MINE PLAN AND PERMIT APPLICATION
FOR TINAJA PIT
CIBOLA COUNTY, NEW MEXICO

SUBMITTED TO

NEW MEXICO MINING AND MINERALS DIVISION

SANTA FE, NEW MEXICO

SUBMITTED BY

C & E CONCRETE, INC.

MILAN, NEW MEXICO

JANUARY 2004

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PREFACE

In the late 1950's to early 1960's the Tinaja Pit was opened and operated as a sand and gravel source for use in construction. During this time, Elsie Snyder owned Section 4, while the Candelaria family owned Section 33. C & E Concrete began extracting (mining/quarrying) and processing (crushing/screening) operations on Section 4, in 1985, and purchased the property from Donna R. Moore in 1986. In 1990, C & E Concrete purchased Section 33 from Caruco Springs Ranch, Inc., Cleatus S. Calloway, owner, and mines this land today and will be mining into the foreseeable future. For over forty years, the Bureau of Indian Affairs and State of New Mexico has used the sand and gravel product from this site for construction applications.

In the past, the San Andres limestone formation and associated overburden was mined/processed at the Tinaja Pit and used exclusively as a sand and gravel aggregate for construction. According to the definition of "Mining" under the New Mexico Mining Act Rules: "...Mining does not mean the exploration and extraction of potash, sand, gravel, caliche, borrow dirt and quarry rock used as aggregate in construction...". Therefore, the State of New Mexico Energy Minerals and Natural Resources Department, Mining and Minerals Division (MMD) did not, in the past, require a mine permit for the Tinaja Pit mine, because it does not regulate sand and gravel or quarry rock used as aggregate in construction.

Currently, C & E Concrete is applying to MMD for a mine permit for the Tinaja Pit, in part, because the limestone product has other industrial uses besides construction aggregate applications. For example, the San Andres limestone can be used for flue gas desulphurization from power plant emissions. Because the Tinaja Pit is now mining/processing a portion of their limestone products for non-aggregate use, C & E Concrete is required by MMD to obtain a mine permit.

The proposed Tinaja Pit includes a "New Unit" as part of the permit application. The

ANew Unit≅ permit is an extension of the existing operations and is located in the southern one half of Section 33. Mine life of the ANew Unit≅ is projected at 40 years and will disturb an additional 44 acres.

As part of the mine permitting process, C & E Concrete has proposed a post-mining land use (PMLU) of sand and gravel mining for use as aggregate in construction. As stated above, MMD does not currently regulate the mining of sand and gravel for use as aggregate and, therefore, the proposal to have a sand and gravel PMLU is being considered by MMD.

Finally, C & E Concrete has attempted to minimize any quarrying impacts to surrounding landowners by acquiring and maintaining a 2 mile buffer zone of land around the existing rock quarry.

MINE PLAN AND PERMIT APPLICATION
FOR TINAJA PIT

INTRODUCTION

C & E Concrete, Inc., a New Mexico Corporation, plans continued operation of an aggregate mine known as Tinaja Pit, located at milepost 51.5 on NM 53 in west central Cibola County, New Mexico (FIGURE 1). The aggregate of interest is limestone. The mine location is about 35 highway miles southwest of Grants, New Mexico.

The permit area consists of 440 acres. The legal description of the permit area is the S 2 of Section 33, T10N, R13W, and the NW 1/4 of Section 4 (north of NM 53), T9N, R13W. Within the permit area, ongoing operation of the Tinaja Pit through August 2003 has resulted in a total of 99 acres of disturbance; 47 acres for the mine pit area (including grubbed margins), 52 acres for facilities area, stockpile area, and the access road from NM 53. The present average annual production for the mine is 400,000 tons.

FIGURE 1A indicates the area of lands under the control of C & E Concrete, Inc., as well as other state and federal land jurisdictions locally. A parcel of US Forest Service land is located west of the Tinaja Pit and within the area of land controlled by C & E Concrete.

The Tinaja Pit is designed for an additional 40-year life of mine, at a production rate of 400,000 tons per year. The Tinaja Pit will continue to be mined using dozers, loaders, rock trucks, and occasional blasting. The rock is crushed and screened in the facilities area prior to transportation by highway trucks to market sites. A portion of the limestone rock is pulverized and bagged on site for a special market.

The mine permit application provided herein addresses applicable requirements of Subpart 5, Existing Mining Operations, of the New Mexico Mining Act Rules, and

Section 69-36-5, Mining Operation Site Assessment, of the New Mexico Mining Act.

