed supplies another approximately 40 percent of the water supply in an average year of precipitation, and the City well-field provides the remaining 20 percent.

The operation of the Buckman well-field has resulted in a regional draw-down of the aquifer. Draw-down from the well pumping does not occur uniformly throughout the aquifer. The greatest amount of draw-down occurs in the vicinity of the wells. Less draw-down of the aquifer occurs at points progressively further from the wells. This effect is described as a "cone of depression," an example of which, is shown in Figure 3-1.

The cone of depression can also be depicted graphically as a series of concentric rings centered either on an individual well, or on an entire well-field. Each ring represents a contour interval, much like those used on a topographic map, to depict the shape and depth of the groundwater around a well or well-field. It is important to characterize the draw-down at varying distances from an individual well or well-field so the impacts of

pumping can be assessed in terms of reducing the pumping capacity of existing wells, reducing flow of natural springs, or reducing the flow of surface water in local or regional streams.

Computer models have been created to estimate the cone of depression and other effects of pumping on the aquifer and surface waters in the Santa Fe basin. A model was developed by CDM for the City of Santa Fe for water supply planning that divides the aquifer into 9 separate layers defined by their depths and water-bearing properties. Layer 1 starts at zero feet and extends down to 100 feet. Layer 2 starts at 100 feet and extends down to 200 feet. Layer 3 starts at 200 feet and extends down to 475 feet. Layer 4 starts at 475 feet and extends down to 800 feet below the ground surface. The City model also includes five more layers below Layer 4 for a total of nine layers. The detailed layering used in this model allows the impacts of pumping to be described more accurately than it has been by other models developed for the region.

The descriptions of the cone of depression in this EA are based on the effects to the aquifer in Layer 4 of the City model. This layer corresponds to the depth from which most of the Buckman wells pump and is therefore the layer in which the largest draw-down impacts occur. Layering of the gravel, sand, silt and clay geologic deposits in the Santa Fe region's aquifer system causes ground water to flow preferentially within an individual layer, since flow between layers is more restricted. The effects of pumping from the Buckman wells, therefore, tends to spread outward within a layer instead of spreading vertically through adjacent layers. Most domestic wells in the region are shallower than the municipal wells, so they tap aquifer layers less affected by the Buckman well-field pumping. The resulting draw-down felt by individual domestic wells due to pumping from the Buckman well-field, and the associated impacts felt by individual domestic wells, would in most cases be smaller than are described for the deeper model layer 4 as discussed in this section. The draw-down values reported here can thus be considered a reasonable worst-case for most wells.

The pumping of each individual well at Buckman has incrementally contributed to the overall well-field cone of depression. In 2001, the depth to groundwater at the center of the cone of depression for the Buckman well-field was approximately 260 feet, as measured in a City of Santa Fe observation well located near the center of the well-field. This depth to water represents the combined effects of pumping from all private, agricultural, and municipal wells in the region, although it is most strongly influenced by pumping from the Buckman wells. Aquifer draw-down from pumping the Buckman well-field takes on an irregular shape due to the local topography and influence of the Rio Grande. Modeling indicates that the ten-foot contour interval of the cone of depression, in Layer 4 of the City model, currently extends approximately four miles to the west, north, and northeast, five miles to the east, southeast, southwest, and northwest, and six miles to the south, away from the center of the cone of depression (CDM 2002a) for a diameter of approximately nine miles. However, the cone of depression at the top of the saturated zone (Layer 1 of the City model) near the ground surface is much smaller. The cone of depression is the result of pumping water from the well-field over the last 30 years. An average of 5,200 AFY of water have been pumped from the Buckman well-field each year for the period of 1995 to 2001. Most of the hydrologic data used in this section were obtained from three reports produced by Camp, Dresser, McKee (CDM 2002a, b, & c), an engineering firm under contract with the City to perform hydrological studies and water supply planning for this project.

Pumping water from the Buckman well-field also results in the depletion of water from the Rio Grande and its tributaries, the Rio Pojoaque and Tesuque Creek. According to the Buckman well-field permit from the OSE, the City of Santa Fe is required to offset any depletion of the flows in the Rio Grande and its tributaries that result from pumping water from the Buckman well-field. The City uses San Juan-Chama Project water to offset depletions in the Rio Grande. Because of this, there is no net depletion of water in the Rio Grande. The San Juan-Chama Project is discussed below.

The center of the Buckman well-field cone of depression lies close to the Rio Grande. This closeness results in a greater depletion of the Rio Grande flow than occurs in the Rio Pojoaque and Tesuque Creek. Computer modeling is also used to estimate the amount of flow reduction in the Rio Grande each year as a result of

pumping at Buckman. Computer modeling estimated a depletion of approximately 2,623 AF for 2001 in the volume of water flowing in the Rio Grande as a result of pumping at Buckman. The average depletion of the Rio Grande for the five-year period from 1997 to 2001 was 2,494 AFY. Historical data from the USGS gaging station at Otowi (#8313000) indicate average flows of 1.05 million AFY in this segment of the Rio Grande for the years 1918 to 1997.

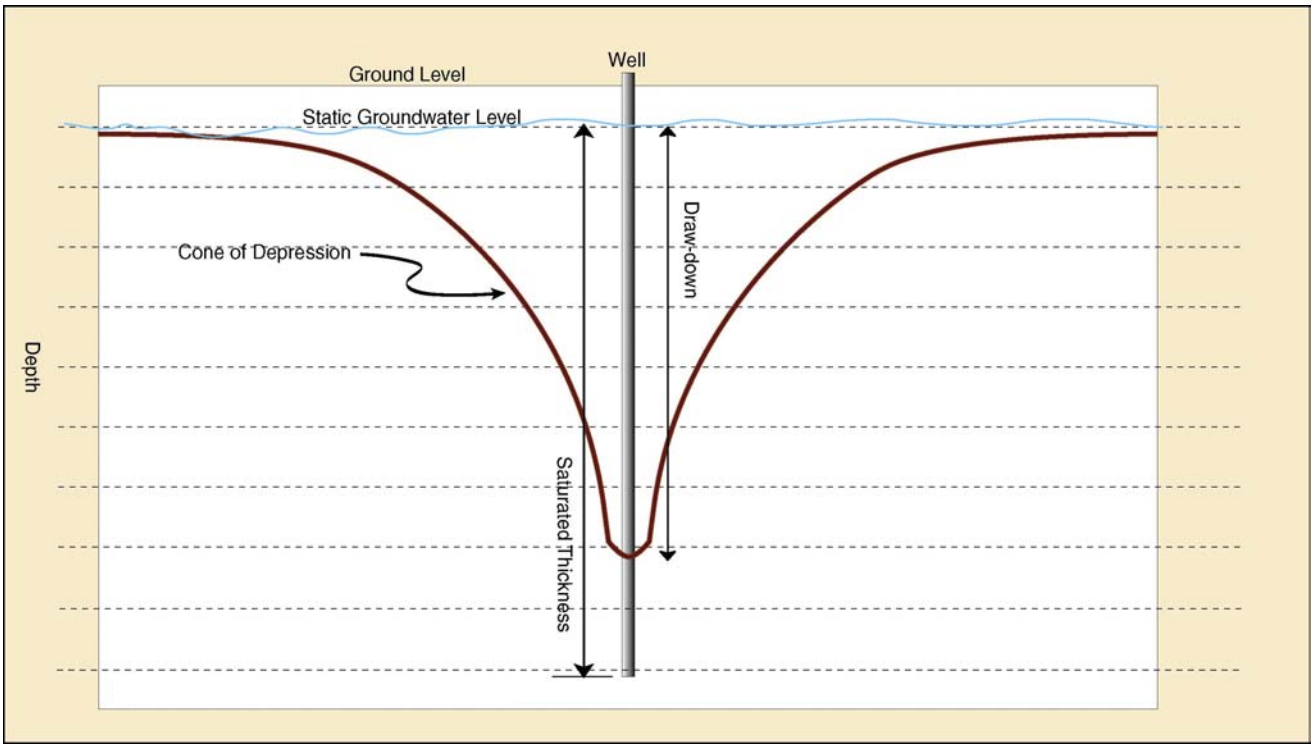


Figure 3-1 Example of a Cone of Depression.

Rio Grande flows are somewhat regulated as a result of the construction and operation of dams on the Rio Chama (El Vado, Heron, and Abiquiu). The Rio Chama is a major tributary to the Rio Grande upstream of the proposed project location, and control of surface flows on that drainage has altered the potential flood and low flows on the Rio Grande. Rio Grande flows have been augmented by a transmountain diversion of water that began in 1971 from the headwaters of the San Juan River in Colorado to the Rio Chama headwaters in New Mexico. The San Juan-Chama Project moves water from the San Juan River watershed in southern Colorado across the continental divide by way of transmountain tunnels into the Rio Chama basin. The Rio Chama then conveys the water to the Rio Grande. This transmountain diverted water is generally referred to as San Juan-Chama water.

Depletion of the Rio Grande from pumping at Buckman is offset by the City of Santa Fe by releases of San Juan-Chama water into the river. As a result, the flow of the Rio Chama and Rio Grande above the Buckman area periodically experiences a higher flow than would normally occur without such releases. Downstream of the Buckman area, annual flows are approximately what they would be if the Buckman well-field didn't exist and no corresponding offsets of San Juan-Chama water were released into the river. Currently, the City of Santa Fe and Santa Fe County own rights to 5,605 AFY of San Juan-Chama water in the Rio Grande, of which, the City owns 5,230 AFY. About a four-year supply of San Juan-Chama Project water has been stored in Heron reservoir, upstream on the Rio Chama. Consequently, even in years of low precipitation, the City and County may be able to withdraw their full annual allotment.

The two main Rio Grande tributaries in the region are the Rio Pojoaque and Tesuque Creek. The method used by the OSE to estimate stream depletions was used to determine the effects of the Buckman well-field on the volumes of water flowing in these two streams. The results show that the cone of depression for the Buckman well-field causes a small reduction in the volumes of groundwater flowing into these tributaries and thus affects their overall flow. The depletion of flows in the tributaries is offset by water rights in these streams that the City has purchased and retired specifically for the purpose of offsetting the effects of pumping at Buckman. When the City purchases and retires acequia water rights for the purpose of offsetting depletions in the Rio Pojoaque and Tesuque Creek, the OSE determines the percentage of the purchase that may actually be consumptively used as offsets. The amount of water required to irrigate one acre of land during one growing season with water from the Rio Pojoaque or Tesuque Creek is 3.35 AF. Of this amount, 1.84 AF per acre are consumed by the crop, evaporation, and evapotranspiration, with the remaining amount returning to the streams via seepage back into the ground. When a farmer enters into an agreement with the City to stop irrigating his land by selling his irrigation water rights, the City only receives credit for the 1.84 AF of water that was originally consumed per acre the farmer was irrigating. Also, because the amount of water in these tributaries available for irrigation was originally over appropriated, the OSE further reduces the credit by approximately 20 to 30 percent in an effort to correct this historical shortage. The net result is that for each acre of land taken out of irrigation, which previously required 3.35 AF per acre to irrigate annually, the City only receives offsetting credit for approximately 70 to 80 percent of the 1.84 AF of water per acre retired (Young 2003, pers. comm.). The City has purchased and retired water rights in these tributaries to compensate for the depletions. Approximately 63.7 AFY in the Rio Pojoaque and approximately 46.0 AFY in Tesuque Creek have been retired and dedicated to offsets required by Buckman pumping. These dedicated rights may only be used as offsets.

The Rio Pojoaque and Tesuque Creek experience reductions in flow because a portion of the water they convey comes from the discharge of groundwater, as opposed to surface runoff from snowmelt and rainfall. For 2001, a reduction of approximately 48 AF in the volume of water flowing in the Rio Pojoaque and a reduction of approximately 12 AF from the volume of water flowing in Tesuque Creek was estimated as a result of pumping at Buckman. Historical data from U.S. Geologic Survey (USGS) gauging stations indicate average flows of 8,905 AFY in the Rio Pojoaque (gaging station #8301000 near Nambe) and 2,317 AFY in Tesuque Creek (gaging station #8308025 near Tesuque). The data for the Rio Pojoaque are for the period between 1936 and 1941, which may not reflect current conditions. More recent flow data for the Rio Pojoaque is not available. The data for Tesuque Creek are for the period between June 1998 and September 1999.

An effort was made by the City to identify stock-water wells in the vicinity of the Buckman well-field. Stock-water wells provide drinking water for wildlife, cattle, and other grazing stock. The USFS and BLM provided a map of wells located in the Buckman area on USFS, BLM, and private lands. Other well locations were provided by individual well owners. The well locations were compared to the OSE well permit database to determine the permit number and other information about the existing wells. Table 3-1 identifies these wells, their locations, their depths, their depths to groundwater when they were drilled, and the estimated depth to water at their locations in 2001. An older well was replaced by well number 437, more commonly known as the "Dead Dog Well," so the older well was not included in the table.

Table 3-1 Stock-water wells in the vicinity of the Buckman well-field – Approximate Existing Conditions.

Well Permit #	Well Location (Township-Range-Section)	Well Depth (ft)	Original Depth to Groundwater (ft)	Estimated Depth to Groundwater in 2001 (ft)
29357	16N-8E-4	100	100	101
35202	16N-8E-4	320	200	201
29723	17N-8E-5	700	645	649

Table 3-1 Stock-water wells in the vicinity of the Buckman well-field – Approximate Existing Conditions.

Well Permit #	Well Location (Township-Range-Section)	Well Depth (ft)	Original Depth to Groundwater (ft)	Estimated Depth to Groundwater in 2001 (ft)
437	17N-8E-33	700	489	494
14073	18N-7E-35	1090	1017	1040
14458	17N-7E-34	1207	1007	1011
438	18N-8E-17	310	220	243
16681	18N-8E-2	745	574	585
7248	19N-8E-32	900	432	632
439	19N-7E-36	345	artesian	<125*
31284	18N-8E-36	815	515	525
6386	18N-8E-24	500	unknown	unknown (4**)
6128	18N-8E-10	560	520	531
6128CLW	18N-8E-10	700	525	536
55206	18N-8E-15	655	580	600

Data source: CDM 2002b

* Note: Computer modeling indicates that this well experienced 125 feet of head reduction or draw-down in 2001. Since the well was originally artesian, and may still be, and the original head pressure of the well is unknown, the depth to groundwater in this well cannot be calculated. It can be assumed, however, that the depth to groundwater is less than 125 feet. The *head pressure* of an artesian well is the amount of pressure exerted by the water at the surface. It can be quantified in terms of the height of a column of water that would be required to exert enough pressure on the well to cause it to stop flowing. For example, if Well Number 439 originally had 125 feet of *head pressure*, then in 2001, the effect of pumping the existing wells at Buckman would be to cause the depth to groundwater at Well Number 439 to be zero feet.