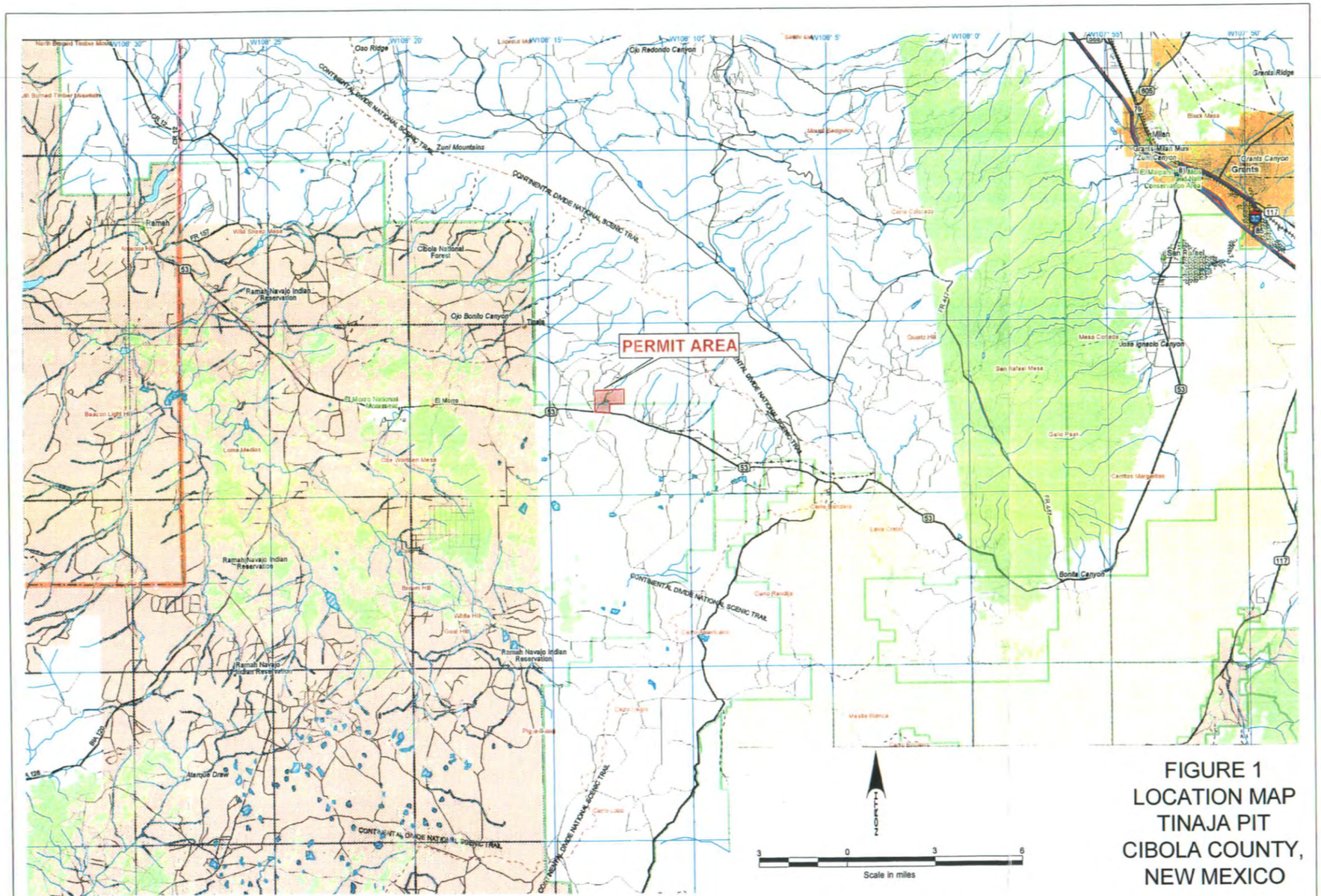


FIGURE 1
LOCATION MAP
TINAJA PIT
CIBOLA COUNTY,
NEW MEXICO

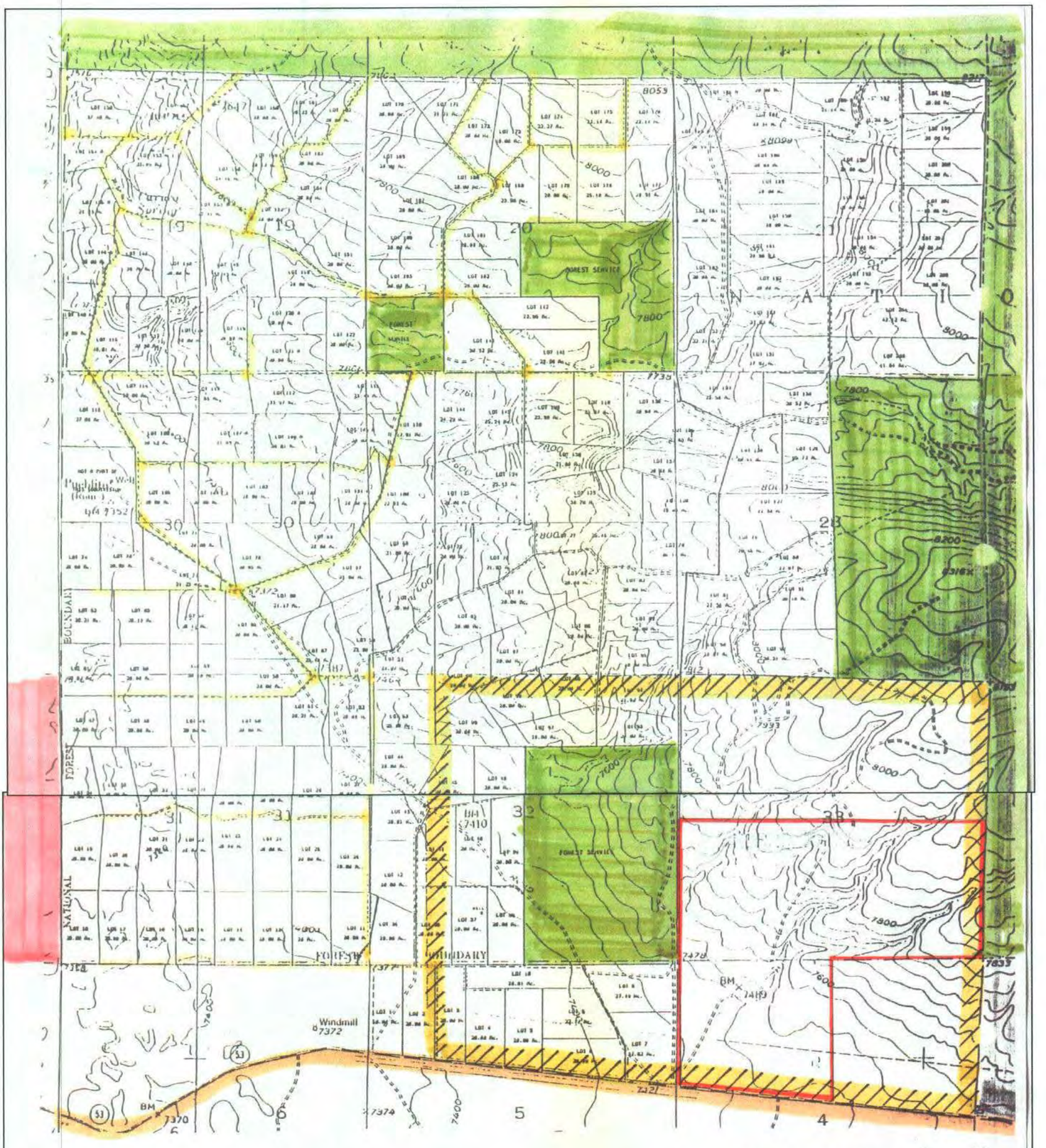


FIGURE 1A

OWNERSHIP JURISDICTIONS
IN THE TINAJA PIT VICINITY
CIBOLA COUNTY, NEW MEXICO

ORIGINAL PERMIT APPLICATION. 502.

This section of the mine plan and permit application addresses information and compliance requirements of Section 502 of the Mining Act. Information is presented in the numerical sequence of requirements for the applicant.

Certification. 502.C.

I certify that I have personally examined and am familiar with the information submitted herein, and based on my inquiry of those individuals responsible for obtaining the information, I believe the submitted information is true, accurate, and complete.

_____

Walter L. Meech, President Date
C & E Concrete, Inc.

Permit Applicant. 502.D.(1).

C & E Concrete, Inc.
P.O. Box 2547
Milan, New Mexico 87021
Phone Number: (505) 287-2944

Owners of Record and Right of Entry. 502.D.(2). and 502.D.(3).

The Tinaja Pit permit area is delineated in FIGURE 2, and includes the S 2 of Section 33, T10N, R13W, and the NW 1/4 of Section 4 (north of NM 53), T9N, R13W. The surface rights and sand and gravel rights of the S 2 of Section 33 are owned by Meech-Cash Rentals. Meech-Cash Rentals is owned by Walter L. and Vicki J. Meech, Ronnie E. and Kathleen Cash, Daniel W. and Patricia A. Meech, and Robert Meech.

The balance of the mineral rights in S 2 of Section 33 is privately owned. The surface rights in the NW 1/4 of Section 4 (north of NM 53) are owned by Walter V. Meech, Jr.

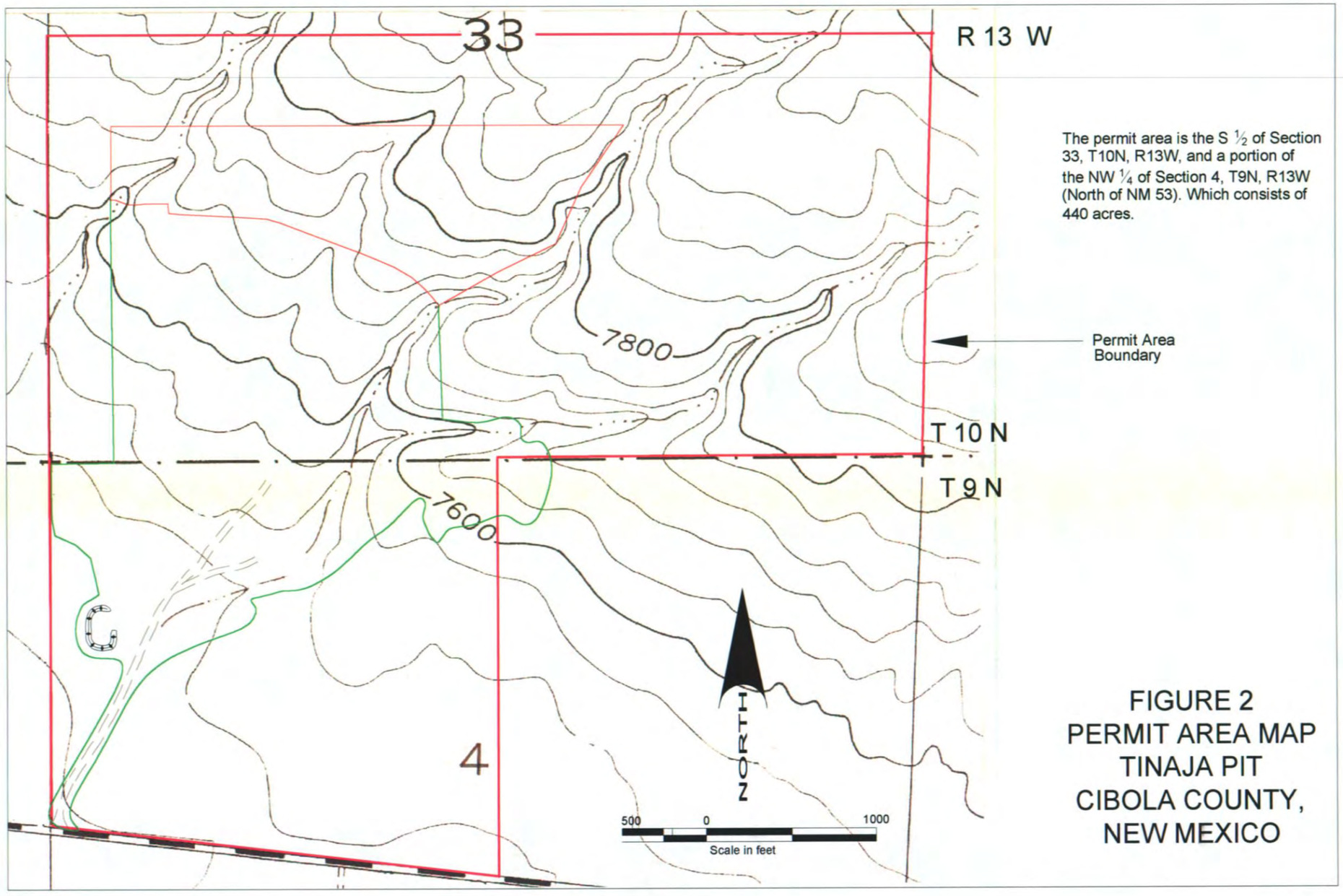


FIGURE 2
PERMIT AREA MAP
TINAJA PIT
CIBOLA COUNTY,
NEW MEXICO

and Norma M. Meech. Mineral rights in the Section 4 portion of the permit area are owned by the Bureau of Land Management. The right to enter the permit area and conduct mining and reclamation operations is granted by leases to C & E Concrete, Inc., from Meech-Cash Rentals (S 2 of Section 33) and from Walter V. Meech, Jr., and Norma M. Meech (NW 1/4 Section 4). The leases which grant this right are provided in EXHIBIT A. C & E Concrete, Inc., is owned by Walter L. and Vicki J. Meech, Ronnie E. and Kathleen A. Cash, and Daniel W. and Patricia A. Meech, and Walter V. Meech and Norma M. Meech.

Site Assessment Documentation. 502.D.(4).

Mining operation assessment information, as required in Section 69-36-5.B. of the New Mexico Mining Act, is provided within portions of the text of this permit application and within the exhibits of the application. Specifically, site assessment information is provided as follows:

Section	Topical Information	PAP Reference
69-36-5.B.(1)	Proposed Permit Area	502.D.(2), page 3
69-36-5.B.(2)	Ground and Surface Water Description	EXHIBIT C
69-36-5.B.(3)	Geologic Regime Description	EXHIBIT B
69-36-5.B.(4)	Description and Impact of Waste Products	507, page 22, & 4
69-36-5.B.(5)	Impact on Local Communities	EXHIBIT G
69-36-5.B.(6)	Wildlife and Wildlife Habitat	EXHIBIT F
69-36-5.B.(7)	Design Limits Description	502.D.(5), page 5

Operation Map. 502.D.(5).

FIGURE 3 shows the permit area for Tinaja Pit, the existing and proposed pit, and the existing processing and support facilities and stockpile area, impoundments, and access road. There are no shafts, adits, waste units, or leach piles in the permit area. Design limits of the pit (new unit) are also shown on FIGURE 3 for future operation.

Vegetation Survey. 502.D.(6).

A vegetation survey was conducted by METRIC Corporation for undisturbed portions of the permit area. A vegetation map, comprehensive list of species, cover and production, and other related descriptive information are provided in EXHIBIT E.

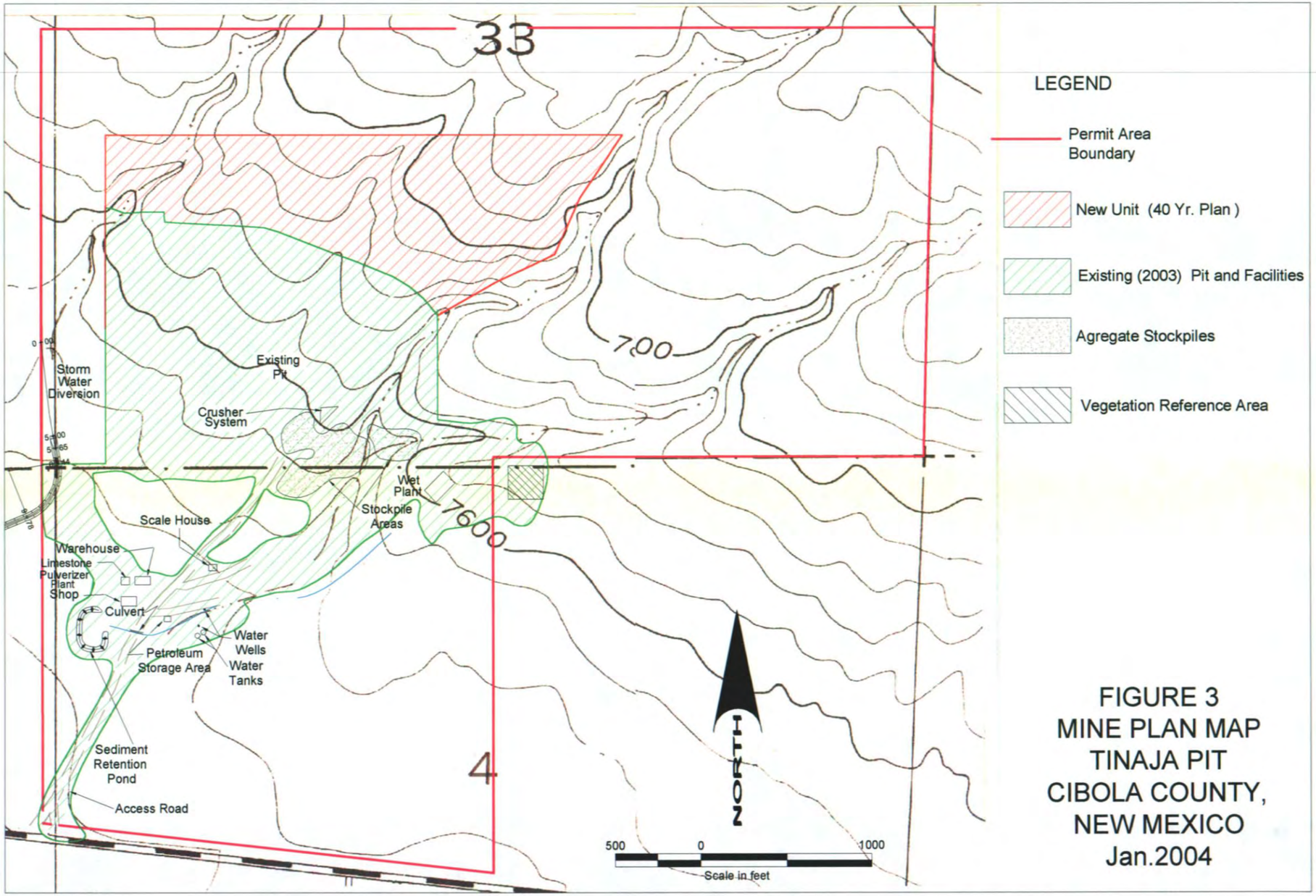


FIGURE 3
MINE PLAN MAP
TINAJA PIT
CIBOLA COUNTY,
NEW MEXICO
Jan.2004

Other Operation Permits and Approvals. 502.D.(7).

Other permits and approvals issued to C & E Concrete, Inc., to conduct Tinaja Pit operations are identified in TABLE 1. Compliance documentation is provided in EXHIBITS H, I, and J.

Applicant/Permit Holder=s Agent. 502.D.(8).

Walter Lee Meech, President
C & E Concrete, Inc.
P.O. Box 2547
Milan, New Mexico 87021
Phone Number: (505) 287-2944

Form of Public Notice. 502.D.(9).

The text of the public notice to be distributed and published in accordance with Section 903 is provided below in English and Spanish.

NOTICE OF APPLICATION FOR EXISTING MINE PERMIT

C & E Concrete, Inc., has applied to the State of New Mexico, Mining and Minerals Division, for an existing mine permit. The purpose of this permit is to allow continuation of operations and provide assurance that the operations will be conducted in an environmentally responsible manner. C & E Concrete, Inc., conducts surface mining and aggregate crushing at the Tinaja Pit located at mile marker 51.2 on NM 53, approximately 35 miles southwest of Grants, New Mexico, in Cibola County. The operations produce pulverized limestone and aggregate products. The surface mining methods create an open pit. Total surface disturbance from past and planned future operations will be 143 acres.

The permit area is located within the S 2 of Section 33, T10N, R13W, and the NW 3 of Section 4, T9N, R13W.

TABLE 1

OTHER OPERATION PERMITS AND APPROVALS FOR TINAJA PIT

Regulatory Authority	Type of Permit	Decision
Environmental Protection Agency 1201 Elm Street Dallas, Texas	1. NPDES Storm Water Multi-Sector General Permit	NMR108021 issued 4-27-98. Permit renewal pending; NOI submitted 10-4-02.
	2. Oil Pollution Act, Spill Prevention Control and Countermeasure (SPCC) Plan	SPCC certified 11-12-02.
	3. NPDES Industrial Discharge Permit	Application to be submitted
New Mexico Environment Department, Air Quality Bureau P.O. Box	1. NSR Air Quality Permit for Portable Rock Crushing Facility	Permit issued 1-19-00
	2. NSR Air Quality Permit for Pulverized Limestone Crusher Plant	Permit issued 7-18-02.

The C & E Concrete, Inc., address is:

C & E Concrete, Inc.
P.O. Box 2547
Milan, New Mexico 87021

Inquiries and written comments may be submitted to the Mining and Minerals Division at:

Director, Mining and Minerals Division
Mining Act Reclamation Bureau
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Any interested person may request that the Director conduct a public hearing on the application. Such a request must be made within 30 days of the date of the newspaper publication of this notice of application.

A copy of the application is available for public inspection at the Mining Act Reclamation Bureau. In addition, inquiries regarding the C & E Concrete, Inc., operations may be made by calling the company office at (505) 287-2944.

NOTICIA DE APLICADO PARA PERMISO DE EXISTENTE MINA

C & E Concrete, Inc., ha aplicado al Estado de Nuevo Mexico, Division de Minerales y Mineda para un permiso existente de mina. El proposito de este permiso esta permitir continuacion de operaciones y proveer la promesa que este trabajo se para en una manera con respecto at medio ambiente responsable. C & E Concrete, Inc., conduce el foso abierto minando y las operaciones de trituracion en el Tinaja Pit ubicaron a la marca 51.2 de carretera NM 53 proximo 35 sudoeste de millas de Grants, New Mexico en el condado de Cibola. Las operaciones producen piedra caliza pulveriza y productos agregados. El superficie minando involucra foso abierto. El superficie total disturbio de pasada e proyectar futuro son intencion 143 acres.

La area de permiso se ubica en S 2 seccion 33, T10N, R13W, y NW 3 seccion 4, T9N, R13W.

C & E Concrete, Inc. es en:

C & E Concrete, Inc.
P.O. Box 2547
Milan, New Mexico 87021

Enviar examenes y escribir comentarios a la division de Minerales y Mineria en:

Director Mining and Minerals Division
Mining Act Reclamation Bureau
2040 South Pacheco
Santa Fe NM 87505

Cualquier persona interesada puede pedir que el Dirictor conduce un publico que oye sobre la aplication. Tal un pedido debe harcerse dentro de 30 dias de la fecha de la publicacion de periodico de este aviso de aplicacion.

Una copia de la aplicacion es disponible para la inspeccion publica en el Mining Act Reclamation Bureau. Ademas , Los examenes con respecto a C & E Concrete, Inc. operaciones, pueden telefonean la oficina de compania en (505) 287-2944.

At the time of filing of the permit application with the Director, proof that the notice of application has been appropriately mailed, posted, and published in accordance with 19.10.,9.903 will be provided to the Director. Additionally, when the application is determined by the Director to be administratively complete, the applicant will provide the Director with proof that the notification of the Director=s determination has been provided to appropriate individuals and organizations in accordance with 19.10.9.903.I.

Permit Fee. 502.D.(10).

C & E Concrete, Inc., requests advisement from the Director regarding the appropriate amount of the permit application fee.

Additional Information. 502.D.(11).

No additional information had been requested by the Director as of the PAP submittal date.

CLOSEOUT PLAN. 506.