**This well has experienced approximately 4 feet of draw-down from its original depth to water as a result of pumping the Buckman well-field through 2001.

Effects of No Action

Under this alternative, Buckman Wells #1 through #8 would continue to be pumped at their most recent five-year rates and Buckman Well #9 would be pumped at approximately 905 AFY through 2060. This pumping estimate for Well #9 was a projection for the purposes of analysis prior to its construction and testing. Recent completion and testing of Well #9 show actual production capacity to be slightly lower; therefore, the effects of pumping Wells #1 through #9 would actually be slightly less than estimated in this EA.

This alternative would result in continued depletions of the aquifer in the Buckman area and the flows of the Rio Grande and its tributaries, the Rio Pojoaque and Tesuque Creek. The delayed effects of pumping groundwater at Buckman since 1972 would continue to be observed in the tributaries of the Rio Grande. The effects are delayed because of the distance between the tributaries and the well-field. The effects on the Rio Grande are much more immediate because of its close proximity to the well-field. By 2060, within the aquifer layer most directly affected by pumping (Layer 4 of the City model), ten feet or more of aquifer draw-down from the Buckman well-field cone of depression would extend approximately five miles to the north, seven miles to the northeast and southwest, eight miles to the east and southeast, eleven miles to the south, and to the boundary of the aquifer to the west and northwest, away from the center of the cone of depression. At the water table surface, however, the drawdown values would be much smaller.

According to the permit from the OSE, the City of Santa Fe is required to offset any depletion of flows in the Rio Grande, Rio Pojoaque, and Tesuque Creek as a result of pumping from the Buckman well-field. Depletions to the Rio Grande are offset by the release of San Juan-Chama Project water while the depletions to the Rio Pojoaque and Tesuque Creek are currently offset by the City's purchase and retirement of surface

water rights in these two tributaries. When the City purchases and retires acequia water rights for the purpose of offsetting depletions in the Rio Pojoaque and Tesuque Creek, the OSE determines the percentage of the purchase that may actually be consumptively used as offsets. The amount of water required to irrigate one acre of land during one growing season with water from the Rio Pojoaque or Tesuque Creek is 3.35 AF. Of this amount, 1.84 AF per acre are consumed by the crop, evaporation, and evapotranspiration, with the remaining amount returning to the streams via seepage back into the ground. When a farmer enters into an agreement with the City to stop irrigating his land by selling his irrigation water rights, the City only recieves credit for the 1.84 AF of water that was originally consumed per acre the farmer was irrigating. Also, because the amount of water in these tributaries available for irrigation was originally over appropriated, the OSE further reduces the credit by approximately 20 to 30 percent in an effort to correct this historical shortage. The net result is that for each acre of land taken out of irrigation, which previously required 3.35 AF per acre to irrigate annually, the City only receives offsetting credit for approximately 70 to 80 percent of the 1.84 AF of water per acre retired (Young 2003, pers. comm.).

Only a portion of the water produced from the existing Buckman well-field and the proposed new wells is tributary to the Rio Grande, Rio Pojoaque, and Tesuque Creek and the amount would vary annually depending on the hydrology of the current year and the preceding hydrologic conditions. The production required from the well-field also varies annually depending on current year, preceding hydrology, and the availability of water from other sources. The OSE makes the annual determination of the required offset water based on the above factors. Well-field production is regulated by the OSE and can never exceed the City's ability to fully offset the depletions to the Rio Grande, Rio Pojoaque, and Tesuque Creek. The remainder of the water resources section discusses the effects of pumping the well-field at full capacity to fully disclose the potential of effects of the proposed action. The well-field production, however, cannot exceed the City's ability to fully offset depletions to the Rio Grande, Rio Pojoaque, and Tesuque Creek.

OSE methodology for estimating stream depletions suggests that depletions of the Rio Grande as a result of pumping Buckman Wells #1 through #9 would reach approximately 4,014 AFY in 2060. This is an increase in depletions of approximately 1,391 AFY since 2001. Depletions would result in lower flows in the Rio Grande downstream of Buckman. Lower flows would result in less water being available in the Rio Grande for downstream users and biota. This additional depletion would be offset in the Rio Grande with San Juan-Chama water; therefore, there would be no net depletion of the Rio Grande under this alternative.

Depletions of the Rio Pojoaque under this alternative would be approximately 233 AFY by 2060. Tesuque Creek would be expected to experience depletions of approximately 80 AFY by 2060. Again, these numbers do not take into account the OSE's permit requirements for the Buckman well-field, which would prevent pumping at Buckman from resulting in depletions of these tributaries in amounts that cannot be offset by the City. Depletions would result in lower flows in the Rio Grande downstream of Buckman. Lower flows would result in less water being available in the tributaries for downstream users and biota. Since any depletions of these tributaries as a result of pumping at Buckman must be offset by the City, there would be no net depletions under this alternative.

According to the results of computer modeling, by 2006, pumping Buckman Wells #1 through #9 would cause the center of the cone of depression to be approximately 380 feet deep (CDM 2002c), which represents an increase in depth of 120 feet over the five year period since 2001. By 2010, the center of the cone of depression would be approximately 400 feet deep, which represents an additional increase in depth of 20 feet over the four year period since 2006. By 2060, the center of the cone of depression would be approximately 480 feet deep, which represents an additional increase in depth of 80 feet over the 50-year period since 2010.

These numbers indicate that with the passage of time, the average annual increase in the depth of the center of the cone of depression would become smaller. Whereas over the five year period between 2001 and 2006, the depth of the center of the cone of depression would increase at an average annual rate of 24 feet per year,

during the four year period between 2006 and 2010, the depth of the center of the cone of depression would increase at an average annual rate of 5.0 feet per year, and during the 50 year period between 2010 and 2060, the depth of the center of the cone of depression would increase at an average annual rate of 1.6 feet per year. Assuming a graph of these rates would result in a normal curve, by 2060, the depth of the center of the cone of depression would be changing very little from year to year.

The effects of pumping from the Buckman well-field on stock-water wells in the area under this alternative were modeled by CDM (2002c). Unlike the effects on the Rio Grande tributaries, these effects would not be delayed because of the close proximity of the stock-water wells to the Buckman well-field. Because the actual pumping rates for the stock-water wells are unknown, it is not possible to predict the effect that draw-down of the aquifer would have on them. It is, however, possible to predict draw-down resulting from operating the Buckman well-field as described under this alternative. Ultimately this tells us very little about whether or not a particular stock-water well would be affected under no action because a low-output well may not require more than a few feet of saturated thickness (the distance between the bottom of the well and the static groundwater level, see Figure 3-1), but it does provide a basis of comparison for the proposed action. A typical stock-water well only pumps a few gallons per minute, which does not require a large saturated thickness, so the output of some of the wells that are expected to experience a high degree of draw-down from the operation of the Buckman well-field may not be affected much if any at all. Alternatively, a well with a very high output may be severely affected by a small reduction in its saturated thickness. The effects of the proposed action are described here in terms of the reduction in the saturated thickness for a given well. A reduction in saturated thickness of greater than 70 percent is generally considered to be an adverse effect. This is because wells are typically capable of producing up to 90 percent of their maximum design yield at a 70 percent draw-down. When the draw-down becomes greater than 70 percent, the yield begins to drop off precipitously. Table 3-2 below presents the results of modeling the effects of draw-down on stock-water wells in the area. Those wells highlighted in red are expected to experience adverse effects in 2060 under no action.

Computer modeling indicates that four stock-water wells would probably be adversely affected by 2060 under this alternative. Well #438 would experience a 94 percent reduction in saturated thickness. Well #6128 would experience a 100 percent reduction in saturated thickness. Well #55206 would experience an 87 percent reduction in saturated thickness. Well #439 would experience a 360 foot reduction in its saturated thickness, which would mean the well would have needed a minimum of 170 feet of initial head pressure when the well was originally drilled for it to not be adversely affected by 2060 under this alternative. Given how unlikely that much initial head pressure is, it can be assumed that Well #439 would be adversely affected.

Table 3-2 Stock-water wells in the vicinity of the Buckman well-field – Projected saturated thickness in 2006 and 2060 under no action.

Well Permit #	Well Location (Township-Range-Section)	Well Depth (ft)	Original Saturated Thickness (ft)	Estimated Saturated Thickness in 2001 (ft)	Projected Saturated Thickness in 2006 (ft)	Projected Saturated Thickness in 2060 (ft)
29357	16N-8E-4	100	0	0	0	0
35202	16N-8E-4	320	120	119	119	112
29723	17N-8E-5	700	55	54	54	35
437	17N-8E-33	700	211	206	205	186
14073	18N-7E-35	1090	73	50	48	28
14458	17N-7E-34	1207	200	196	195	189
438	18N-8E-17	310	90	67	62	5
16681	18N-8E-2	745	171	160	160	126

Table 3-2 Stock-water wells in the vicinity of the Buckman well-field – Projected saturated thickness in 2006 and 2060 under no action.

Well Permit #	Well Location (Township-Range-Section)	Well Depth (ft)	Original Saturated Thickness (ft)	Estimated Saturated Thickness in 2001 (ft)	Projected Saturated Thickness in 2006 (ft)	Projected Saturated Thickness in 2060 (ft)
7248	19N-8E-32	900	468	268	268	243
439*	19N-7E-36	345	345+	+220	215+	unknown
31284	18N-8E-36	815	300	290	289	277
6386**	18N-8E-24	500	unknown	unknown	unknown	unknown
6128	18N-8E-10	560	40	29	25	0
6128CLW	18N-8E-10	700	175	164	160	135
55206	18N-8E-15	655	75	55	55	10

* Note: Computer modeling indicates that this well would experience 360 feet of head reduction or draw-down by 2060. Since the well was originally artesian and the original head pressure of the well is unknown, the future saturated thickness of this well cannot be calculated. It can be assumed, however, that the saturated thickness would be close to zero. The *head pressure* of an artesian well is the amount of pressure exerted by the water at the surface. It can be quantified in terms of the height of a column of water that would be required to exert enough pressure on the well to cause it to stop flowing. For example, if Well Number 439 originally had 15 feet of *head pressure*, then in 2060, the effect of pumping the existing wells at Buckman would be to cause the saturated thickness of Well Number 439 to be exactly 0 feet.

**This well has experienced approximately 4 feet of draw-down from its original depth to water as a result of pumping the Buckman well-field through 2001. By 2060, approximately 17 feet of draw-down would be expected under this alternative. Since the original saturated thickness is unknown, it is impossible to estimate what it would be in the future.

Effects of the Proposed Action

The effects of pumping all thirteen wells through 2060 at Buckman have been modeled by CDM (2002b) and are described here. The incremental effect of proposed Wells #10 through #13 are presented here as well. The addition of four supplemental wells between Booster Stations No. 2 and No. 3 would change the shape of the cone of depression by drawing it out farther to the southeast. Table 3-3 on the next page presents a comparison of the extent of the 10-foot contour interval under no action and the proposed action. By 2060, the depth of the center of the Buckman well-field cone of depression would be approximately 500 feet deep, which represents an additional 120 feet of depth attributable to proposed Wells #10 through #13.

Table 3-3 Effects of the Buckman well-field on the regional aquifer.

	Distance to the Ten-Foot Contour Interval from the Center of the Buckman Well-Field Cone of Depression (mi)							
	N	NE	E	SE	S	SW	W	NW
Existing Condition (2000)	4	4	5	5	6	5	4	5
No Action in 2060 (Wells #1 – #9)	5	7	8	8	11	7	AB[1]	AB[1]
Proposed Action in 2060 (Wells #1 – #13)	6	6	8	12	13	8	AB[1]	AB[1]
Incremental Effect of Wells #10 – #13	1	-1	0	4	2	1	–	–

[1]AB = Aquifer Boundary.

By the end of 2060, the Rio Grande would experience a reduction in flow of approximately 4,507 AFY, which represents approximately 493 AFY more than would occur under no action. This additional depletion would be offset in the Rio Grande with San Juan-Chama water. Because of this, there would be no net depletion of water in the Rio Grande under this alternative.

By the end of 2060, the anticipated effect of operating all thirteen wells at Buckman on the Rio Pojoaque is projected to be a reduction in flow of approximately 327 AFY, which represents approximately 94 AFY more than would occur under no action. By the end of 2060, the anticipated effect of operating all thirteen wells at

Buckman on Tesuque Creek is projected to be a reduction in flow of approximately 167 AFY, which is approximately 87 AFY more than would occur under no action. Again, these numbers do not take into account the OSE's permit requirements for the Buckman well-field. According to the permit from the OSE, the City of Santa Fe is required to offset any depletion of flows in the Rio Grande, Rio Pojoaque, and Tesuque Creek as a result of pumping from the Buckman well-field. Depletions to the Rio Grande are offset by the release of San Juan-Chama Project water while the depletions to the Rio Pojoaque and Tesuque Creek are offset by the City's purchase and retirement of surface water rights in these two tributaries. When the City purchases and retires acequia water rights for the purpose of offsetting depletions in the Rio Pojoaque and Tesuque Creek, the OSE determines the percentage of the purchase that may actually be consumptively used as offsets. The amount of water required to irrigate one acre of land during one growing season with water from the Rio Pojoaque or Tesuque Creek is 3.35 AF. Of this amount, 1.84 AF per acre are consumed by the crop, evaporation, and evapotranspiration, with the remaining amount returning to the streams via seepage back into the ground. When a farmer enters into an agreement with the City to stop irrigating his land by selling his irrigation water rights, the City only receives credit for the 1.84 AF of water that was originally consumed per acre the farmer was irrigating. Also, because the amount of water in these tributaries available for irrigation was originally over appropriated, the OSE further reduces the credit by approximately 20 to 30 percent in an effort to correct this historical shortage. The net result is that for each acre of land taken out of irrigation, which previously required 3.35 AF per acre to irrigate annually, the City only recieves offsetting credit for approximately 70 to 80 percent of the 1.84 AF of water per acre retired (Young 2003, pers. comm.). Well-field production is regulated by the OSE and can never exceed the City's ability to fully offset the depletions to the Rio Grande, Rio Pojoaque, and Tesuque Creek. Although this section discusses the effects of pumping the well-field at full capacity, the well-field production cannot exceed the City's ability to fully offset depletions to the Rio Grande, Rio Pojoaque, and Tesuque Creek. The potential effects of this alternative on floodplains, wetlands, and riparian areas are discussed in Section 3.1.4.

Computer modeling indicates that the same four stock-water wells affected under no action plus two additional wells would probably be adversely affected by 2060 under the proposed action. Table 3-4 on the next page presents the results of modeling the effects of draw-down on stock-water wells in the area. Wells highlighted in yellow would be adversely affected by both the no action and proposed action alternatives. Wells highlighted in red are only expected to be adversely affected by the proposed action. Wells #438 and #6128 are expected to experience a 100 percent reduction in saturated thickness. Well #55206 is expected to experience an 80 percent reduction in saturated thickness under the proposed action, which is better than what would be expected under no action. Well #439 would experience an approximately 320 foot reduction in its saturated thickness, which means it needed to have a minimum of 112 feet of initial head pressure when it was originally drilled for it to not be adversely affected by 2060 under this alternative. Given how unlikely that much initial head pressure is, it can be assumed that Well #439 would be adversely affected. Since these four stock-water wells would be adversely affected under no action, the incremental effect of proposed Wells #10 through #13 on them is irrelevant.

Well #29723 is expected to experience a 100 percent reduction in its saturated thickness under the proposed action. Well 437 is expected to experience a 78 percent reduction in its saturated thickness. One important factor is expected to mitigate these effects. The OSE administers the permit for operation of the Buckman well-field. Under the permit, well-field production cannot exceed the City's ability to fully offset depletions to the Rio Grande, Rio Pojoaque, and Tesuque Creek. Consequently, the effects of the proposed action on all the stock-water wells is expected to be similar to the effects of no action. The effects of the proposed action in 2006 are discussed in Section 3.8.2 Cumulative Effects since this year holds no particular significance unless the effects of the proposed Buckman Direct Surface Diversion are considered.

Table 3-4 Stock-water wells in the vicinity of the Buckman well-field – Projected saturated thickness in 2060 under the proposed action.

Well Permit #	Well Location (Township -Range- Section)	Well Depth (ft)	Original Saturated Thickness (ft)	Estimated Saturated Thickness in 2001 (ft)	Projected Sat. Th. in 2060 (No Action) (ft)	Proj. Sat. Th. in 2060 (Proposed Action) (ft)	Incremental Effect of the Proposed Action (2060)
29357	16N-8E-4	100	0	0	0	0	0
35202	16N-8E-4	320	120	119	112	110	-2
29723	**17N-8E-5**	**700**	**55**	**51**	**35**	**0**	**35**
437	**17N-8E-33**	**700**	**211**	**206**	**186**	**46**	**140**
14073	18N-7E-35	1090	73	50	28	28	0
14458	17N-7E-34	1207	200	196	189	195	-6
438	**18N-8E-17**	**310**	**90**	**67**	**5**	**0**	**5**
16681	18N-8E-2	745	171	160	126	131	-5
7248	19N-8E-32	900	468	268	243	178	65
439*	**19N-7E-36**	**345**	**345+**	**>220**	**unknown**	**>25**	**-40**
31284	18N-8E-36	815	300	290	277	110	167
6386**	18N-8E-24	500	unknown	unknown	unknown	unknown	-23
6128	**18N-8E-10**	**560**	**40**	**29**	**0**	**0**	**0**
6128CLW	18N-8E-10	700	175	164	135	65	70
55206	**18N-8E-15**	**655**	**75**	**55**	**10**	**15**	**-5**

* Note: Computer modeling indicates that this well would experience 360 feet of head pressure reduction or draw-down by 2060 under no action and 320 feet of head pressure reduction or draw-down in 2060 under the proposed action. Since the well was originally artesian and the original head pressure of the well is unknown, the future saturated thickness of this well cannot be calculated. It can be assumed, however, that the saturated thickness would be close to zero. The *head pressure* of an artesian well is the amount of pressure exerted by the water at the surface. It can be quantified in terms of the height of a column of water that would be required to exert enough pressure on the well to cause it to stop flowing. For example, if Well Number 439 originally had 320 feet of *head pressure*, then in 2060, the effect of the proposed action would be to cause the saturated thickness of Well Number 439 to be exactly 345 feet, equivalent to the depth of the well.

**This well has experienced approximately 4 feet of draw-down from its original depth to water as a result of pumping the Buckman well-field through 2001. By 2060, 17 feet of draw-down are anticipated under no action and 40 feet of draw-down are anticipated under the proposed action.

Environmental Commitments

The OSE would require the City to offset any and all depletions in the Rio Pojoaque and Tesuque Creek resulting from operation of the Buckman wells. The OSE typically considers the magnitude, location, and timing of depletions when determining these offsets so that any losses from the aquifer in the vicinity of the tributaries are accounted for. Should additional offsets in the tributaries to the Rio Grande be required by the OSE, the City may purchase senior water rights from current owners who use the water for irrigation via acequias that divert the water from those tributaries. The quantity of these rights available for purchase, however, are limited and the owners are not required to sell. Also, when the City purchases and retires acequia water rights for the purpose of offsetting depletions in the Rio Pojoaque and Tesuque Creek, the OSE determines the percentage of the purchase that may actually be consumptively used as offsets. The amount of water required to irrigate one acre of land during one growing season with water from the Rio Pojoaque or Tesuque Creek is 3.35 AF. Of this amount, 1.84 AF per acre are consumed by the crop, evaporation, and evapotranspiration, with the remaining amount returning to the streams via seepage back into the ground. When a farmer enters into an agreement with the City to stop irrigating his land by selling his irrigation water rights, the City only receives credit for the 1.84 AF of water that was originally consumed per acre the farmer was irrigating. Also, because the amount of water in these tributaries available for irrigation was originally over appropriated, the OSE further reduces the credit by approximately 20 to 30 percent in an effort to correct

this historical shortage. The net result is that for each acre of land taken out of irrigation, which previously required 3.35 AF per acre to irrigate annually, the City only recieves offsetting credit for approximately 70 to 80 percent of the 1.84 AF of water per acre retired (Young 2003, pers. comm.). Any additionally required offsets in the tributaries could be met by other means. The small quantities involved would allow for the regular delivery of water to the tributaries by truck. Another option could be the delivery of water to the tributaries by pipeline. These options for meeting future offset requirements by the OSE will be analyzed in more detail as long-term projects. The City would also be required by the OSE to maintain sufficient water rights in the Rio Grande to offset any and all depletions of flows in the river resulting from operation of the Buckman wells. In the absence of additional offsets, the City would not be allowed to pump water from the Buckman well-field at a rate that results in depletion levels that cannot be offset in the Rio Grande or the two tributaries. Any other commitments necessary for the proposed action would be identified by the OSE prior to approval of the application.

3.3 Air Quality

Existing Conditions

The Clean Air Act of 1970, as amended, established National Ambient Air Quality Standards (NAAQS; 40 CFR 1 § 81.332) to protect the public from exposure to dangerous levels of several air pollutants. Santa Fe County is in Air Quality Control Region (AQCR) 157. AQCR 157 has been classified as attainment area for all air pollutants identified in the NAAQS (Cook 2002, pers. comm.). Because of this classification for Santa Fe County, the proposed project is not subject to EPA requirements for ambient monitoring. Buckman Road and the utility access road to the proposed La Tierra tank site are used by recreational vehicles and utility vehicles. These vehicles generate a small amount of exhaust and fugitive dust in dry conditions.

Effects of No Action

There would be no effects to air quality under this alternative.

Effects of the Proposed Action

Fugitive dust from grading operations and vehicle travel to and from the sites are the only anticipated effects to air quality during construction. There are no businesses or residences near the well-sites, so exposure to the public for this portion of the proposed action would be minimal. Large volumes of dust are not expected and would be minimized by the use of best management practices by the construction contractors (e.g., water trucks would spray water on the roads to keep dust down if necessary). These effects would be temporary for the duration of construction. Exhaust emissions from heavy equipment and vehicles working on the well-sites, La Tierra tank site, and pipeline would be minor and temporary for the duration of the construction period. During operation of the wells, maintenance vehicles would periodically travel to and from the well-sites, resulting in a negligible amount of additional exhaust and fugitive dust generation. There would be no adverse impacts to air quality in the region as a result of the construction or operation of the proposed new supplemental wells or La Tierra water storage tank.

Environmental Commitments

Best management practices would be employed by the construction contractors to minimize effects to air quality (e.g., water trucks would spray water on the roads to keep dust down if necessary). No other commitments are required.

3.4 Living Resources

The following living resources description and discussion is intended to provide a general overview of the biota present in the region and within the proposed pipeline corridor, well-site locations, and the La Tierra tank location. Information was obtained by reviewing project planning documentation, previously published environmental analysis documentation, information acquired from July and August 2002 field surveys that were conducted in support of the *Buckman Water Diversion Environmental Impact Statement*, and site-specific surveys conducted on October 23 and November 12, 2002 for the proposed action. In total, over 37 man-days in 2002 were spent in the field by professional biologists surveying for flora and fauna. These biologists used standard accepted survey techniques and protocols.

3.4.1 Wildlife

The presence of high cliffs at Diablo Canyon, approximately three miles northwest of Booster Station No. 2, and the riparian areas along the Rio Grande, approximately five miles northwest of Booster Station No. 2, provide valuable habitat for flora and fauna. The river valley is a corridor for movement of migratory birds and several species of mammals. It would not be unlikely for some of these species to be found in and around the proposed project area. Wildlife habitat within the project area generally consists of disturbed land where well-developed native herbaceous plant communities are lacking. Although a variety of wildlife (i.e., amphibians, retiles, mammals, birds, etc.) may be found in the piñon-juniper woodlands and sage scrub grasslands in the local region; few species would exclusively utilize the project sites.

Existing Conditions

Mammalian species that could be expected to utilize habitats found in the proposed project site locations and pipeline corridor are representative of the region. These species include: mule deer (*Odocoileus hemionus*), raccoon (*Procyon lotor*), porcupine (*Erethizon dorsatum*), valley pocketgopher (*Thomomys bottae*), Colorado chipmunk (*Eutamias quadrivittatus*), piñon mouse (*Peromyscus truei*), squirrels (*Spermophilus* spp.), desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), cottontail rabbits (*Sylvilagus* spp.), woodrats (*Neotoma* spp.), and deer mice (*Onychomys* spp.). Predatory species would include: black bear (*Ursus americanus*), coyote (*Canis latrans*), fox (*Vulpes* spp.), mountain lions (*Felis concolor*), long-tailed weasel (*Mustela frenata*), badger (*Taxidea taxus*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), and striped skunks (*Mephitis mephitis*). Human activities and hunting pressure within the Rio Grande corridor have kept large and predatory mammal populations at fairly low levels. However, this region is still a very important refuge for large and small mammals in New Mexico (BIA 2000).

Because of previous and existing impacts from overgrazing by livestock, developments, and other human uses, the proposed project area contains little prime and/or suitable nesting, denning, foraging, or hunting habitat for wildlife other than snakes and lizards. Although the presence of a diverse range of wildlife that includes 21 mammals, 132 birds, 13 reptiles, and 5 amphibians has been documented by observation or capture on BLM land in the Buckman area, during recent biological surveys there was a noticeable lack of birds and mammals within most of the proposed project area. The proposed project sites and pipeline corridor do not contain any perennial aquatic habitat.

Effects of No Action

There would be no effects to wildlife under this alternative.

Effects of the Proposed Action

Approximately 12.2 acres of low value wildlife habitat would be disturbed during construction and approximately 3.2 acres would be permanently altered for the well facilities and La Tierra tank. During site clearing activities highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. An almost negligible increase in competition for resources in the undeveloped areas surrounding the proposed project sites may occur due to the carrying capacity limitations of these areas, which may result in a small amount of additional pressure to lands already at or near carrying capacity. These effects are expected to be minimal.

For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during construction or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to Wells #11 and #12 due to the increased noise level, traffic, lights, and other human activity, both pre- and post-construction (Kelly and Rotenberry 1993).

Given the large and dynamic nature of reptile, amphibian, and small mammal populations, the high percentage of available habitat in the surrounding areas and the existing levels of noise, traffic, lights, and other human activities in the area, these effects are not expected to be adverse. Open trenches, such as the those that would be necessary to install the pipeline and electrical conduits, have the potential to trap small mammals, amphibians, and reptiles and can cause injury to large mammals during construction. The measures described below would minimize the effects to wildlife from these trenches.

The proposed action would result in relatively minor adverse effects to wildlife either directly or by loss of habitat. There are no activities related to construction or operations that would result in adverse off-site effects on Rio Grande aquatic species.

Environmental Commitments

The project would include an upland erosion control and revegetation plan. Project boundaries would be staked and temporarily fenced prior to construction thus minimizing the potential for disturbances outside the project area. To minimize the risk to wildlife from open trenches, the trenches would be backfilled as the pipeline and electrical conduits are laid in the ground. Trenches would not be left open overnight unless absolutely necessary. If the pipeline trench must be left open overnight, an escape ramp for wildlife would be placed in it. The trench would also be inspected and any trapped animals would be removed prior to backfilling.

3.4.2 Vegetation

Three primary plant communities are represented throughout the areas surrounding the proposed project sites. The dominant plant communities are the Piñon-Juniper Savanna and Piñon-Juniper Woodland, and to a lesser extent the Great Basin Sage Scrub community. The natural states of these communities along with human-caused alterations in their compositions are described in detail by Dick-Peddie (1993).

The natural processes that shaped the piñon-juniper woodland have been disrupted. Historically the piñon-juniper complex was open and savannah like with a reoccurrence of low intensity fires every 15-40 years. Today, due to the reduction of native grass and general loss of ground-cover vegetation that could sustain a low intensity ground fire and coupled with the aggressive suppression of natural fires and juniper tree invasion, the potential for a severe wild-land fire has increased dramatically. Dense stands of piñon-juniper are now present in some areas with tree densities ranging between 100 to over 300 trees per acre.

Historical overgrazing has been cited as the primary disturbance causing the continuing decline of local soils. Extensive grazing by cattle and sheep in the piñon-juniper woodland and juniper savanna vegetation zones has resulted in a decline in the fragile surface soils resulting in the inability of the land to support a more dynamic plant community.

Existing Conditions

Well-site #10 is the farthest northwestern project location and is southeast of the riparian and semi-riparian areas along the Rio Grande. It is adjacent to the floodplain of the lower Cañada Ancha. This area is subjected to intense pressure from cattle grazing and human uses, both permitted and unpermitted, such as off-road driving, refuse dumping, and camping. This broad, open floodplain is dominated by rabbitbrush (*Chrysothamnus nauseosus, C. depressus*) and the ubiquitous disturbance indicator, snakeweed (*Gutierrezia sarothrae*). Other plants in this association include Apache plume (*Fallugia paradoxa*), four-wing saltbush (*Atriplex canescens*), and two species of globemallow (*Sphaeralcea angustifolia, S. incana*). One-seeded juniper (*Juniperus monosperma*) is the most common tree species. Other woody vegetation includes piñon pine (*Pinus edulis*), yucca (*Yucca glauca*), tree cholla (*Opuntia imbricata*), and sand sage (*Artemisia filifolia*).