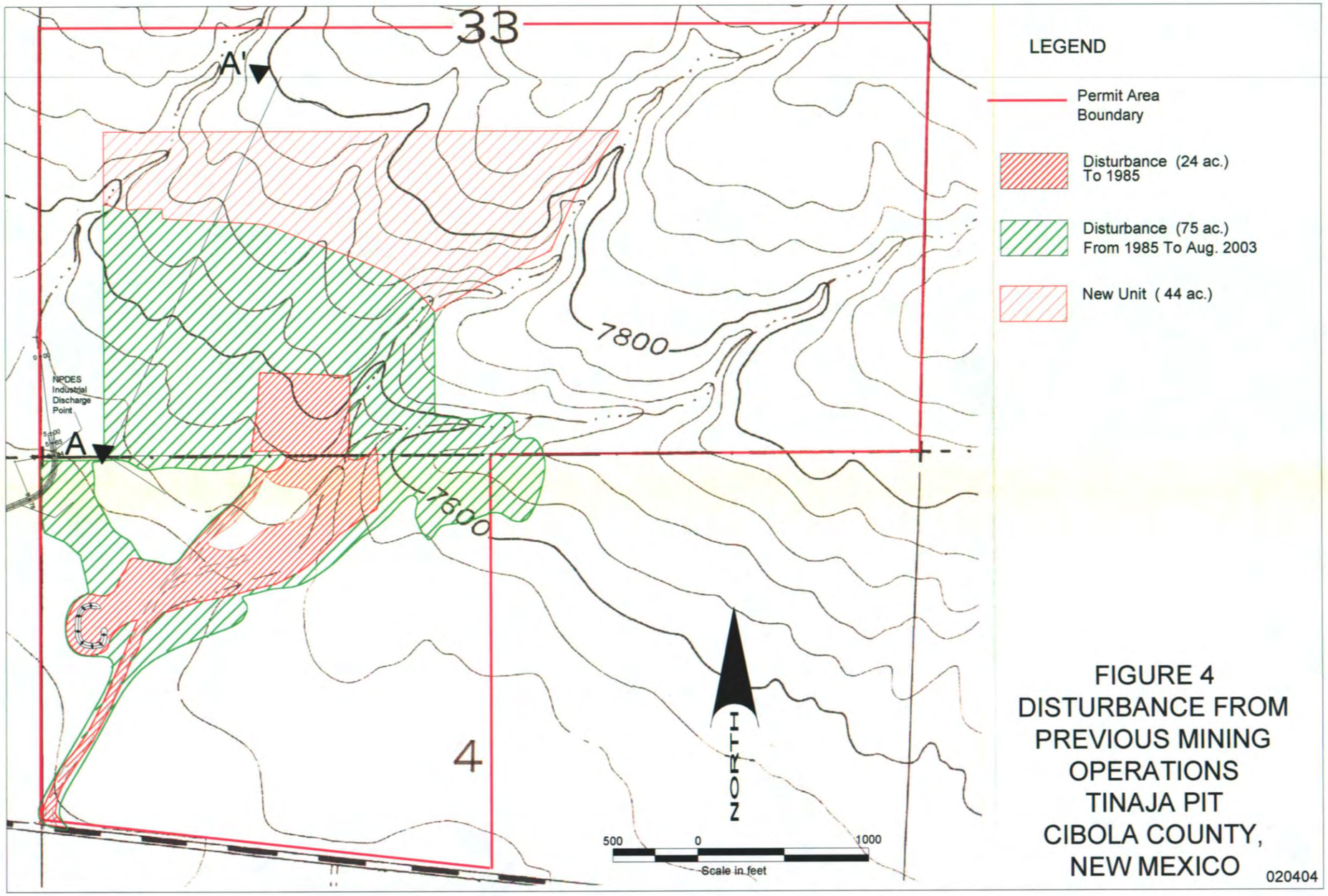
This section of the mine plan and permit application addresses information and compliance requirements of Section 506 of the Mining Act.

Site Specific Characteristics of Permit Area. 506.A.

C & E Concrete, Inc., has been excavating and processing aggregate at the Tinaja Pit since 1985. Operations by previous owners prior to 1985 reportedly began in the 1950's. Early operations were conducted only within the northern portion of Section 4. The extent of disturbance associated with these previous mining activities, including the access road from NM 53, is estimated at 24 acres in 1985. Total existing disturbance by mining activities (existing mine) in the permit area is about 99 acres as of August 2003. The extent of the disturbance at Tinaja Pit to the Year 1985 and to the Year 2002 (August) is delineated on FIGURE 4.

Current and past mining operations have employed methods of drilling and blasting to loosen and break the limestone resource, loaders and trucks for removal of the broken rock from the pit, and crusher and screening systems to grade the products. The current pit and limit of the 40-year life of mine is pictured in the A-AN cross section of FIGURE 5.

In the current operation, woody cover is grubbed from the overburden surface. Sizeable wood is cut for firewood. Slash is burned on site. Stoney overburden, which ranges in thickness from 5 to 20 feet near the active pit, is removed from the surface by loader and hauled to the crusher and screening system for product grading. The pit contains 2 operating benches. The upper bench is about 25 feet in height. The lower bench is 50 feet in height. A crawler-mounted drill is employed for drilling blast holes. Ammonium-nitrate blasting agent (ANFO) is utilized. Broken rock is loaded by front-end loaders into off highway haul trucks and transported to the crusher system in the facilities area for crushing and grading into aggregate products. The aggregate crusher


33
A'
A
7800
7600
NPDES
Industrial
Discharge
Point
4
500
0
1000
Scale in feet
LEGEND
Permit Area
Boundary
Disturbance (24 ac.)
To 1985
Disturbance (75 ac.)
From 1985 To Aug. 2003
New Unit (44 ac.)
FIGURE 4
DISTURBANCE FROM
PREVIOUS MINING
OPERATIONS
TINAJA PIT
CIBOLA COUNTY,
NEW MEXICO
020404

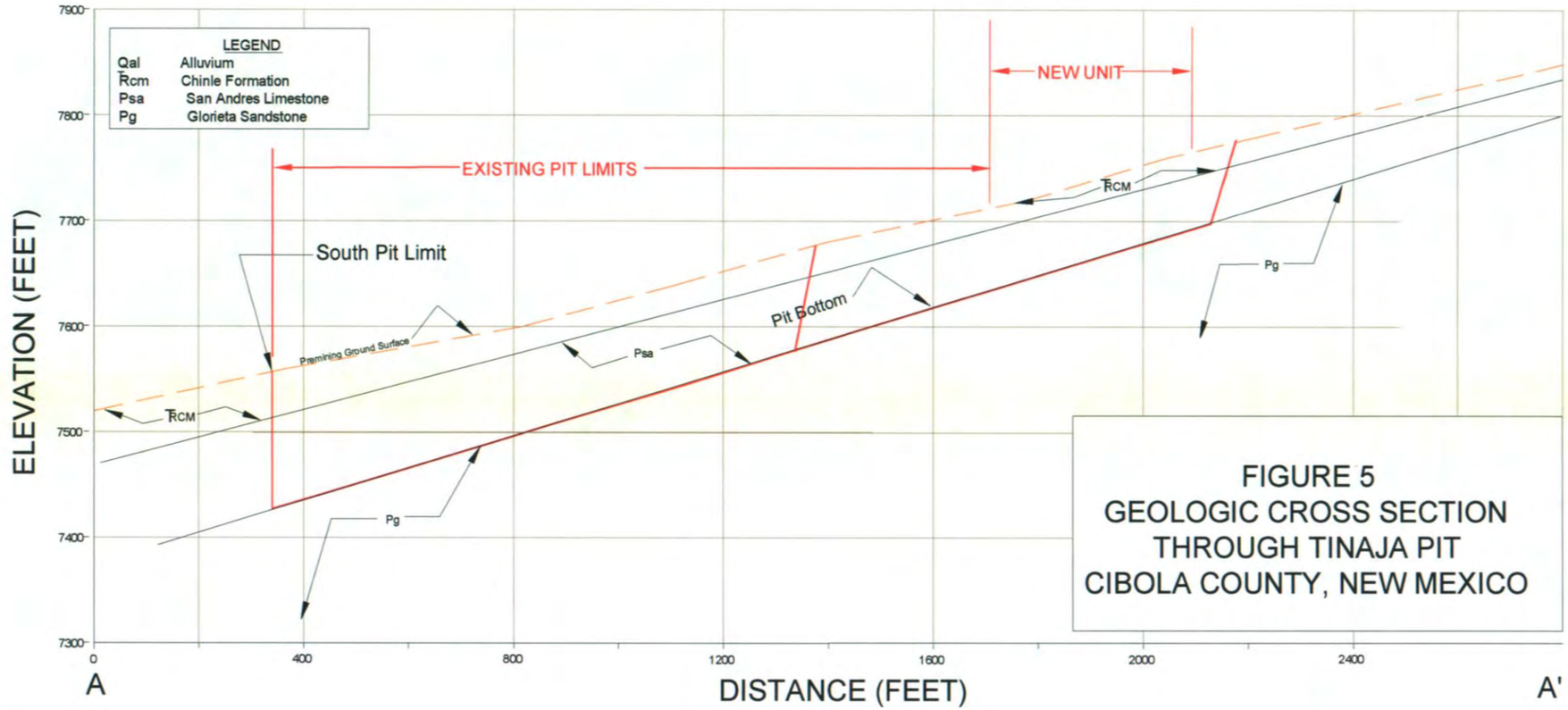


FIGURE 5
GEOLOGIC CROSS SECTION
THROUGH TINAJA PIT
CIBOLA COUNTY, NEW MEXICO

system operates under New Mexico Air Quality Control Permit No. 0879-M1 (EXHIBIT J).

In addition to aggregate products, the Tinaja Pit also produces pulverized limestone. Limestone fines are hauled to a limestone pulverizer plant located immediately west of the warehouse building. The pulverizer plant operates under New Mexico Air Quality Control Permit No. 2678 (EXHIBIT J).