Well-sites #11 through #13 are located southeast of Well-site #10 and adjacent to the existing pipeline corridor along Buckman Road. These well-sites are characterized by vegetation similar to that found at Well-site #10. Most of the plant communities are degraded from erosion resulting from off-highway vehicle use and high densities of piñon pines and junipers that prevent the establishment of herbaceous vegetation.

Much of the existing pipeline corridor easements have been cleared of vegetation and the recovering community is comprised of grasses and forbs interspersed with some woody species. Thus, there is a minimal presence of intact native vegetation communities within the pipeline corridors. The existing pipeline corridors are maintained to prevent the encroachment of trees and as a result much of the vegetation present is comprised of shrubs and weedy species. The pipeline corridor includes more forbs and grasses than the potential well-sites. Plants encountered in this corridor include winterfat (*Krascheninnikovia lanata*), blue grama (*Bouteloua gracilis*), side-oats grama (*Bouteloua curtipendula*), peppergrass (*Lepidium montanum*), sweet clover, and annual wildflowers such as yarrow (*Achillea millefolium*), Palmer's penstemon (*Penstemon palmeri*), and coneflower (*Ratibida columnifera*).

Very high densities of piñon pines and junipers are present at the proposed water tank location and associated utility corridor. In many areas the tree canopies are touching and the soils are rilled or contain large erosion gullies. Bark beetle piñon pine mortality is evident in the area in a clumped distribution. Tree mortality at this time, however, is not extensive, but may become so in the future.

There are no permanent surface water bodies (ponds), perennial streams, or jurisdictional wetlands within the proposed project area. There are two general types of washes that are encountered along the proposed project route. The first are those that have not been subjected to recent flash floods. These have denser stands of vegetation, including juniper and rabbitbrush, than the surrounding upland areas. The second type of wash is the sandy, open, scoured arroyo. These areas support relatively few plants and contain only annuals such as scurf-pea (*Psoralidium lanceolatum*) and clammy-weed (*Polanisia dodecandra*).

Invasive, Non-Native Species. No invasive, non-native plant species were observed in the project area during the biological surveys that were conducted in 2002. This does not preclude the potential existence of a seed bank of these types of weeds, which, under the right conditions of soil disturbance and moisture, could germinate and become established in the project area.

Effects of No Action

Tree densities would continue to increase along with mortality from bark beetles. Grazing, if unmanaged, in the vicinity of the proposed well-sites would continue to degrade the soils and quality of the grasslands. There would be no immediate change in effects to vegetation under this alternative. The long-term effects of the existing land use practices at well-sites #11 and #12, along the La Tierra pipeline corridor, and at the La Tierra tank site would continue to degrade the quality of the plant communities there.

Invasive, Non-Native Species. No invasive, non-native plant species have been observed in the project area.

Effects of the Proposed Action

Clearing during construction of the permanent well-sites and temporary construction easements would affect vegetation by resulting in the removal of approximately 12.2 acres of Great Basin Sage Scrub. Approximately 10 to 12 trees would be removed as the proposed wells have been carefully sited to avoid trees as much as possible. These trees would be immediately replanted around the well-sites. A revegetation plan would specify maintenance and survival criteria for the trees. Following construction, well-site areas outside of the fenced facilities would revert back to their previous condition. Inside the fenced facilities a native herbaceous vegetation structure would be maintained. Approximately 3.2 acres would be permanently affected; however, effects to the plant communities in the overall project area would be minor.

Construction of the La Tierra tank would require the clearing of approximately 5.4 acres of an extremely dense stand of Piñon-Juniper Woodland. The clearing of these trees may actually relieve some of the stress on the trees immediately surrounding the site. The vegetation in the disturbed areas over and around the tank would eventually recover with the help of erosion control measures and the implementation of a revegetation plan.

Invasive, Non-Native Species. No invasive, non-native plant species have been observed in the project area. All disturbed soils would be reseeded with native species and watered when necessary to ensure the re-establishment of native vegetation. A revegetation plan, approved by the BLM, would be developed prior to completion of construction activities.

Environmental Commitments

The project would include an upland erosion control and revegetation plan. All disturbed soils would be reseeded with native species and watered when necessary to ensure the re-establishment of native vegetation. Trees removed from the well-sites would be replanted. The revegetation plan, which must be approved by the BLM, would be developed prior to completion of construction activities and would include maintenance and survival criteria for the trees. Project boundaries would be staked and temporarily fenced prior to construction thus minimizing the potential for disturbances outside the project area. Following construction, the temporary fence would be removed and a permanent fence would be erected around the permanent facilities.

3.4.3 Special Status Species

Section 7 of the *Endangered Species Act* (ESA), which is administered by the U.S. Fish and Wildlife Service (FWS), requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of federally protected endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect listed species. The State of New Mexico has jurisdiction on state lands through the New Mexico Wildlife Conservation Act (17-2-37 to 17-2-46 New Mexico Statutes Annotated 1978). In addition, the BLM and USFS also maintain lists of species of concern

to each agency. Even though the proposed project is on BLM and City of Santa Fe lands, the USFS list of species of concern was reviewed due to the close proximity of their lands containing similar habitat as the proposed project area. Federal or state listing of a species indicates a high concern for the continued viability of that species or population within the State of New Mexico.

The following 17 species are listed from Santa Fe County under the ESA by the FWS.

ENDANGERED
Southwestern willow flycatcher (*Empidonax traillii extimus*)

THREATENED
Bald eagle (*Haliaeetus leucocephalus*)
Mexican spotted owl (*Strix occidentalis lucida*), with critical habitat

PROPOSED THREATENED
Mountain plover (*Charadrius montanus*)

CANDIDATE
Yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN
New Mexican meadow jumping mouse (*Zapus hudsonius luteus*)
Townsend's big-eared bat (*Corynorhinus townsendii*)
American peregrine falcon (*Falco peregrinus anatum*)
Arctic peregrine falcon (*Falco peregrinus tundrius*)
Baird's sparrow (*Ammodramus bairdii*)
Northern goshawk (*Accipiter gentilis*)
Rio Grande sucker (*Catostomus plebeius*)
Chiricahua dock (*Rumex orthoneurus*)
Santa Fe cholla (*Opuntia viridiflora*)

Existing Conditions

There are 52 species of wildlife considered special status by the U.S. Fish and Wildlife Service (FWS), BLM, USFS, or the State of New Mexico that are known to occur, or could potentially occur, in Santa Fe County. In addition, about 30 species of birds may occur in Santa Fe County that are designated as High Priority by Hawks Aloft, a private avian conservation organization based in New Mexico. Of these 82 species, there may be suitable habitat for 15 within the proposed project area. The only legally protected species that is likely to use the general project area is the bald eagle (*Haliaeetus leucocephalus*). Table 3-5 presents a list of the 15 special status species of Santa Fe County that have potential for occurrence in the Buckman area.

Table 3-5 Special-Status Species of Santa Fe County with Potential for Occurrence in the Buckman Area.

	Status				
Common Name (*Scientific Name*)	**FWS**	**FS**	**BLM**	**NM**	**General Habitat**
REPTILES					
Desert kingsnake (*Lampropeltis getula splendida*)	–	S	–	–	Riparian or grassland, but also found in piñon-juniper

Table 3-5 Special-Status Species of Santa Fe County with Potential for Occurrence in the Buckman Area.

	Status				
Common Name (*Scientific Name*)	**FWS**	**FS**	**BLM**	**NM**	**General Habitat**
BIRDS					
Western burrowing owl (*Athene cunicularia hypugaea*)	–	–	S	–	Open grasslands, prairies, desert scrub
Ferruginous hawk (*Buteo regalis*)	–	S	S	–	Arid plains and open rangelands
Swainson's hawk (*Buteo swainsoni*)	–	S	–	–	Grasslands, shrublands, and riparian woodlands
Mountain plover (*Charadrius montanus*)	PT	S	–	S	Sparse, semiarid grasslands and plains
American peregrine falcon (*Falco peregrinus anatum*)	SC	S	–	T	Open country with steep canyons
Bald eagle (*Haliaeetus leucocephalus*)	T	S	–	T	Winters along shores of rivers, lakes, reservoirs
Loggerhead shrike (*Lanius ludovicianus*)	–	–	S	–	Open country, grasslands, and desert scrub
Southwestern willow flycatcher (*Empidonax traillii extimus*)	E	–	–	E	
Gray vireo (*Vireo vicinior*)	–	S	–	T	Open woodlands with well-developed grasses
MAMMALS					
Ringtail (*Bassariscus astutus*)	–	S	–	S	Various rocky and broken areas
Gunnison's prairie dog (*Cynomys gunnisoni*)	SC	–	–	S	Open grasslands from low valleys to montane meadows
Western spotted skunk (*Spilogale gracilis*)	–	–	–	S	Various rocky and brushy areas
New Mexican jumping mouse (*Zapus hudsonius luteus*)	SC	(S)	(S)	(T)	Dense riparian forb-grass communities
PLANTS					
Santa Fe cholla (*Opuntia viridiflora*)	SC	–	–	E	Gravelly rolling hills in piñon-juniper woodland
Santa Fe blazing star (*Mentzelia springeri*)	–	–	–	S	Volcanic pumice and unconsolidated pyroclastic ash in piñon-juniper woodland and lower montane coniferous forest

Designations are: Endangered (E), Threatened (T), Candidate (C), Proposed (P), Species of Concern (SC), and Sensitive (S). Statuses in parentheses are listed by the agency for New Mexico, but not specifically for Santa Fe County.

The Rio Grande silvery minnow is not found above the Cochiti dam, which is downstream of the project area. There were no plant species found that are listed in the inventory of rare and endangered plants of New Mexico. Two species are known to be present in areas adjacent to the project area. Cyanic milkvetch (*Astragalus cyaneus*) has been identified in the Calabasas Arroyo and dagger cholla (*Opuntia clavata*) was identified in the Calabasas Arroyo, Alamo Arroyo, Norton Substation, Diablo Canyon and Diablo Mesa. The only state-listed animal species that may potentially occur in the area is the gray vireo. The gray vireo is known to occupy Piñon-Juniper Savanna habitats and has been positively identified in a wooded canyon near

Cerrito Pelado on the Caja del Rio Plateau. It has also been observed to breed in an area west of Cieneguilla, approximately 15 miles southwest of the project area, and stated to occure in "dry juniper savanna habitats from Norton Substation west to the flanks of Diablo Mesa and La Mesilla." The southwestern willow flycatcher is known to breed north of the Buckman area. A peregrine falcon was observed in Diablo Canyon in 1996 (Cox 1999). Diablo Canyon contains possible nesting grounds for this species. Diablo Canyon is approximate three miles northwest of project area. Site surveys did not reveal the presence of this species, nor any of the other species listed above in the vicinity of the project area. No suitable habitat for any of the species identified in Table 3-2 was found in the project area during site surveys.

Effects of No Action

There would be no effects to special status species under this alternative.

Effects of the Proposed Action

The silvery minnow would not be affected by the proposed action because any depletions of the flow of the Rio Grande by pumping from the Buckman well-field are offset by releases of San Juan-Chama water, as described in Section 3.2 Water Resources. Rio Grande flows below Cochiti Dam are controlled by the operation of the dam, therefore the timing of the releases of San Juan-Chama water from the storage reservoirs upstream of the project area are not critical to maintaining the flow below the dam. Sufficient quantities of San Juan-Chama water are currently stored in the upstream reservoirs to offset depletions of the Rio Grande due to pumping of the Buckman well-field as described under the proposed action for the foreseeable future. The OSE would not allow the Buckman well-field to be pumped at a rate for which depletions of the Rio Grande cannot be offset by releases of San Juan-Chama water.

Due to the lack of suitable habitat within the area of the proposed action, no effect to any protected or special status species is expected as a result of implementing of the proposed action. Similarly no, or only minor, effects from disruption of foraging activities by special status species are expected to result from implementing of this alternative.

Environmental Commitments

No commitments, other than that described previously for wildlife in general, is required.

3.5 Historic, Cultural, Traditional Cultural Properties, and Archaeological Resources

3.5.1 Sacred Sites

Existing Conditions

Sacred sites or Traditional Cultural Properties (TCPs) are land areas identified by Native Americans as having important religious value. Sacred lands of the San Ildefonso Pueblo are directly across the Rio Grande from the Buckman area. These tribal lands are used to support the cultural practices of the Pueblo. No other sacred sites were identified through consultation with the tribes listed in Chapter 5.

Effects of No Action

There would be no effects to sacred sites under this alternative.

Effects of the Proposed Action

Well #10, to be located at Booster Station No. 2, is the closest point in the project area to the Rio Grande and the San Ildefonso lands on the opposite side. This well would be approximately 3.6 miles away from these sacred lands. There would be no effects to sacred sites under this alternative.

Environmental Commitments

No commitments are required.

3.5.2 Historical, Cultural, and Archaeological Resources

Existing Conditions

A Class I Archeological records search was conducted to identify any known historical, cultural, or archaeological resources in the project area. On November 25 – 26, 2002, a Class III archeological field survey was conducted in the project area. This survey included a 100-foot buffer zone around the proposed La Tierra tank site and well-sites (including the access road and utility easements), and a 50-foot buffer zone on either side of the linear portions of the proposed action that pass through federal or city-owned land. The segment of the proposed La Tierra connector pipeline that passes through private property was surveyed within the boundaries of the right-of-way, where construction activities would be confined.

The Class I and III surveys revealed no archeological sites and only five isolated occurrences of artifacts. All data from these occurrences were recorded and are described in the report (SWCA 2002) prepared for the State Historic Preservation Officer (SHPO). No other historical, cultural, or archeological resources are known to occur in the project area.

Effects of No Action

There would be no effects to historical, cultural, or archaeological resources under this alternative.

Effects of the Proposed Action

No known historical, cultural, or archaeological resources would be affected by the proposed action. In the event that new archeological resources are discovered during construction, the BLM would be notified. All work within 50 feet of the new discovery would be stopped until an appropriate plan for mitigation has been approved.

Environmental Commitments

In the event that new archeological resources are discovered during construction, the City would notify the BLM. All work within 50 feet of the new discovery would be stopped until an appropriate plan for mitigation has been approved by the BLM and the SHPO.

3.6 Socioeconomic Conditions

The primary socioeconomic factors potentially affected by the proposed action are tourism, ways of life, employment, and the landscaping industry in the City of Santa Fe. Tourism provides a major source of income for businesses in the City. Santa Fe's unique and traditional characteristics along with the natural beauty of the surrounding landscape make it a favorite tourist destination. One of the attractive features of the City is the landscaping in the downtown area near the plaza. Many of the residents of Santa Fe maintain

small flower gardens, which add to the character of the City. Gardening is an important part of life for many of the City's residents. New buildings currently under construction would require some kind of landscaping when they are completed. A number of nurseries in the City are dependent on the public's ability to maintain healthy yards and gardens in both private and public areas through the summer months each year. Along with these nurseries, landscaping and yard maintenance businesses provide a relatively small amount of employment in the service and retail sectors.

An Annual Water Budget Ordinance was recently passed by the Santa Fe City Council to prevent growth that requires additional water. The Ordinance requires all permit applications for new construction of homes or businesses to be accompanied by payment for the retrofitting of a sufficient number of water conserving fixtures in other existing residences or businesses to fully offset the anticipated increased water use. Alternatively, applicants may directly install a sufficient number of water conserving fixtures in other existing residences or businesses to fully offset the anticipated increased water use. The proposed action is needed to maintain the supply of water to existing users during periods of drought.

Modifications to existing homes or businesses that would result in an increased use of water would be required to offset the anticipated increase in water use by retrofitting other water fixtures in the same building with water conserving fixtures. These measures are designed to prevent any increase in the total system demand for water through the City's water distribution system.

3.6.1 Employment and Income

Existing Conditions

Employment in Santa Fe County has grown by almost 30 percent over the past 10 years, similar to the population growth rate. Unlike population growth, which grew faster in the County, job growth continues to be concentrated in the City. The top employment sectors are the services industry (30%), government (28%), and retail trade (14%). Construction employment accounted for almost eight percent of total employment in 2001. Combining the individual components in another way, employment related to tourism (including retail trade; arts, entertainment, and recreation; and accommodations and food service) is almost 30 percent of the total. In 2001, the unemployment rate for Santa Fe County was 2.6 percent and 2.4 percent for the City. Non-agricultural employment in Santa Fe County has increased at a faster rate than both the state and the nation since 1960.

Income statistics for Santa Fe County reflect significantly higher median household and per capita incomes than for New Mexico residents as a whole. The median household income for 1999, as presented in the 2000 US Census, is $42,207 for Santa Fe County and $34,133 for the state median. Per capita income for Santa Fe County residents was reported at $23,594, compared to $17,261 for the state average. The Bureau of Business and Economic Research (BBER) at the University of New Mexico (UNM 2002a) reports that wage and salary disbursements accounted for only 43 percent of the County's personal income in 1999, compared to 58 percent nationwide. Income in Santa Fe County is supplemented by dividends, interest, and rent (27 percent) and owners income (10 percent). Even though the Santa Fe County per capita income is above the national average, the average wage in the County is only about 80 percent of the US average (UNM 2002a).

During the 1990s, the taxable gross receipts for Santa Fe County increased 93 percent for a compound annual rate of 6.8 percent. The City of Santa Fe's gross receipts tax base grew by 80 percent or a compound rate of 6.0 percent. Given that employment grew more in the City than in the County, this appears to be unreasonable until the impact of a new law requiring gross receipts taxes on housing sales to be reported at the location of the house rather than the location of the real estate agent's office is factored into the equation. By 2000, the City's share of the County total slipped below 80 percent and was just over 78 percent in 2001, a bad year for Santa Fe and other tourist destinations. While Santa Fe has maintained its share of total taxable

gross receipts from retail trade and services, it accounts for only about half of the total taxable gross receipts from construction. Total taxable gross receipts for Santa Fe County in 2001 were $3,101.5 million, dominated by retail trade ($1,289.2 million) and services ($869.9 million).

Effects of No Action

Retail and services employment would be affected as opportunities with new businesses decrease. The construction sector, currently at just over 7% of the total labor market would be directly impacted if new residential and commercial building activity is restricted by water shortages. The BBER estimates that building construction employment could fall by roughly 10% by 2005, possibly affecting approximately 500 workers in the area (UNM 2002b).

Effects of the Proposed Action

The BBER predicts that the construction sector of the labor force would feel the same range of impacts as under the No Action Alternative even though more houses would be permitted (UNM 2002b). Construction of the proposed action would employ some workers, at least temporarily, although exact numbers are not known. Operation and maintenance of the facilities would be done by existing Sangre de Cristo crews and would not require a staffing increase.

Environmental Commitments

No commitments are required.

3.6.2 Housing

Existing Conditions

More housing is being built outside the City limits, and the City is permitting fewer residential units – 510 per year during the 1992 – 2001 period, down from an average of 687 units in the previous 10 years (UNM 2002a) or a 35 percent decrease in the 10-year period. Reasons for this include the higher price of land in the City limits and the requirement to hook up to municipal services.

According to the US Census, the median value of Santa Fe County owner-occupied housing units in 2000 was $189,400. Many of the most expensive homes in the County do not meet the census definition of owner-occupied, being second or seasonal homes for people who are legal residents of another state, skewing the median value downwards. Between 1996 and 2002, the median sales price for existing and new, single-family detached homes in Santa Fe County ranged from a low of $127,116 to a high of $697,500. The northern part of the County, including Las Campanas, had the highest prices during that 6-year period, ranging from $332,500 to $697,500. The US Census only counts primary residences. Since the most expensive homes in the Santa Fe area are typically not the primary residence of the owners, the information on home values is skewed downward.

Effects of No Action

Housing growth in Santa Fe County would gradually decrease as fewer new housing units are permitted and built. Subdivisions with already approved units would be more likely to be built, but fewer than 3,150 units would be able to obtain utility hook-ups during the 10-year planning period (UNM 2002b), thereby reducing the amount of population growth and increasing the per unit cost of both owner-occupied and renter-occupied units. Development of additional units at Las Campanas would be restricted. If the water shortage were to reach Stage 4 (or 5) water restrictions, the BBER predicts that all of Santa Fe County may shut down new

building activity (UNM 2002b), although builders are not expected to abandon the area but to wait until the water situation is resolved and housing development can resume. One exception to this is that City permits for so-called "affordable housing" are exempt from limits due to water restrictions. Consequently, new housing would still be available in the City for the low-income segment of the population.

Effects of the Proposed Action

No studies could be found that specifically examine the potential effects of the proposed action, however, certain conclusions can be drawn from the information available. Under this alternative, Stage 4 (and 5) water restrictions would be avoided for the near-term foreseeable future. Home construction would continue with a slightly elevated cost due to the requirements of the Annual Water Budget Ordinance. Housing growth that creates an increased demand for water from the City system cannot occur as a result of the passing of the Annual Water Budget Ordinance. This project would not provide enough water to allow for growth that increases the demand for water. There would be no adverse effects to housing as a result of implementing this alternative; however, there may be some positive effects if Stage 4 and 5 water restrictions are avoided. By avoiding Stage 4 (and 5) water restrictions, new building activity would not be entirely shut down.

Environmental Commitments

No commitments are required.

3.6.3 Ways of Life

Existing Conditions

The area of potential effect on ways of life is Santa Fe County and the southernmost portion of Rio Arriba County. Historically, this part of northern New Mexico is characterized by the rural and agricultural nature, Indian and Hispano populations, and pockets of persistent poverty (Jemez y Sangre, 2002). The current tri-cultural mix of Anglo, Hispanic, and Indian populations represents one of the most unique cultures in the world. Land-based Indian and Hispano cultures continue the centuries-old traditions that included distinctive land use and settlement patterns, agricultural and irrigation practices, natural resource stewardship practices, social relations, religious activities, and architecture.

The ancient acequia system is a prime example of this traditional lifestyle, being a vital part of the irrigation system of subsistence and market agriculture as well as integral to the social fabric that holds together rural communities. Within the City limits, the acequias bring water to keep lawns and gardens green and productive, in stark contrast to the outlying high desert arid landscape. These traditions and practices have been important in attracting out-of-region visitors and maintaining the local tourism industry (Jemez y Sangre, 2002).

Founded in 1607, Santa Fe is the second oldest city in the United States and is the oldest capital city in America. Tourists coming to Santa Fe, the City Different, for its art galleries and museums, fine restaurants, and cultural attractions like the renowned Santa Fe Opera, are also interested in the possibility of visiting nearby Indian pueblos such as Tesuque and traditional Hispanic villages such as La Cienega. Many of these traditions and practices are being lost because these tourists are now settling in the area. For example, the acequia system has been challenged in recent years by land developers buying water rights for housing rather than for agriculture. And Indian Pueblos are becoming known more for their casinos than for the ceremonial dances or traditional arts and crafts.

Effects of No Action

Should additional offsets in the tributaries to the Rio Grande be required by the OSE, the City may purchase senior water rights from current owners who use the water for irrigation via acequias that divert the water from those tributaries. The retirement of these rights would result in an incremental decrease in this traditional method of agricultural irrigation. Stage 3, 4 and 5 water restrictions may be imposed if severe drought conditions persist. These restrictions would severely curtail small-scale traditional gardening in the historic district of the City. Eventually, these traditions could be replaced by other activities that require less or no water. Tourism may gradually decrease as the traditional attractiveness of the City gives way to a more common urban appearance.

Effects of the Proposed Action

The imposition of Stage 3 water restrictions during peak demand periods would be shorter or potentially avoided altogether. Stage 4 and 5 water restrictions would be avoided for the near-term foreseeable future. Small-scale traditional gardening in the historic district of the City would be allowed to continue. Should additional offsets in the tributaries to the Rio Grande be required by the OSE, the City may purchase senior water rights from current owners who use the water for irrigation via acequias that divert the water from those tributaries. The retirement of these rights would result in an incremental decrease in this traditional method of agricultural irrigation. The quantity of these rights available for purchase, however, are limited and the owners are not required to sell. Also, the required offsets in the tributaries could be met by other means. The small quantities involved would allow for the regular delivery of water to the tributaries by truck. Another option could be the delivery of water to the tributaries by pipeline. These options for meeting future offset requirements by the OSE are currently being studied by the City and will be analyzed in more detail as long-term projects to be implemented by 2010. No adverse effects to ways of life are expected as a result of implementing this alternative.

Environmental Commitments

The City is currently studying other means of offsetting depletions of the Rio Pojoaque and Tesuque Creek, such as transporting water to them via truck or pipeline. This study is part of the City's long-term water management program, which will be analyzed in a separate NEPA document. The use of other means such as these would eliminate any potential adverse effects to ways of life.

3.6.4 Demographic Trends and Environmental Justice

Existing Conditions

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that the effects on minority and low-income populations within a project area be given special consideration to determine if the proposed action would result in disproportionate adverse effects to their communities.

The total population for Santa Fe County, as enumerated by the 2000 US Census, was 129,292. Of that total, 48 percent, or 62,203 people, live within the City of Santa Fe. The County is growing faster than the State of New Mexico (20.1% between 1990-2000). The County is also growing faster than the City, continuing a trend first seen since 1980, when 65 percent of the County population lived within the city limits. In 1990, 57 percent of the County population lived within the city limits. The BBER projects that the population of Santa Fe County will increase to 158,624 people by 2010 (UNM 2002b). Based on the decreasing percentage of residents in Santa Fe County living within the city limits, it is estimated that approximately 63,450 people would live in the City at that time.

Females account for approximately 51 percent of the population of Santa Fe County, and the median age is 37.9 years, reflecting the nation-wide trend of an older population. Almost half (49%) of the County's population reports themselves as being of Hispanic or Latino origin; 45.5 percent are reported as White persons, not of Hispanic or Latino origin, and 3.1% are reported as American Indian and Alaska Native persons. Over 10 percent of Santa Fe County residents reporting on the 2000 US Census are listed as being foreign born, reflecting the number of Mexican Nationals living in the area.

The connector pipeline from the proposed La Tierra tank would pass through the communities of La Mariposa and Tierra de Oro. These communities are located in U.S. Census Block 5057, Block Group 5, Census Tract 102.01, in Santa Fe County, New Mexico. According to 2000 US Census data, 3.1 percent this block's population reported themselves as being of Hispanic or Latino origin, while 96.9 percent are reported as White persons, not of Hispanic or Latino origin. 2000 US Census income data is not yet available for this block, however, housing in these communities is similar to that of Las Campanas, where property values range from $332,500 to $697,500. These property values indicate that this block's population does not qualify as low-income. There are, however, low-income populations in Santa Fe County.

Effects of No Action

Under this alternative, there would be no additional water to make up for existing demands during drought periods. This would equally affect all members of the city and county populations that are currently dependent upon the City water supply. There would be no effects to demographic trends under this alternative. Because City permits for so-called "affordable housing" are exempt from water restriction limits, new housing would continue to be available to all income-levels of the population; therefore, environmental justice is not an issue under this alternative.

Effects of the Proposed Action

Within the City and Santa Fe County, the additional water that operation of the new wells would provide would be equally available to all users dependent upon the City water supply. Because there are no low-income or minority populations in the immediate project area, they would not be disproportionately affected by construction of the proposed action. Environmental justice is, therefore, not an issue. There would be no effects to demographic trends under this alternative.

Environmental Commitments

No commitments are required.

3.6.5 Community Infrastructure

Existing Conditions

In addition to paved roads and other utilities such as electricity, telephone service, and the City sewer system, the Tierra de Oro and La Mariposa neighborhoods, along with other adjacent neighborhoods, are connected to the City water distribution system. This system is divided up into different pressure zones based on elevation. The Tierra de Oro neighborhood and other adjacent neighborhoods are in Pressure Zone 5. This pressure zone is connected to the 10 million gallon water storage tank located approximately two miles to the east on Camino de los Montoyos.

The connection to the tank is made by a 16-inch diameter pipeline. This pipeline follows a utility easement from the 10 million gallon water storage tank to the pressure reducing valve (PRV) in Pressure Zone 5. The PRV is located just south and east of the east end of Dandelion Circle and just north of Camino La Tierra.

The utility easement and pipeline pass between the residential streets of Vista Sandia and East Wildflower Drive. Also within this easement is the 20-inch diameter Buckman water transmission pipeline that extends from the 10 million gallon water storage tank all the way to Buckman Booster Station No. 4, located to the west/northwest along Camino La Tierra.

Emergency medical and fire services are provided to the communities in the project area by Santa Fe County. In addition to a private security force, police protection in these communities is provided by the New Mexico State Police.