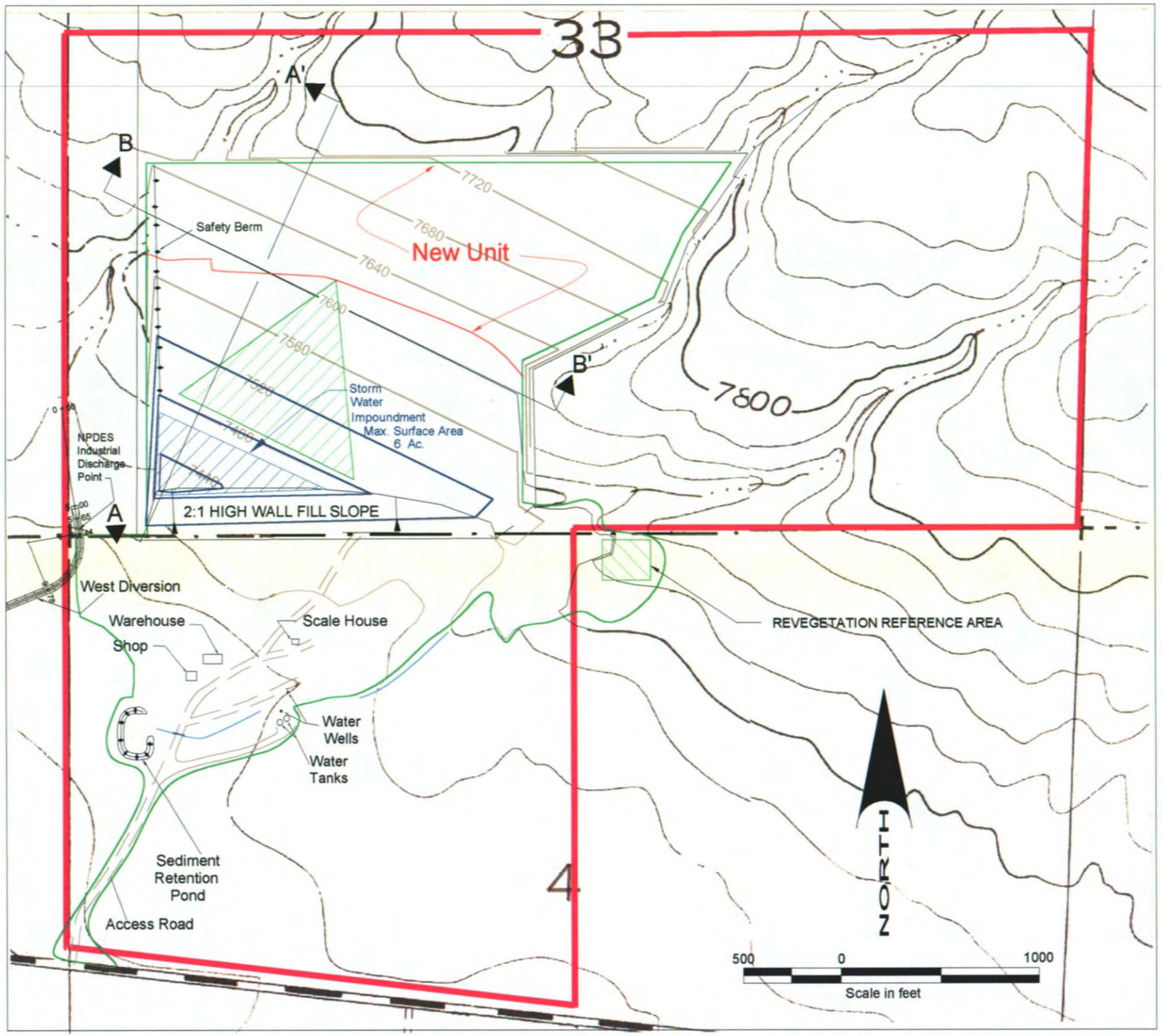
The geology, hydrology, climatology, and other environmental data for the permit area are provided in EXHIBITS B, C, D, E, F, AND G.

Post-Mining Land Use

The post-mining land use planned for the Tinaja Pit permit area is the continuation of construction aggregate operations beyond the limits of mining under the New Mexico mining permit, as delineated on FIGURE 3. The life of the current mining operation is planned for 40 years. It is estimated that, at the time of closeout in about the year 2043, approximately 44 acres will have been disturbed, including pit area, facilities area, stockpile area, and roads, of which 10 acres of pit area within the existing pit designation (FIGURE 6) will have been revegetated. A statement from the land owners regarding continued construction aggregate operation, as the desired post-mining land use, is provided in EXHIBIT K.

Closeout Procedures and Sequence. 506.B.

Following completion of the 40-year life of aggregate mining within the delineated mining limits under the New Mexico mining permit, construction aggregate operations will continue at the Tinaja Pit. All mine facilities, such as the crusher system, limestone pulverizer plant, primary and secondary truck scales, storage trailers, wet plant, testing lab, equipment lube products storage area, explosives supplies, parts storage and bone yard materials area, sediment pond, fuel storage tanks, and water wells and water



LEGEND

- Permit Area Boundary
- Boundary of Disturbed Area after 40 year Life of Mine
- Reclamation Fencing
- 10 Acre Reclaimed Plot

FIGURE 6
RECLAMATION & POST MINING CONTOUR MAP
TINAJA PIT
CIBOLA COUNTY, NEW MEXICO

020404

storage tanks, will remain in place on site for use in the continued construction aggregate operations.

Final slopes on the mined pit floor will be 13 percent overall, the same slope as premining conditions. The final contours in the mined pit area are indicated in FIGURE 6. FIGURE 7 shows a filled 2:1 slope at the south highwall. The north highwall is shown beyond the new unit limits (FIGURE 8). The west highwall is planned to be permanent and ultimately provide habitat for birds. The highwall face will be swept with an anchor chain to remove loose rock material and reduce rock spalling in order to provide for stability. An approximate 3-foot high berm will be placed about 50 feet from the toe of the highwall to exclude vehicular activity in proximity to the highwall. FIGURE 8 shows the west highwall within the new unit and the east highwall beyond the limits of the new unit. Fencing will be provided along the top of the permanent west highwall to prevent equipment, pedestrians and wildlife from approaching the top of the highwall.

The pit is not planned to be backfilled. The southwest corner of the pit will serve to impound storm water. If the volume of impounded water exceeds 10 acre feet, the amount above the 10 acre foot volume will be discharged by pumping to the diversion channel under an NPDES permit. At closure after mining ceases, a 10-acre portion of the pit up slope from the impoundment (FIGURE 6) will be revegetated. Plant growth medium will be spread to a depth of two feet over the 10-acre area. Nutrient testing will be carried out in the area to be revegetated to determine fertility status of the planting medium and quantities of fertilizer to be initially applied. Application of fertilizer will be incorporated into the soil by discing operation.

When mining ceases, seeding of the area will be conducted between July 1 and August 31, prior to the season of highest expected precipitation and during favorable soil and air temperatures.

The seed mix and seeding rates for revegetation of the designated areas is outlined in TABLE 2. These rates result in 20 PLS (pure live seeds) per square foot. Weed-free

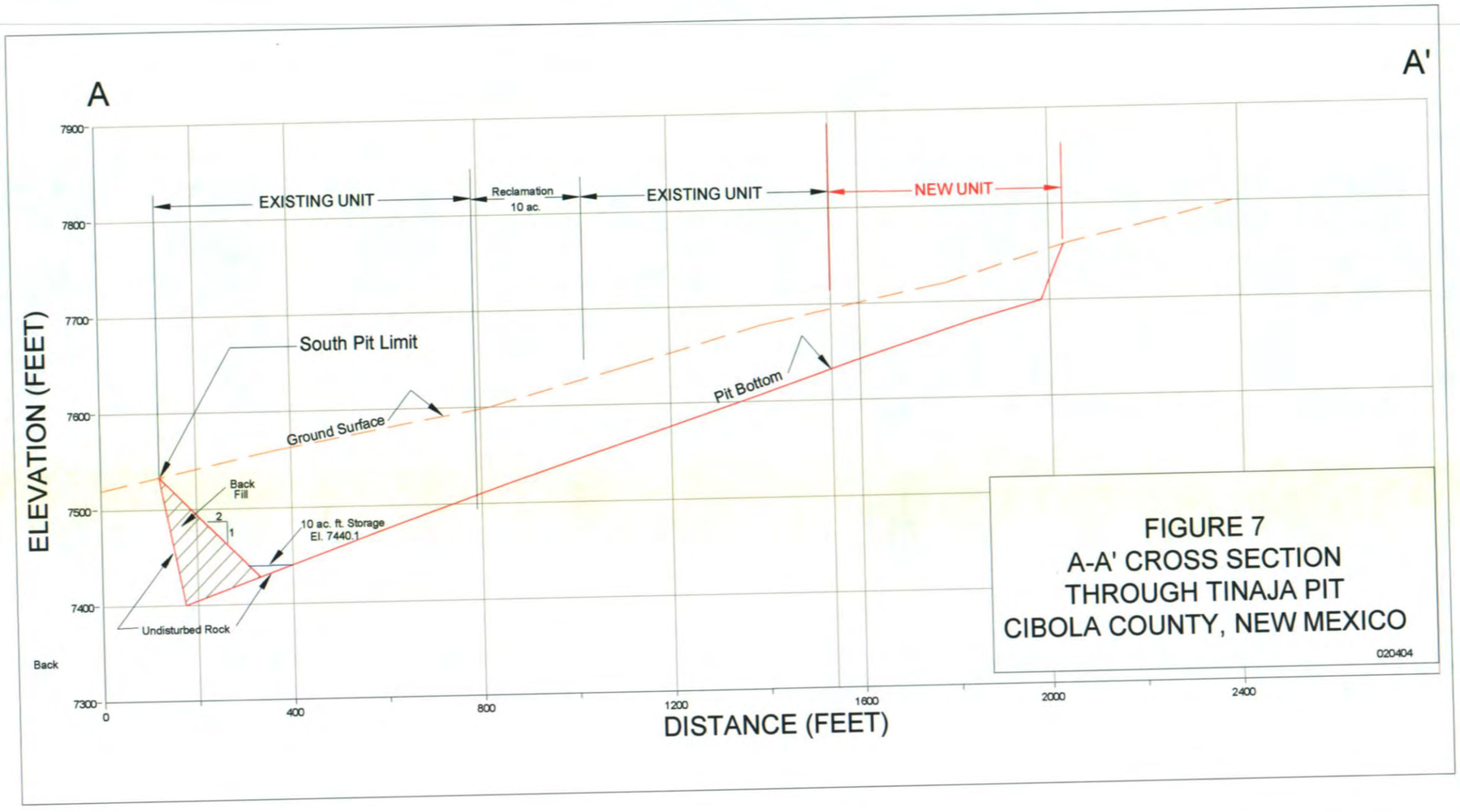


FIGURE 7
A-A' CROSS SECTION
THROUGH TINAJA PIT
CIBOLA COUNTY, NEW MEXICO
020404

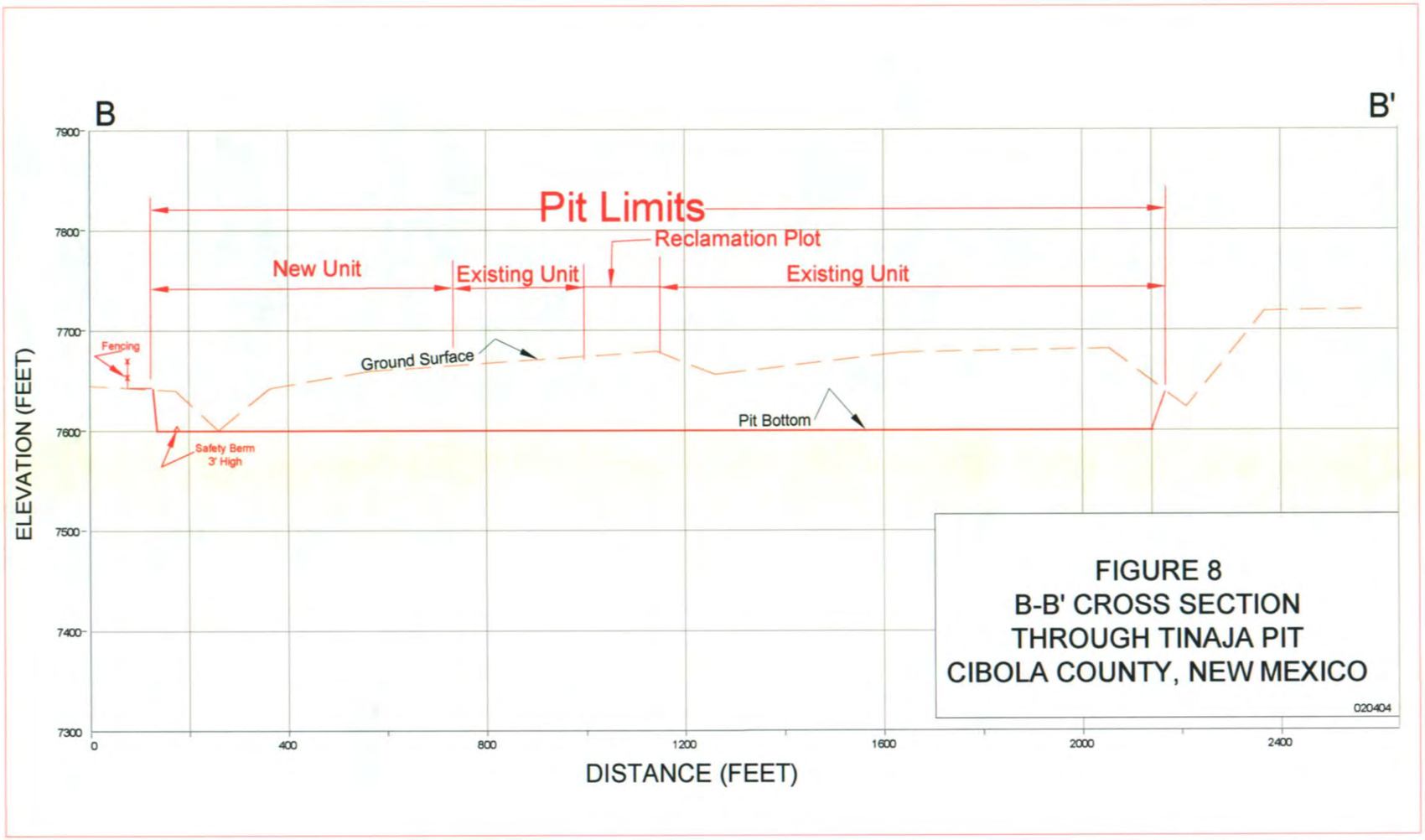


FIGURE 8
B-B' CROSS SECTION
THROUGH TINAJA PIT
CIBOLA COUNTY, NEW MEXICO

020404

TABLE 2

RESEEDING MIX AND RATES

Species (recommended varieties)	Lbs PSL/acre *	Percent of Mix
Sideoats grama (Niner, Vaughn)	9	25
Blue grama (Lovington, Hachita)	3	15
Western wheatgrass (Arriba, Barton)	16	25
Little bluestem (Pastura)	7	10
Sand dropseed (Amur)	1	10
Fourwing saltburh (Rincon, Santa Rita)	1	5
Winterfat (Hatch)	1	5
Rocky Mountain penstemon (Bandera)	6	5

* Seeding is assumed to be by hydro-mulcher; seeding rates must be doubled if broadcast seeding is conducted.

mulch, at a rate of 2 tons per acre, will be applied and crimped to enhance rainfall infiltration, minimize crusting of soil, and reduce erosion potential.

If unfavorable germination and/or growing conditions occur during the revegetation process and development of the vegetation is not progressing, reseeding of the designated areas will be conducted in the following year between July 1 and August 1.

PERFORMANCE AND RECLAMATION STANDARDS AND REQUIREMENTS. 507

Ten acres of the Tinaja Pit permit area (FIGURE 6) will be reclaimed to a condition that allows for re-establishment of a self-sustaining ecosystem and which is consistent with the proposed post-mining land use as continued sand and gravel operation. C& E Concrete, Inc., will comply with conditions for performance and reclamation which may become a part of the permit to mine.

Within the pit area proposed to be mined over the 40-year life of mine, the soil mantle is very shallow (less than 20 inches in thickness), according to the local soil survey (USDA-SCS, 1993), and thins to bedrock toward the northeast in the permit area. Because of the thin mantle of topsoil in the area, it is not technically feasible to segregate and stockpile topsoil for reclamation use.

The Chinle Formation which overlies the San Andres Limestone as an overburden is considered by C & E Concrete, Inc., as an aggregate resource and is excavated and processed for sale as base course in the local vicinity. According to Tinaja Pit personnel, the thickness of the Chinle is 5 to 20 feet at the pit margins, and thins down to the surface of the San Andres Limestone to the north and northeast (EXHIBIT B, FIGURE B-1).

The efficiency of mining the aggregate reserve results in the economic use of all excavated rock and overburden from the Tinaja Pit, as well as fines from the processing system. No waste products are generated in the mining and processing activities which would be suitable and available for backfill material in the pit reclamation process. It is estimated that more than 1.1 million cubic yards of suitable material would be required to backfill the southern portion of the final pit in order to restore positive drainage from the pit area. Additionally, substantial suitable plant growth medium would be required to topdress the remainder of the final pit with, say, one foot of material. C & E Concrete, Inc., considers such a backfill and topdressing requirement to be technically and economically unfeasible.

C & E Concrete, Inc., will comply with all applicable federal and state laws, regulations, and standards which might apply to the pit. No emission generating activities or potential pollutant source storage or use will be conducted within the pit area following pit closure. Should natural runoff to the pit result in impoundment of greater than 10 acre feet of water, the water will be discharged from the pit under an NPDES permit (FIGURE 6) by pumping to reduce the impoundment volume below 10 acre feet.

Safety fencing, consisting of 6-foot chain link fence will be placed above and along the highwall perimeter to prevent accidental or unauthorized access to the pit area in order to ensure safety for the public.

NEW UNITS. 508

Most Appropriate Technology and Best Management Practices. 508.A.

The Tinaja Pit is operated as a limestone quarry and crushing operation using conventional techniques and processes. Compliance with required permits (e.g. air quality, storm water) is maintained. Best management practices for storm water pollution prevention are outlined in EXHIBIT I. In particular, adverse impacts to water quality in the permit area are mitigated by the sediment retention pond, storm water impoundment, and a stream diversion. Refer to Section 508.B.(4)., B.(5)., and B.(6).

Assure Protection. 508.B.

Signs, Markers, and Safeguarding. 508.B.(1).

A locking gate is maintained at the access road to the mine, which will be locked when the mine is unattended. The entrance to the mine will be posted with a sign identifying the mine name, permit number, permittee, business address, and phone number. Visible perimeter markers will be established to designate the boundaries of the permit area. The permit boundary will be signed. Fencing is maintained around the property boundaries to exclude livestock and trespassing. Fencing and warning signs will be placed above the permanent high wall on the west side of the pit in order to provide a safeguard for pedestrians and wildlife.

Wildlife Protection. 508.B.(2).

Adverse impacts to wildlife, important habitat, and livestock will be minimized during mining and reclamation. The mining area supports habitats that are typical of the region and contains no important or unusual habitats. The entire property is fenced to exclude livestock, which however are not present within the mine property. Additional fencing or enclosures will be placed around any toxic or harmful chemicals or substances that may be present in the mine. Unavoidably, wildlife habitat will be lost as a result of mining. Postmining land use will be sand and gravel quarrying.

Cultural Resources. 508.B.(3).

An archeological survey was conducted by Quivira Research Associates on July 3, 2003. The survey covered the designated new unit area (FIGURE 3) of about 46 acres. the report of this survey is provided as EXHIBIT L.