Effects of No Action

Pressure Zone 5 of the City water distribution system would continue to be underserved by the lack of sufficient volume in the 10 million gallon water storage tank. Water pressure in this zone would be difficult to maintain during periods of high demand. Difficulties managing the supply of water stored in the distribution system would continue. There would be no other effects to community infrastructure under this alternative.

Effects of the Proposed Action

Pressure Zone 5 of the City water distribution system would be supplied with a sufficient volume of stored water. Water pressure in this zone would be more readily maintained. Management of the supply of water stored in the distribution system would be improved. The installation of the new 16 to 24-inch pipeline would require crossing Fin del Sendero Road. This would result in a temporary disruption of traffic flow on this road during the installation of the pipeline beneath the road and repavement of the road where the pipeline would cross. These disruptions would be brief, lasting no more than a half-day. One lane of Fin del Sendero Road would be kept open at all times during this process to allow traffic to pass. Emergency services and police protection would not be interrupted by the proposed action. No other utilities or infrastructure would be affected by this alternative.

Environmental Commitments

A traffic control plan would be developed for and implemented during construction. This plan would include the placement of appropriate warning signs and other safety measures. One lane of Fin Del Sendero Road would be kept open at all times during installation of the pipeline beneath the roadbed and during repavement of the road surface where the pipeline crosses. All buried utilities within the La Tierra tank portion of the project area would be precisely located prior to construction activities requiring digging. No other commitments are required.

3.7 Land Use

The land on which the supplemental wells would be located is administered by the BLM. The land is currently used for grazing, recreation, and utility corridors. The land on which the La Tierra tank would be located is owned by the City. This land is currently undeveloped, but is zoned for future residential development. It is currently used for recreation and utility corridors. The pipeline that would connect the La Tierra tank to the distribution system would follow an existing utility easement that passes through the private residential communities of La Mariposa and Tierra de Oro.

3.7.1 Utility Infrastructure

This section discusses the utility infrastructure in the portion of the project area surrounding the new supplemental well-sites. Section 3.6.5 Community Infrastructure addresses utilities in the portion of the project area surrounding the La Tierra tank and its associated connector pipeline.

Existing Conditions

A number of utilities are present in the portion of the project area in and around the proposed well-sites and the Buckman area in general. High voltage electrical power transmission lines cross the area in several directions. These transmission lines are connected to large substations also located in the project area. Buried natural gas pipelines also cross the Buckman area in several places, including within an easement that follows Buckman Road. This same easement contains the main Buckman well-field water transmission pipeline, which transports all water from the Buckman well-field back to the Santa Fe distribution system. Connector pipelines lead from each of the Buckman wells to Booster Station No. 1, except for Buckman Well #9, which connects directly to the main water transmission pipeline between Booster Stations No. 1 and 2. Fiber optic cables and telephone lines area are buried in the Buckman area and air vents for the gas and water lines project up out of the ground in various locations.

Effects of No Action

There would be no effects to utility infrastructure under this alternative.

Effects of the Proposed Action

The proposed action would increase the amount of water system infrastructure in the project area and the Buckman area in general. The power supply for proposed Wells #10 and #13 is already available within the fenced perimeter of Booster Stations No. 2 and 3. These wells would simply tie directly into the existing power supply at the Booster Stations. The power supply for proposed Wells #11 and #12 would tie into the existing buried power cable that follows the Buckman main water transmission pipeline, within the new access road to these wells. The new cable would follow the access road into the new well-sites. All other existing utility infrastructure would remain essentially the same. All buried utilities within the project area would be precisely located prior to construction activities requiring digging. There would be no adverse effects to the utility infrastructure as a result of implementing the proposed action.

Environmental Commitments

All buried utilities within the project area would be precisely located prior to construction activities requiring digging. No other commitments are required.

3.7.2 Grazing

Existing Conditions

Presently, no grazing is taking place in the vicinity of the proposed La Tierra tank site. Two lease-holders maintain grazing allotments from the BLM in the area surrounding the proposed well-sites. Cattle are allowed to graze in the project area on a periodic basis depending upon the amount of grass available for foraging. Letters were mailed to the two lease-holders to inform them of the proposed action and solicit any concerns they may have about the project.

Effects of No Action

There would be no effects to grazing under this alternative.

Effects of the Proposed Action

No concerns were raised by grazing lease-holders other than the need to preserve the capacity of stock-water wells. The stock-water wells are discussed in detail in the Water Resources section of this document. There would be no effects to grazing under the proposed action.

Environmental Commitments

No commitments are required.

3.7.3 Recreation, Solitude, and Remoteness

Existing Conditions

Recreational users of the area include those who access lands surrounding Buckman Road for swimming, boating, fishing, rock-climbing, birding, rock hounding, horseback riding, partying, picnicking, hunting, shooting, hiking, off-highway vehicle use, and camping. A large number of people accessing the Buckman area use the U.S. Forest Service (USFS) land near the Rio Grande for these purposes. The public has direct access to the well-sites via Buckman Road.

Frequent weekend and summer month use of the Buckman area occurs primarily by recreational users. In order to estimate the recreational use of the Buckman area, a traffic survey was conducted on Sunday, September 15, 2002, as well as vehicle counter data collected between September 9 and October 7, 2002 (including 5 weekends). These data indicate that roughly 94 percent of the approximate 249 vehicles that traveled past Dead Dog Well over the 5 weekends on Buckman Road were doing so for recreational purposes (Tetra Tech 2002).

The Taos RMP describes most of the lands adjacent to Buckman Road as Semi-Primitive Non-Motorized (SPNM). The Recreation Opportunity Spectrum (ROS), a management tool used by the BLM, refers to providing a sense of remoteness as distance from the sight and sounds of human activity and ½-mile from motorized trails in SPNM areas. Although the RMP designates existing roads and trails as open to vehicle use, management direction for SPNM is to provide opportunities for challenge and solitude.

Noise data was obtained from work that was performed in support of the proposed Buckman Direct Surface Diversion project. Existing noise conditions were evaluated by performing field noise measurements at several locations in the study area where noise levels may change as a consequence of the project. Noise levels were recorded at eight locations, including a site near the Rio Grande, along the Buckman transmission pipeline corridor, and at several existing booster stations in the pipeline corridor. A-weighted average noise levels (Leq dBA)[1] were collected in 10-minute intervals at each location using standard noise measuring protocols and an Ono Sokki LA-1250 Integrating Sound Level Meter. Noise monitoring was performed on

[1] The relative loudness of a sound or noise is described in units of decibels (dB), a measure of sound pressure on a logarithmic scale. Noise conditions are usually described by a time-averaged noise level, expressed as the equivalent noise level (Leq). An A-weighting filter is also used to correlate physical noise levels with the frequency sensitivity of human hearing and the subjective response to noise. Thus, noise conditions are generally discussed in terms of hourly average A-weighted noise levels in decibels, or Leq dBA. The average noise level occurring over a 24-hour period is usually and described as a day-night average noise level (abbreviated DNL, or Ldn), and includes adding 10 decibels to sound levels occurring during the nighttime hours (between 10 PM and 7 AM).

Wednesday, January 8, 2003. Measured average noise levels (Leq) and estimated day-night average noise levels at the eight monitoring sites are provided in Table 3-6.

Table 3-6 Measured Leq and Estimated Ldn Noise Levels.

Description of Monitoring Location	Measured Noise Level (Leq dBA)	Estimated Day-Night Level (Ldn)
1) River – at proposed intake structure (rushing water)	54.0	60.4
2) Near River – in parking area	38.4	44.8
3) Proposed pipeline alignment – between Booster Stations 1 & 2	20.0	26.4
4) Booster Station 2 – 100 feet from pump house	51.7	58.1
5) Booster Station 2 – 1000 feet from pump house	36.0	42.4
6) Booster Station 3 – 100 feet from pump house	53.6	60.1
7) Booster Station 3 – 500 feet from pump house	35.5	41.9
8) Booster Station 4 – 100 feet from pump house	51.9	58.3

The BLM Farmington Office has drafted standards for "noise sensitive areas" (NSAs) including cultural resource areas, wilderness, BLM recreation resources, and camping and picnicking areas. That standard is 48.6 dBA over a 24-hour period. "For noise sources located inside NSAs, the standard is 48.6 dBA at 300 feet in all directions from the noise source" (BLM 2001). The standard was based on a 1973 EPA study conducted to determine a threshold for nuisance noise.

Slightly higher noise levels were observed immediately adjacent to the existing booster stations associated with the Buckman well-field. However, noise levels at the fence line for each of these facilities were observed to rapidly diminish within a few hundred feet of each pump house.

Noise levels affect the amount of solitude and sense of remoteness that can be experienced by recreational users of the Buckman area. Up close to Booster Station No. 2, noise from the pumps inside the building increases rapidly; however, moving only a marginal distance away from the station, all noise becomes indistinguishable from background levels. Noise characteristics of the corridor between Booster Stations No. 2 and 3 are that of wind, nature, the occasional gunshot from target shooting, and vehicles using Buckman Road.

Two miles farther south of Buckman Booster Station No. 2 is a small well and livestock corral called Dead Dog Well. The corrals at this location are still used from time to time. These animals can create noise levels that are noticeable close up, but a short distance away, noise levels generated by the animals fade rapidly into the background.

Noise levels at Booster Station No. 3, located two miles southeast of the Dead Dog Well on Buckman Road, are comparable to those at Booster Station No. 2. The noise levels of the Buckman Road corridor between Dead Dog Well and Booster Station No. 3 are characterized by sounds of nature and the occasional passing car. Because Booster Station No. 3 is located relatively close to the residential neighborhood of Las Campanas, noise levels there are slightly higher. The sound of intermittent construction activity, increased vehicle traffic, and residences is barely discernible.

The proposed site for the La Tierra tank is currently on undeveloped land. Noise levels in the area are characterized primarily as the sounds created by wind and nature. The site is far enough away from any roads that vehicle noise is non-existent. The connector pipeline corridor extends through the Tierra de Oro and La Mariposa neighborhoods. Noise levels in these neighborhoods are relatively quiet and typical of partially developed residential areas with no fixed sources of extremely loud noise.

A light-use hiking/running trail exists on the opposite side of the arroyo from the La Tierra tank that primarily receives foot traffic from homeowners living in the nearby communities of La Mariposa and Tierra de Oro.

Effects of No Action

There would be no effects to recreation, solitude, and remoteness under this alternative.

Effects of the Proposed Action

Construction activities associated with the pipeline, well-sites, and tank would not obstruct recreational traffic traveling along Buckman Road. The minor road improvements to the access road to the La Tierra tank would temporarily block recreational traffic; however, these activities would be short in duration. No adverse affects to recreational resources are anticipated by implementing this alternative.

Construction of the proposed supplemental wells, La Tierra tank, and pipeline would result in some noise. Drilling operations would generate the most noticeable amount of noise; however, this disruption of solitude and sense of remoteness would be temporary and of short duration. Construction of the La Tierra tank and installation of its connector pipeline would occur during normal daytime working hours. Noise generated by construction of the tank and its attendant treatment building and pipeline would be minimal, temporary, and of short duration.

The noise analysis for the proposed Buckman Direct Surface Diversion project assumed that each future pump station would generate the equivalent of two existing pump houses (using logarithmic addition, a doubling of sound energy always produces an increase of 3 decibels). Noise levels at different distances were estimated using the principle of simple attenuation from a point source (noise attenuation is expressed as a function of 20 times the logarithm of the reference distance divided by the distance to the receiver). Table 3-7 provides the estimated average noise levels (Leq) and day-night average noise levels (Ldn) at various distances from the booster stations.

Table 3-7 Estimated Noise Levels At Various Distances from Future Booster Stations (Ldn)

Distance From Pump Stations	Leq dBA	Ldn
100 feet	56.6	63.1
500 feet	42.6	49.1
1320 feet (1/4 mile)	34.2	40.6

As shown in Table 3-7, noise levels at the booster stations (with dual pump houses) would be approximately 56.6 decibels (40.6 dBA Ldn) at a distance of 1320 feet from the booster stations. While compatible with current and future land uses, faint noise from the pump houses could potentially be audible in some areas (as far as ¼-mile away) where current noise levels are very low (in the low-30 decibel range).

Well pumps generate much less noise than booster station pumps and the new variable speed pumps in the booster stations are expected to produce no more noise than the existing constant speed pumps. Given that there would only be one pump house and one well-house at each booster station under this alternative, it is estimated that there would only be a slight increase in noise levels at Booster Stations No. 2 and 3 from operation of the wells inside the new well-houses. This increase would be small and indistinguishable from the noise generated by the booster stations. Wells #11 and #12 would generate a small amount of noise in areas currently free from noise disturbances by any sources other than the errant report from target shooting and occasional passing vehicles on Buckman Road. Noise produced by these wells would dissipate even more rapidly a short distance away and are not likely to be distinguishable from background noise a ¼-mile

away. No noise from any components of the proposed action are expected to be discernable at a distance of ½-mile from the source or Buckman Road south of Diablo Canyon. No adverse effects to solitude and remoteness are expected as a result of this alternative.

Environmental Commitments

Upon completion of construction of the proposed action the City would be required to conduct noise measurements at a distance of ½-mile from each of the new wells, which would be located along Buckman Road south of Diablo Canyon. These measurements would be conducted to determine the Ldn during a period of peak demand. If it is determined that operation of the new wells is causing noise levels in excess of 48.6 dBA Ldn at a distance of ½-mile from the source, then the City would be required to take additional measures to reduce the noise levels produced by the wells and booster stations to below 48.6 dBA Ldn at ½-mile from Buckman Road south of Diablo Canyon.

3.7.4 Negative Declaration of Critical Elements

- The project area has not been designated as either an Area of Critical Environmental Concern (ACEC) or a Special Management Area (SMA);
- There are no prime or unique farmlands in the project area;
- The project area has not been designated as either a Wilderness or Wilderness Study Area (WSA).

3.8 Secondary and Cumulative Effects of the Proposed Action

3.8.1 Secondary Effects of the Proposed Action

Secondary effects are those that occur indirectly as a result of the proposed action. These effects can sometimes be beneficial as well as adverse. Secondary (indirect) effects of the proposed action in this EA occur in the area of socioeconomics. By implementing the proposed action the City of Santa Fe would be better able to meet the peak demand of its water customers and Stage 3 water restrictions may be delayed or avoided altogether in the near-term foreseeable future.

Stage 4 or 5 water restrictions would be further delayed and the fire department would not be as likely to experience low water pressures or shortages during emergencies. Without the imposition of Stage 4 or 5 water restrictions, construction of new residential and commercial facilities would not be forced to stop and employment and income levels within that industry would continue to follow current trends. Unemployment rates and home values would not be adversely affected by implementing the proposed action.

While landscaping businesses and nurseries may continue to suffer somewhat from the conscientious conservation practices of Santa Fe residents, planting and watering activities would not be restricted as long as Stage 3 water restrictions are not imposed.

The aesthetic value attributable to landscaping in the City would not be diminished, therefore, tourists would still be attracted to the area. Residents of the City of Santa Fe would be able to tend to their gardens as they have in the past and City parks may be watered as necessary. This would allow residents to enjoy their yard and garden spaces and foster normal recreational activity levels in the City.

Environmental Commitments

No commitments are required.

3.8.2 Cumulative Effects

Cumulative effects result "from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time" (40 CFR 1508.7). These actions include on or off-site projects conducted by government agencies, businesses, or individuals that are within the spatial and temporal boundaries (project area) of the actions considered in this EA. Cumulative effects analysis includes both direct and indirect effects.

Analysis in this section is presented for each resource potentially affected by the proposed action in combination with past, present, and reasonably foreseeable future actions. Two other planned actions have been identified that require analysis in combination with the proposed action in this EA. One is the proposed construction and operation of the Buckman Direct Surface Diversion, as previously mentioned in this document. The other is the planned development of affordable housing on the City land where the proposed La Tierra tank would be located. These projects may potentially result in adverse effects to resources even without the implementation of the proposed action in this EA. Since there can be no cumulative effect to a resource as a result of the proposed action if no effect to the resource is anticipated from the proposed action, the cumulative effects were analyzed only for those resources expected to be affected by the proposed action.

The Buckman Direct Surface Diversion, if authorized, would become operational in late 2006 or early 2007. This project would allow the City and County to withdraw its allotment of San Juan-Chama water directly from the Rio Grande. At that time, pumping from the Buckman well-field would be scaled back to approximately 1,000 AFY. As a result, the analysis in this section is divided into two time periods. The first time period begins with the implementation of the proposed action and ends when the proposed Buckman Direct Surface Diversion, if authorized, would become operational. The second time period begins if and when the proposed diversion becomes operational and continues into the reasonably foreseeable future. Although the effects to water resources are analyzed through 2060, the reasonably foreseeable future is actually sooner than this because there are so many other currently unplanned potential water projects that could affect regional water resources well before then.

Visual Resources

The construction of the proposed Buckman Direct Surface Diversion, if authorized, may potentially result in adverse effects to visual resources in the Buckman area. The USFS and BLM are currently in the process of identifying the visual quality of the Buckman area. This work would not be finalized in time to meet the schedule for the proposed action in this EA. Consequently, the cumulative effects of this proposed project and the proposed diversion project on visual resources in the Buckman area would be more accurately determined in the upcoming NEPA document for the diversion project. Interim results of visual analysis indicate that the project area for the proposed action would fall under BLM VRM Class III Management Objectives.

The most visible parts of the diversion project are those that are planned near the Rio Grande. While the proposed diversion project includes the construction of additional booster stations in the vicinity of the proposed supplemental wells, these new booster stations would be located adjacent to the existing booster stations, thus retaining the existing character of the landscape in the vicinity of the proposed supplemental wells. Other diversion project infrastructure that would be located in the vicinity of the proposed supplemental wells would be buried within the existing easements. No adverse cumulative effects to visual resources are expected as a result of the proposed supplemental wells.

Development by the City of affordable housing on the City-owned land surrounding the proposed La Tierra tank site would substantially diminish the visual quality of the viewshed to the east of the communities of La Mariposa and Tierra de Oro. This development alone would result in adverse impacts to visual resources in the vicinity of the proposed La Tierra tank site. The addition of the tank would not contribute adversely to this effect. The open space created by the cleared ground over the tank may actually somewhat reduce the potential adverse cumulative effect of development in this area.

Environmental Commitments

No commitments are required.

Water Resources

The effects of operating all thirteen wells at Buckman during the first and second time periods have been modeled by CDM (2002b) and are described here. The addition of four new supplemental wells between Booster Stations No. 2 and No. 3 would change the shape of the cone of depression by drawing it out farther to the south-southeast as shown in Table 3-8. Just prior to the second time period, the center of the cone of depression would be approximately 385 feet deep.

Table 3-8 Cumulative effects of the Buckman well-field on the regional aquifer.

	Distance to the Ten-Foot Contour Interval from the Center of the Buckman Well-Field Cone of Depression (mi)							
	N	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Existing Condition (2000)	4	4	5	5	6	5	4	5
No Action in 2006 (Wells #1 – #9)	4	5	5	5	6	5	5	5
Proposed Action in 2006 (Wells #1 – #13)	4	4	5	8	6	5	6	6
Incremental Effect of Wells #10 – #13 in 2006	0	1	0	3	0	0	1	1
No Action w/o Direct Diversion in 2060 (Wells #1 – #9)	5	7	8	8	11	7	AB[1]	AB[1]
Prop. Action w/o D. Diversion in 2060 (Wells #1 – #13)	6	6	8	12	13	8	AB[1]	AB[1]
Incremental Effect of Wells #10 – #13 in 2060	1	-1	0	4	2	1	–	–
No Action with D. Diversion in 2060 (Wells #1 – #9)	4	4	4	5	5	3	4	5
Prop. Action w/ Direct Diversion in 2060	3	4	5	8	6	3	4	4
Incremental Effect of Wells #10 – #13 in 2060	-1	0	1	3	1	0	0	-1

By the end of the first time period in 2006, the cumulative effect of operating all thirteen wells at Buckman on the Rio Pojoaque is projected to be a reduction in flow of approximately 66 AFY, which represents approximately 1 AFY more than would occur under no action. By 2060, the cumulative effect of operating the proposed direct diversion at Buckman and the corresponding scaled-back operation of the Buckman well-field on the Rio Pojoaque is projected to be a reduction in flow of approximately 71 AFY, which represents approximately 2 AFY more than would occur under no action combined with the proposed direct diversion.

The relatively minor additional draw-down predicted in the Rio Pojoaque resulting from the operation of all thirteen wells is attributed to the more distant location of the additional four wells from the Rio Pojoaque than Buckman Wells #1 through #9. Because the cumulative effect of operating the existing nine wells at Buckman and the proposed direct diversion after 2006 would eventually result in depletions that exceed the City of Santa Fe's water rights in the Rio Pojoaque, the City is presently studying additional means of offsetting future depletions in the Rio Pojoaque. This study is part of a long-term water supply analysis that would evaluate a large number of options available to the City for meeting the City's water supply needs over the next 40 years. The maximum projected annual depletion of the Rio Pojoaque as a result of operating all thirteen wells at Buckman in combination with the proposed Buckman Direct Surface Diversion project

represents less than one percent of the total average annual stream flow. Based on the results of applying OSE methodology for estimating stream depletions and the best information available, along with the OSE's Buckman permit requirements, no adverse cumulative effects to flows in the Rio Pojoaque are anticipated.

By the end of 2006, the cumulative effect of operating all thirteen wells at Buckman on Tesuque Creek is projected to be a reduction in flow of approximately 18 AFY, which represents approximately 1 AFY more than would occur under no action. By 2060, the cumulative effect of operating the proposed direct diversion at Buckman and the corresponding scaled-back operation of the Buckman well-field on Tesuque Creek is projected to be a reduction in flow of approximately 40 AFY, which represents approximately 7 AFY more than would occur under no action combined with the proposed direct diversion. These reductions in flow in Tesuque Creek are not projected to exceed the City's water rights in this tributary by 2060. The maximum annual depletion of Tesuque Creek as a result of pumping all thirteen wells at Buckman represents less than one percent of the total average annual stream flow. Based on the results of applying OSE methodology for estimating stream depletions and the best information available, along with the OSE's Buckman permit requirements, no adverse cumulative effects to flows in Tesuque Creek are anticipated.

By the end of 2006, the Rio Grande would experience a reduction in flow of approximately 2,949 AFY, which represents approximately 23 AFY more than would occur under no action. This additional depletion would be offset in the Rio Grande with San Juan-Chama water. By 2060, the cumulative effect of operating the proposed direct diversion at Buckman and the corresponding scaled-back operation of the Buckman well-field on the Rio Grande is projected to be a reduction in flow of approximately 677 AFY, which represents approximately 144 AFY less than would occur under no action combined with the proposed direct diversion. Table 3-9 on the page 55 has been provided to summarize the direct, indirect and cumulative effects of no action, the proposed action, and the proposed Buckman Direct Surface Diversion on surface water resources.

A comparison of stock-water well depths, original depths to groundwater in those wells, and the anticipated cumulative draw-down effects from pumping all thirteen Buckman wells for each year through 2060 was conducted by CDM (2002b) to determine if any of the stock-water wells might be adversely affected. Table 3-10 on page 56 presents a summary these effects in terms of the saturated thickness in each well. To maintain a consistent reference for the comparison of effects, the cumulative effects are described here in terms of saturated thickness. A reduction in saturated thickness of 70 percent or more is considered an adverse effect. No stock-water wells are expected to be adversely affected by pumping all thirteen wells at Buckman either by 2006 or by 2060.

Environmental Commitments

The OSE would require the City to offset any and all depletions in the Rio Pojoaque and Tesuque Creek resulting from operation of the Buckman wells. The OSE typically considers the magnitude, location, and timing of depletions when determining these offsets so that any losses from the aquifer in the vicinity of the tributaries are accounted for. Should additional offsets in the tributaries to the Rio Grande be required by the OSE, the City may purchase senior water rights from current owners who use the water for irrigation via acequias that divert the water from those tributaries. The quantity of these rights available for purchase, however, are limited and the owners are not required to sell. When the City purchases and retires acequia water rights for the purpose of offsetting depletions in the Rio Pojoaque and Tesuque Creek, the OSE determines the percentage of the purchase that may actually be consumptively used as offsets. The amount of water required to irrigate one acre of land during one growing season with water from the Rio Pojoaque or Tesuque Creek is 3.35 AF. Of this amount, 1.84 AF per acre are consumed by the crop, evaporation, and evapotranspiration, with the remaining amount returning to the streams via seepage back into the ground. When a farmer enters into an agreement with the City to stop irrigating his land by selling his irrigation water

rights, the City only recieves credit for the 1.84 AF of water that was originally consumed per acre the farmer was irrigating. Also, because the amount of water in these tributaries available for irrigation was originally over appropriated, the OSE further reduces the credit by approximately 20 to 30 percent in an effort to correct this historical shortage. The net result is that for each acre of land taken out of irrigation, which previously required 3.35 AF per acre to irrigate annually, the City only recieves offsetting credit for approximately 70 to 80 percent of the 1.84 AF of water per acre retired (Young 2003, pers. comm.). Any additionally required offsets in the tributaries could be met by other means. The small quantities involved would allow for the regular delivery of water to the tributaries by truck. Another option could be the delivery of water to the tributaries by pipeline. These options for meeting future offset requirements by the OSE will be analyzed in more detail as long-term projects. The City would also be required by the OSE to maintain sufficient water rights in the Rio Grande to offset any and all depletions of flows in the river resulting from operation of the Buckman wells. In the absence of additional offsets, the City would not be allowed to pump water from the Buckman well-field at a rate that results in depletion levels that cannot be offset in the Rio Grande or the two tributaries. Any other commitments necessary for the proposed action would be identified by the OSE prior to approval of the application.

Living Resources

The combined effect of constructing and operating the proposed supplemental wells and the proposed Buckman Direct Surface Diversion would be the further displacement of fauna. Although difficult to quantify, following the completion of all construction activities and recovery of the vegetative communities, this displacement is expected to be minor. There would be no effects to special status species as a result of implementation of the proposed action and the proposed Buckman Direct Surface Diversion, if authorized.

Table 3-9 Comparison of direct and cumulative effects to surface water resources. [1]

	Required offsets to the Rio Grande (AFY)	Percent reduction of flow in the Rio Grande[3]	Required offsets in the Rio Pojoaque (AFY) [4]	Percent reduction of flow in the Rio Pojoaque (%)	Required offsets in Tesuque Creek (AFY)	Percent reduction of flow in Tesuque Creek (%)	Depth of the center of the cone of depression (feet)	Well-field production (AFY)
Existing Conditions (2001)	2,623	0	48	0.54	12	0.52	260	5,200
No Action by 2006	2,926	0	65	0.73	16	0.69	380	6,105
The Proposed Action by 2006[2]	2,949	0	66	0.74	18	0.78	385	10,000
The Incremental Effect of the Proposed Action by 2006	23	0	1	0.01	1	0.04	5	3,895
No Action by 2060	4,014	0	233	2.62	80	3.45	480	6,105
Proposed Action in 2060	4,507	0	327	3.67	167	7.21	500	10,000
The Incremental Effect of the Proposed Action by 2060	493	0	94	1.06	87	3.75	20	3,895
The Proposed Action combined with the Direct Diversion in 2060	677	0	71	0.80	40	1.73	60	1,000[5]

[1] All numbers in the table are rounded to the nearest whole number, however, incremental effects were calculated using real numbers with up to five significant digits.

[2] The cumulative effects of the proposed action combined with the proposed direct diversion in 2006 are the same as the effects of just the proposed action since the proposed direct diversion, if authorized, is not expected to be operational until after 2006.

[3] The City's permit from the Office of State Engineer to operate the Buckman Wells states that the operation of the Buckman well-field shall not cause a depletion of the flow of the Rio Grande. San Juan-Chama water stored in upstream reservoirs is released to offset depletions of water in the Rio Grande that result from pumping groundwater from the Buckman well-field. Because of this, the Rio Grande experiences no reduction of flow from operation of the Buckman well-field.

[4] The City has purchased water rights in the Rio Pojoaque and Tesuque Creek to compensate for flow reductions experienced in these tributaries as a result of pumping groundwater from the Buckman well-field. Because the cumulative effect of operating the existing nine wells at Buckman and the proposed direct diversion after 2006 would eventually result in depletions that exceed the City of Santa Fe's water rights in the Rio Pojoaque, the City is presently studying additional means of offsetting future depletions in the Rio Pojoaque. This study is part of a long-term water supply analysis that will evaluate a large number of options available to the City for meeting the City's water supply needs over the next 40 years.

[5] Beginning in 2007.

Table 3-10 Stock-water wells in the vicinity of the Buckman well-field – Projected saturated thickness in 2006 and 2060 under the proposed action combined with the proposed Buckman Direct Surface Diversion project.