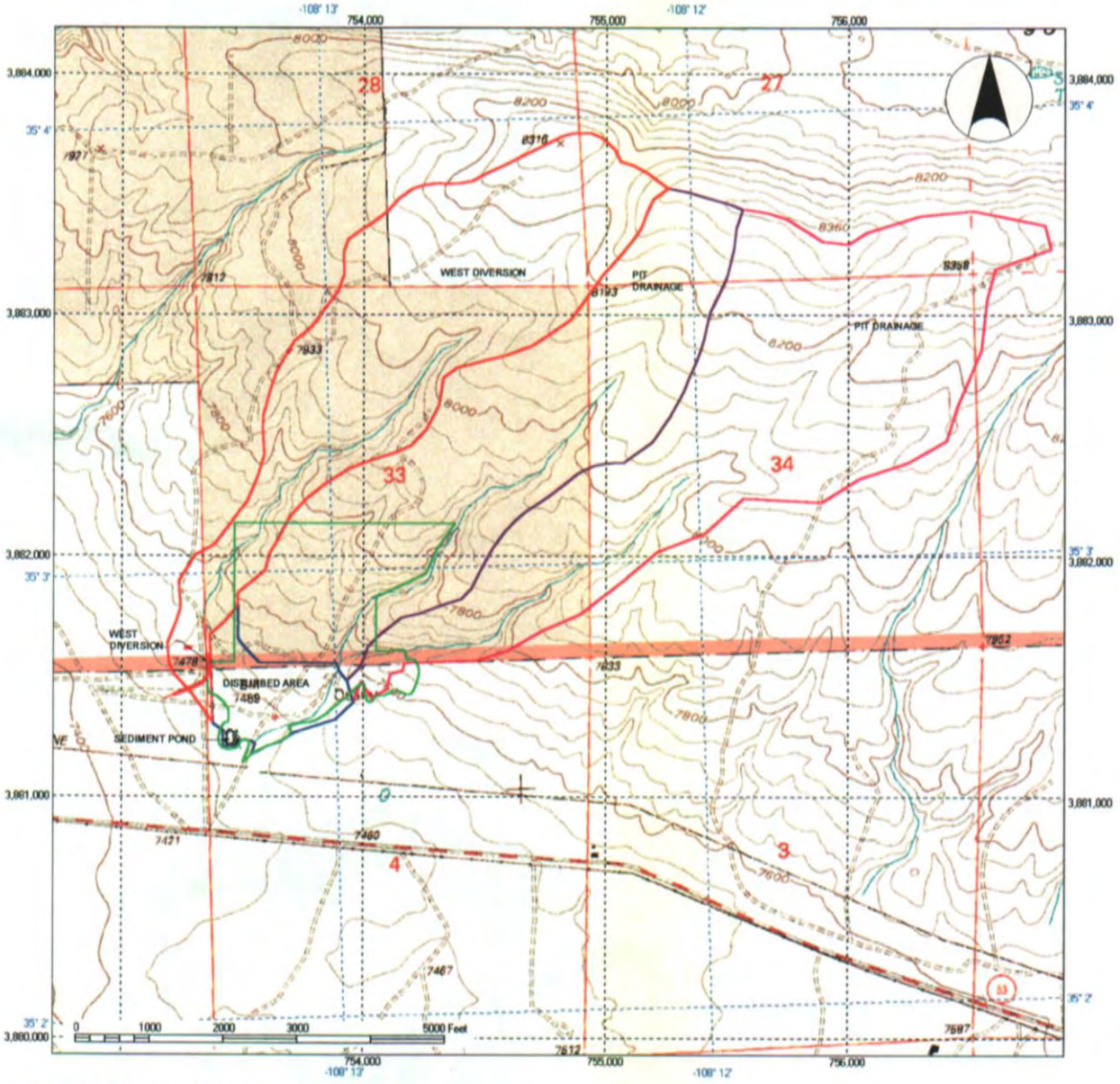
The most recent listing of cultural properties in New Mexico shows no sites on or pending nomination to the State Register of Cultural Properties or the National Register of Historic Places in or immediately adjacent to the new unit area.

State cultural resource records indicate two sites, LA 38145 and LA 38570, outside the new unit area but within the permit area. LA 38145 has been completely covered by grading and stockpiling activities. Although LA 38570 has been disturbed, testing will be necessary to assess the site=s eligibility for nomination to the State and/or National registers.

Hydrologic Balance. 508.B.(4).

Surface water runoff from the facilities area will be contained in the sediment retention pond shown on FIGURE 3. This pond will be expanded to store the runoff resulting from the 10-yr, 24-hr storm (EXHIBIT M).

Surface water runoff which comes in contact with the pit will be stored in the storm water impoundment located in the southwest corner of the pit as shown on FIGURE 3. The storm water impoundment will be equipped with a marker indicating the level below which 10 acre-feet of water is stored in the impoundment. In the event the water level in the impoundment rises above the 10 acre-feet level, portable pumps will be used to lower the water level below the 10 acre-feet level within 72 hours. The excess water will be discharged into the stream diversion shown on FIGURES 3, 6 and 9, and it will exit the permit area at the discharge point shown on FIGURE 6. The excess water will be discharged under an NPDES discharge permit (EXHIBIT M).



USGS BASE - Valle Largo 7.5 min. Quadrangle

FIGURE 9
TINAJA PIT
WATERSHED MAP

Background suspended solids data is not available for the site. However, water which may be discharged from the sediment retention pond or the storm water impoundment will very likely contain less suspended sediments than storm water flowing in adjacent water courses during storm events. At closeout, the storm water impoundment will be sampled for four consecutive quarters (assuming it contains water) and analyzed for the following parameters. The results will be compared to the New Mexico Standards for Interstate and Intrastate Streams Section 3101.K. and L. for livestock watering and wildlife habitat as follows. After the first sample results are received, any parameters which are present at less than one half of the standard will not be analyzed for in the subsequent quarters.

Parameter	Standard (mg/l)
Aluminum, dissolved	5,000
Arsenic, dissolved	200
Boron, dissolved	5,000
Cadmium, dissolved	50
Chlorine, residual	11
Chromium, dissolved	1,000
Cobalt, dissolved	1,000
Copper, dissolved	500
Cyanide, weak acid dissociable	5.2
Lead, dissolved 100	
Mercury	0.77
Selenium, total recoverable	0.005
Vanadium, dissolved	100
Zinc, dissolved	25,000
4,4-DDT and derivitives	0.001
PCB=s	0.014
radium-226 + radium-228	30 pCi/L
tritrium	20,000 pCi/L
total gross alpha (including radium-226, but excluding radon and uranium)	15 pCi/L

In order to prevent undisturbed area runoff from entering the sediment retention pond, a temporary/permanent stream diversion will be constructed in the western portion of the permit area as shown on FIGURES 3 and 9. The stream diversion has been sited in relatively flat topography so that it will not increase the potential for landslides. The

stream diversion was designed by a New Mexico Registered Engineer.

Stream Diversions. 508.B.(5).

The stream diversion shown on FIGURES 3 and 9, will be temporarily diverted to an ephemeral stream, which has a watershed area of 342 acres. The stream does not exhibit characteristics of waters of the US, and will not require a Clean Water Act, Section 404 permit. However, conferral will be conducted with Corps of Engineers permitting personnel to confirm this condition. The diversion has been designed to pass the 10-year, 24-hour peak flow. At closeout the pit will have captured all but 28 acres of the watershed. The diversion will then permanently divert the 100-year, 24-hour peak flow from the 28 acres. As indicated above, the stream diversion will be designed by a New Mexico Registered Engineer. The stream diversion and sediment retention pond will be part of the post mining land use (EXHIBIT M).

Impoundments. 508.B.(6).

The two impoundments at the site (the Sediment Retention Pond and the Storm water Impoundment) are both incised (excavated) structures which impound no water against an embankment. Therefore, the impoundments are not subject to the jurisdiction of the Mine Safety and Health Administration or the State Engineer (EXHIBIT M).

Minimization of Mass Movement. 508.B.(7).

The only man made piles at the site will be product (sand, gravel, rock) stockpiles. The stockpiles will be maintained at or below the height which can be achieved by a conveyor. Thereby, minimizing concerns for mass movement.

Riparian and Wetland Areas. 508.B.(8).

No wetland plants, no temporarily or permanently saturated soils, and no indications of wetland hydrology were observed in the survey area. Therefore, no Corps of Engineers jurisdictional wetlands were identified. Riparian habitat, streams, and ponds do not occur in the mine property.

Roads. 508.B.(9).

The road system for the Tinaja Pit consists of a paved access road from entrance northward to the scale house and to near the south rim of the pit (FIGURE 3). The asphalt pavement is approximately 24 feet in width. Access within the facilities, stockpile, and pit areas is along corridors with no specific alignments. Unpaved access routes are water sprayed for dust control as necessary. The paved access road will be retained for the postmining sand and gravel operations at the request of the land owner.

Subsidence Control. 508.B.(10).

No underground or in situ solution mining activities are planned at the Tinaja Pit. No subsidence controls are proposed.

Explosives. 508.B.(11).

Blasting at Tinaja Pit is designed to prevent injury to persons and damage to public or private property outside the permit area and minimize potential negative environmental impacts. A 300-foot buffer is maintained between blasting area and US Forest Service to the west, which is the closest land area outside the permit area. Blasting operations will meet all Mine Safety and Health Administration standards and requirements.

Currently, there are no dwellings or structures outside the proposed permit area and within one half mine of the pit boundary. If a dwelling or structure is built within one half mile of the pit boundary, C & E Concrete, Inc., will notify the resident how to request a pre-blasting survey to be conducted.

Site Stabilization and Surface Configuration. 508.C.

The post-mining land use of the permit area is gravel mining. The mined-out pit will be used for stockpiling of gravel products. The final slopes will generally consist of solid limestone which is inherently very stable against mass movement. Limestone, which consists primarily of calcium carbonate, is not an acid forming material, and is not

known to produce any toxic leachates. This is particularly true since the watertable at the site is at a depth of about 800 feet below the ground surface (EXHIBIT C).

Erosion Control. 508.D.

At closeout, approximately 10 acres of land within the mined-out pit will be reclaimed for wildlife habitat (FIGURE 7). The reclaimed area will be situated such that no surface water drainages will pass through the area. Vegetation will be established as described in Section 508.E to control erosion.

Revegetation. 508.E.

At closeout, approximately 10 acres of land within the mined-out pit will be reclaimed for wildlife habitat (FIGURE 7). The reclaimed area will be situated such that no surface water drainages will pass through the area. Vegetation will be established as described in Section 508.E to control erosion.