Well Permit #	Well Location (Township-Range-Section)	Well Depth (ft)	Original Saturated Thickness (ft)	Proj. Sat. Th. in 2006 – Proposed Action (ft)	Proj. Sat. Th. in 2060 – No Action w/ Diversion (ft)	Proj. Sat. Th. in 2060 – Prop. Action w/ Diversion (ft)
29357	16N-8E-4	100	0	0	0	0
35202	16N-8E-4	320	120	118	118	118
29723	17N-8E-5	700	55	45	48	43
437	17N-8E-33	700	211	180	203	191
14073	18N-7E-35	1090	73	28	63	60
14458	17N-7E-34	1207	200	193	197	196
438	18N-8E-17	310	90	59	66	64
16681	18N-8E-2	745	171	154	158	161
7248	19N-8E-32	900	468	260	448	423
439	19N-7E-36	345	345+	213+	280+	295+
31284	18N-8E-36	815	300	279	294	290
6386*	18N-8E-24	500	unknown	unknown	unknown	unknown
6128	18N-8E-10	560	40	22	25	22
6128CLW	18N-8E-10	700	175	157	160	157
55206	18N-8E-15	655	75	53	58	56

*This well has experienced approximately 4 feet of draw-down from its original depth to water as a result of pumping the Buckman well-field through 2001. By 2060, 9 feet of draw-down are anticipated under this alternative.

Socioeconomics

The combined effect of operating the proposed supplemental wells and the proposed Buckman Direct Surface Diversion, if authorized, would be to provide the City with the ability to better meet immediate and near-term future peak water demands. While Landscaping firms and nurseries may continue to suffer somewhat from the conscientious conservation practices of Santa Fe residents, planting and watering activities would not likely be curtailed as they are under Stage 3 water restrictions. Stage 4 or 5 water restrictions would not be imposed and the fire department would not experience low water pressures or shortages during emergencies. Because stage 4 or 5 water restrictions would not be imposed, construction of new residential and commercial facilities would not be forced to stop and employment and income levels within that industry would continue to follow current trends. Unemployment rates and home values would not be adversely affected.

The aesthetic value attributable to landscaping in the City would not be further diminished. City residents would be able to tend to their gardens as they have in the past and City parks may be watered as necessary at least through the 10-year planning period. This would allow residents to enjoy their yard and garden spaces and would foster normal recreational activity levels in the City.

Environmental Commitments

No commitments are required.

CHAPTER 4.0 ENVIRONMENTAL COMMITMENTS TO MINIMIZE POTENTIAL ADVERSE EFFECTS

Topography

All permanent earthwork would be contoured to minimize erosion and ensure proper runoff. Temporary best management practices would be employed in the handling of hazardous materials such as fuel, lubricants, and other chemicals typically used for construction. They would also be used to prevent down-cutting and incising during rainstorms or rapid snowmelts. The construction contractor would be required to develop and maintain on-site a Stormwater Management Plan, which would include all the best management practices that would be employed during construction.

Soils

Temporary erosion control measures (i.e. silt fencing, etc.) would be employed during construction to prevent erosion until more permanent measures have been installed. Permanent measures include re-seeding the well-sites, tank site, and pipeline corridor, and installing gabion mats or concrete pads in areas where water flowing across the access road to the tank could result in incision and down-cutting. Best management practices would be employed by construction contractors to mitigate fugitive dust and erosion resulting from soil disturbance. Should the pipelines ever become exposed as a result of erosion, the City would ensure that they are re-buried in a timely manner. The construction contractor would be required to develop and maintain on-site a Stormwater Management Plan, which would include all the best management practices that would be employed during construction.

Floodplains, Wetlands, and Riparian Zones

Any mitigation would be identified by the ACOE during the permitting process prior to construction of the La Tierra connector pipeline. The City is currently studying other means of offsetting depletions of the Rio Pojoaque and Tesuque Creek, such as transporting water to them via truck or pipeline. This study is part of the City's long-term water management program, which will be analyzed in a separate NEPA document. The use of other means such as these would eliminate any potential adverse effects to wetlands and riparian zones.

Visual Resources

Disturbed areas would be reseeded and any trees that must be removed for construction of the wells would be replanted according to an approved vegetation plan. The well pump-houses and disinfection/fluoridation building would be constructed with dark colored prefabricated stucco-like materials on the outside, which would blend in better with the background and reduce the visibility of the inevitable graffiti and facilitate periodic repainting. The City would periodically paint these structures with a color selected by the BLM to cover any graffiti that accumulates on them. Other water management structures in the Buckman area currently maintained by the City would be repainted as necessary to cover graffiti with the same dark color approved by the BLM. During operations, the handling of hazardous materials would employ best management practices and comply with all applicable laws and regulations. Immediately following completion of construction, the sites would be reseeded with native species.

Water Resources

The OSE would require the City to offset any and all depletions in the Rio Pojoaque and Tesuque Creek resulting from operation of the Buckman wells. The OSE typically considers the magnitude, location, and timing of depletions when determining these offsets so that any losses from the aquifer in the vicinity of the tributaries are accounted for. Should additional offsets in the tributaries to the Rio Grande be required by the

OSE, the City may purchase senior water rights from current owners who use the water for irrigation via acequias that divert the water from those tributaries. The quantity of these rights available for purchase, however, are limited and the owners are not required to sell. When the City purchases and retires acequia water rights for the purpose of offsetting depletions in the Rio Pojoaque and Tesuque Creek, the OSE determines the percentage of the purchase that may actually be consumptively used as offsets. The amount of water required to irrigate one acre of land during one growing season with water from the Rio Pojoaque or Tesuque Creek is 3.35 AF. Of this amount, 1.84 AF per acre are consumed by the crop, evaporation, and evapotranspiration, with the remaining amount returning to the streams via seepage back into the ground. When a farmer enters into an agreement with the City to stop irrigating his land by selling his irrigation water rights, the City only receives credit for the 1.84 AF of water that was originally consumed per acre the farmer was irrigating. Also, because the amount of water in these tributaries available for irrigation was originally over appropriated, the OSE further reduces the credit by approximately 20 to 30 percent in an effort to correct this historical shortage. The net result is that for each acre of land taken out of irrigation, which previously required 3.35 AF per acre to irrigate annually, the City only recieves offsetting credit for approximately 70 to 80 percent of the 1.84 AF of water per acre retired (Young 2003, pers. comm.). Any additionally required offsets in the tributaries could be met by other means. The small quantities involved would allow for the regular delivery of water to the tributaries by truck. Another option could be the delivery of water to the tributaries by pipeline. These options for meeting future offset requirements by the OSE would be analyzed in more detail as long-term projects. The City would also be required by the OSE to maintain sufficient water rights in the Rio Grande to offset any and all depletions of flows in the river resulting from operation of the Buckman wells. In the absence of additional offsets, the City would not be allowed to pump water from the Buckman well-field at a rate that results in depletion levels that cannot be offset in the Rio Grande or the two tributaries. Any other commitments necessary for the proposed action would be identified by the OSE prior to approval of the application.

Air Quality

Best management practices would be employed by the construction contractors to minimize effects to air quality (e.g., water trucks would spray water on the roads to keep dust down if necessary). No other commitments are required.

Wildlife

The project would include an upland erosion control and revegetation plan. Project boundaries would be staked and temporarily fenced prior to construction thus minimizing the potential for disturbances outside the project area. To minimize the risk to wildlife from open trenches, trenches would be backfilled as the pipeline and electrical conduits are laid in the ground. Trenches would not be left open overnight unless absolutely necessary. If a trench must be left open overnight, an escape ramp for wildlife would be placed in it. The trench would also be inspected and any trapped animals would be removed prior to backfilling.

Vegetation

The project would include an upland erosion control and revegetation plan. All disturbed soils would be reseeded with native species and watered when necessary to ensure the re-establishment of native vegetation. Trees removed from the well-sites would be replanted. The revegetation plan, which must be approved by the BLM, would be developed prior to completion of construction activities and would include maintenance and survival criteria for the trees. Project boundaries would be staked and temporarily fenced prior to construction thus minimizing the potential for disturbances outside the project area. Following construction, the temporary fence would be removed and a permanent fence would be erected around the permanent facilities.

Special Status Species

Commitments would be the same as that described previously for wildlife in general.

Historical, Cultural, and Archaeological Resources

In the event that new archeological resources are discovered during construction, the City would notify the BLM, the SHPO, and the tribes listed in Chapter 5 Consultation and Coordination. All work within 50 feet of the new discovery would be stopped until an appropriate plan for mitigation has been approved by the SHPO.

Ways of Life

The City is currently studying other means of offsetting depletions of the Rio Pojoaque and Tesuque Creek, such as transporting water to them via truck or pipeline. This study is part of the City's long-term water management program, which will be analyzed in a separate NEPA document. The use of other means such as these would eliminate any potential adverse effects to ways of life.

Community Infrastructure

A traffic control plan would be developed for and implemented during construction. This plan would include the placement of appropriate warning signs and other safety measures. One lane of Fin Del Sendero Road would be kept open at all times during installation of the La Tierra connector pipeline beneath the roadbed and during repavement of the road surface where the pipeline crosses. All buried utilities within the La Tierra tank portion of the project area would be precisely located prior to construction activities requiring digging. No other commitments are required.

Utility Infrastructure

All buried utilities within the project area would be precisely located prior to construction activities requiring digging.

Recreation, Solitude and Remoteness

Upon completion of construction of the proposed action the City would be required to conduct noise measurements at a distance of ½-mile from each of the new wells, which would be located along Buckman Road south of Diablo Canyon. These measurements would be conducted to determine the Ldn during a period of peak demand. If it is determined that operation of the new wells is causing noise levels in excess of 48.6 dBA Ldn at a distance of ½-mile from the source, then the City would be required to take additional measures to reduce the noise levels produced by the wells and booster stations to below 48.6 dBA Ldn at ½-mile from Buckman Road south of Diablo Canyon.

General Environmental Commitments for the Proposed Action

Best management practices would be employed by construction contractors to mitigate fugitive dust and erosion resulting from soil disturbance. Temporary erosion control measures, such as silt fencing, straw bales, etc., would be employed during construction to prevent erosion from runoff until more permanent measures have been installed. Permanent measures include re-seeding the well-sites, tank site, and pipeline connections, and installing gabion mats or concrete pads in areas where drainage crossings have resulted in incision and down-cutting. Temporary best management practices would be employed in the handling of hazardous materials such as fuel, lubricants, and other chemicals typically used for construction. They would also be used to prevent down-cutting and incising during rainstorms or rapid snowmelts. During operations, the

handling of hazardous materials would employ best management practices and comply with all applicable laws and regulations. Appendix B contains regulatory information regarding best management practices.

CHAPTER 5.0 CONSULTATION AND COORDINATION

5.1 Public Scoping

A public scoping meeting was held at the Santa Fe Public Library from 6:00 p.m. to 8:30 p.m. on Monday, November 18, 2002. The meeting was advertised in the Legal section of the Santa Fe New Mexican newspaper on two Fridays, November 8 & 15, 2002. A three column width by 4-inch length display ad was run in the Journal North newspaper on Thursday, November 14, 2002, and in the Los Alamos Monitor newspaper on Wednesday, November 13, 2002, and Sunday, November 17, 2002. A public service announcement was made daily on public radio station KUNM, which reaches the entire Santa Fe and Los Alamos areas. Phone calls and emails were made to people who attended the public site tour for the proposed Buckman Direct Surface Diversion project. Copies of the display ad that ran in the newspaper were distributed on Friday, November 15, 2002, in the communities of Tierra Nueva, Tierra de Oro, and La Mariposa. The presidents of the neighborhood associations for these three communities were contacted by phone and notified of the meeting. Administrative staff of Las Campanas were also notified by phone.

The meeting began shortly after 6:00 p.m. to accommodate late arrivals. A total of nine members of the general public attended and signed in on the register. Ten governmental officials and staff were present along with five technical consulting members of the project team. The meeting began with introductions of some of the attending project team members and a brief description of the agenda. This was followed by a presentation on NEPA, the purpose and need for the project, and the estimated timeline for completion of the NEPA process by the BLM NEPA Coordinator from the Taos Field Office. The next presentation, given by the CDM Engineering Project Manager, provided an overview of the proposed action. This presentation was followed by a one-hour comment period, which included a number of questions about the proposed action and other relevant concurrent water projects. Attending members of the project team addressed these questions individually according to their particular area of expertise. Both prior to and immediately following the meeting, members of the public met with individual project team members and examined the display maps and photographs that were brought to the meeting by CDM.

The results of the scoping meeting are more fully detailed in a separate report prepared for the City of Santa Fe and the BLM by the environmental contractor, Tetra Tech, Inc (2002b). Comments made and questions asked by the public were recorded by the environmental contractor and are included in this report. The relevant issues raised by the public during this meeting were addressed to the extent possible in this EA.

5.2 Persons and Agencies Consulted

The following agencies, tribes, and individuals received letters or have been otherwise contacted informing them of the proposed action and requesting a reply regarding any concerns they may have. Copies of all correspondence are contained in the Appendix D. Those persons and agencies that have required coordination are denoted by an asterisk.

5.2.1 Federal Agencies

U.S. Department of the Interior, Bureau of Indian Affairs
U.S. Department of the Interior, Bureau of Reclamation
U.S. Department of Agriculture, Forest Service
U.S. Fish and Wildlife Service*
U.S. Army Corps of Engineers*

5.2.2 Tribes

Pojoaque Pueblo
San Ildefonso Pueblo
Nambe Pueblo
Santa Clara Pueblo
Tesuque Pueblo
Cochiti Pueblo
Jemez Pueblo
San Filipé Pueblo
Santo Domingo

5.2.3 State Agencies

New Mexico Office of the State Engineer*
New Mexico Environment Department*
New Mexico Department of Energy, Minerals, and Natural Resources*
New Mexico Department of Game and Fish*
The Board of Regents, New Mexico State University*

5.2.4 County

Santa Fe County, Utilities Department

5.2.5 Individuals

Ms. Lillian Walker
Mrs. Jose Ortiz
Ms. Gloria Ortiz
Mr. William Seedorff
Mr. Shelby Boggio
Mr. Reid Bandeen

CHAPTER 6.0 REFERENCES

6.1 Documents Cited

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6.2 Personal Communications

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Ransom, Dan, Water Conservation, Sangre de Cristo Water Division, City of Santa Fe, New Mexico, February 5, 2003.

Young, Mary, Water Resources Engineer, New Mexico Office of the State Engineer, Santa Fe, New Mexico, February 25, 2003.

Appendix A

City of Santa Fe

Water Restriction Ordinance

Appendix B

Best Management Practices and Stormwater Management Regulations

Appendix C

Technical Memoranda

Appendix D

Project Correspondence