Foliar, basal, and surface cover, productivity, diversity, and tree density data were collected at the mine site in September 2002 in grassland and piñon/juniper woodland. The same techniques used for initial sampling will be used to ascertain revegetation success. Success will be determined using the figures and standards found in the Mining Act Rules. Postmining land use will be sand and gravel quarrying.

A vegetation reference area for the Tinaja Pit was designated on 3 July 2003. It may be used in the future to evaluate revegetation success after reclamation of selected affected areas. The land surface on which it is situated is owned by and controlled by C. & E. Concrete, Inc. The area is located at the center of the north margin of section 4, R13W, T9N. Its north edge follows the section and township boundary 200 feet east and 200 feet west from the center of the section which was indicated by a red metal post. From these points the edges of the reference area run nearly south approximately 200 feet, thus describing a rectangle of about 1.84 acres (80,000 sq ft). The coordinates of the four corners follow (WSG 84 datum):

	Degrees North	Degrees West
Northwest:	35.04637E N	B108.21385E W
Northeast:	35.04642E N	B108.21249E W
Southeast:	35.04589E N	B108.21246E W
Southwest:	35.04597E N	B108.21373E W

This location was chosen for three reasons. First, it is not slated to be mined or to be disturbed in the future yet it is readily accessible. Second, the reference area includes the dominant habitat, piñon/juniper woodland, that occurs on the undisturbed portions of the quarry planned for mining. Third, most of the west half of the reference area was grubbed and cleared of woody growth in 1990. This area will provide useful information concerning the unmanipulated regrowth of disturbed land in the quarry area. All of the east half of the area is undisturbed piñon/juniper woodland. Of course, vegetation data from any undisturbed land near the reference area or elsewhere on the property owned by C. & E. Concrete, Inc., may be used for comparative purposes in the future.

The reference area will be completely fenced as necessary to exclude livestock. Currently no livestock are grazed in the mine area (FIGURE 6). The fence will be maintained and the land within it will not be disturbed by wood cutting, hunting, or any other activity, and will not be entered by vehicles. Metal signs with permanent lettering will be attached to the fence and will be maintained or replaced as necessary. The sign will contain the following information:

C. & E. Concrete, Inc.
Vegetation Reference Area
Do Not Enter or Disturb
No Hunting or Wood Cutting
Contact (505) 287-2944 For Information

EXHIBIT A

DOCUMENTATION OF LEASE BETWEEN WALTER V. MEECH, JR. AND NORMA M. MEECH (LESSOR) AND C & E CONCRETE, INC. (LESSEE) FOR THE PORTION OF SECTION 4 WITHIN THE PERMIT AREA
AND
DOCUMENTATION OF LEASE BETWEEN RONNIE E. CASH ON BEHALF OF MEECH-CASH RENTALS (LESSOR) AND C & E CONCRETE, INC. (LESSEE) FOR THE PORTION OF SECTION 33 WITHIN THE PERMIT AREA
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EXHIBIT B

GEOLOGY AND SOILS
OF THE TINAJA PIT AREA

EXHIBIT B
GEOLOGY AND SOILS

Geology

The Tinaja Pit permit area is located on the slopes of the southern flank of the Zuni Mountains. Elevations within the permit area range from 7440 feet in the southwest corner at the access road/NM 53 intersection and rise to 8000 feet in the northeast corner. Topography in the permit area is indicated in FIGURE B-1. Natural land surface slopes within the area to be mined (Section 33) are typically 8 to 10 percent to the southwest. Slopes along the access road in Section 4 are 1 to 2 percent.

The limestone reserve of interest is the Permian San Andres Limestone widely occurring along the outslopes of the Zuni Mountains. According to Kottlowski (1962), the San Andres Limestone typically is 110 feet in thickness in the southeastern Zuni Mountains, and is generally high in calcium. San Andres Limestone reserve thickness as measured at the Tinaja Pit is approximately 75 feet. Regionally, the formation is typically 115 to 145 feet in total thickness. The base at the San Andres Limestone dips to the southwest. Within the permit area, the dip, as calculated from Maxwell (1986), is about 7E to 8E to the southwest.

The geology of the permit area and adjacent area is illustrated on FIGURE B-1. Overlying the San Andres Limestone (Psa) as a generally unconsolidated overburden is the Chinle Formation (T_R cm), composed of reddish brown sandstone interbedded with pebble conglomerate, siltstone and mudstone. The thickness of the Chinle within the permit area near the present active pit varies from 5 to 20 feet, but in the region may reach 1500 feet in thickness. However, the Chinle remnant in the permit area thins out to the north and northeast (FIGURE B-1).

Downslope of the mine facilities area is a mantle of Quaternary Alluvium, typically up to 50 feet in thickness, composed primarily of silt and fine-grained sand, above the Chinle

E:\Figure B-1 Geology Map.pdf

and San Andres. Immediately underlying the San Andres Limestone is the Glorieta Sandstone ranging in thickness in the general vicinity from 150 to 165 feet. Below the Glorieta is the Yeso Formation, comprised of sandstone and siltstone with some limestone bedding, generally 800 feet in thickness (Maxwell, 1986).

Soils

Soils of the permit area are described in two soil surveys which cover the area. The USDA, Soil Conservation Service, 1967, Soil Survey of the Zuni Mountain Area, describes the Section 33 upland portion of the permit area. The lower portion in the NW 2 of Section 4 is described in the USDA, Soil Conservation Service, 1993, Soil Survey of Cibola Area. Overall, rocky soils with limestone outcrops and/or gravel at or near the surface occur in most of the permit area, particularly within Section 33. Smaller areas near the toe of the limestone slope in the NW 1/4 of Section 4, contain sandstone rather than limestone outcrops and/or gravel.

Laporte stony loam, 3B10% slopes, is present on the high areas between the canyons on the uplands of Section 33. This soil is loose, very soft, easily excavated, shallow, and wellBdrained. Permeability is moderately rapid, water capacity is very low, runoff is slow except during severe rainstorms (moderate), hazard of water erosion is moderate, and hazard of blowing soil is severe. San Andres limestone occurs as outcrops and in the soil profile. Limestone gravel and stone fragments cover approximately 50% of the surface in many places. Soil depth is usually no more than about 20". Laporte stony loam, 20B40% slopes, occurs in and on the sides of the canyons. Otherwise, this soil has characteristics similar to the Laporte stony loam. The upland soils are classified as LaporteBVessilla complex, 3 to 15 percent slopes, in USDA-SCS (1993). A significant percentage of these shallow soils will be lost by the ongoing quarrying and planned operations.

Deep soils cover approximately 30% of the NW 3 of Section 4. Most of this 3 section

has, or had, shallow rocky soils in premining conditions. Approximately equal areas of two deep soils are present. Millpaw loam, 0 to 5 percent slopes, occurs in swales and is formed of mixed alluvium. It is deep and wellBdrained, permeability is slow, water capacity is very high, runoff is medium, hazard of water erosion is moderate, and hazard of soil blowing is slight. Teco sandy loam, 2B5 percent slopes, occurs on valley sides and hills and is formed in mixed alluvium. It is deep, wellBdrained, permeability is moderately slow, available water capacity is high, runoff is medium, hazard of water erosion is moderate; and hazard of blowing soil is slight. No significant impacts to these lowland soils are anticipated by planned mining operations.

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EXHIBIT C

GROUNDWATER AND SURFACE WATER HYDROLOGY OF THE TINAJA PIT AREA

EXHIBIT C
GROUNDWATER AND SURFACE WATER HYDROLOGY

Groundwater

The permit area and vicinity is part of the Gallup Underground Water Basin, declared in 1994 by the New Mexico State Engineer Office. Known wells within the vicinity of the Tinaja Pit permit area are delineated on FIGURE C-1 and outlined in TABLE C-1, based on records of the New Mexico State Engineer Office. There are no recorded local springs in the area (White and Kues, 1992).

The most productive groundwater aquifers are the Yeso Formation, Glorieta Sandstone, San Andres Limestone, Chinle Formation and Quaternary Alluvium. Water quality information for a well completed in the Alluvial Aquifer 4 miles west of the permit area indicates good quality water, with total dissolved solids of 273 mg/l.

According to Baldwin and Rankin (1995), the Chinle yields 10 to 300 gpm, with sodium and bicarbonate predominant in the water. The San Andres and Glorieta aquifers yield up to 2830 gpm, with total dissolved solids in the range of 130 to 4200 mg/l. This water is generally calcium bicarbonate sulfate type. The San Andres Limestone on the flank of the Zuni Mountains is a recharge zone. Water moves down gradient along solution channels and fractures in the limestone and to a lesser extent through interconnected pore spaces and fractures in the Glorieta (Baldwin and Rankin, 1994).

C & E Concrete maintains two wells within the permit area, indicated as (W-8 and W-9 on FIGURE C-1). Wells W-8 and W-9 are permitted by the NM State Engineer Office (SEO) as Declaration No. G-336 and Declaration No. 336-S, respectively. Water levels in these wells are greater than 800 feet (Meech, 2002). Diversion of 22.77 acre feet of water per year has been approved by the SEO for the Tinaja Pit operation (NMSEO, 1996). Hydrologic analysis conducted by the SEO, regarding possible drawdown o

E:\Figure C-1 Locations of Water Wells.pdf

TABLE C-1

WATER WELLS OF RECORD IN THE VICINITY OF TINAJA PIT
CIBOLA COUNTY, NEW MEXICO

Well No.	Owner	SEO File	Location T, R, Sec.	Year Completed	Depth of Well (ft)	Static Water Lever (ft)	Well Yield (gpm)
W-1	Herman H. or Kathryn M. Weng	G-00370	10N.13W.29.43	-	-	-	
W-2	Edward Valdez	G-00827	09N.13W.04.332	1998	915	775	20 - 30
W-3	Don Cator	G-00872	10N.13W.29.233	1998	1410	600	-
W-4	Daniel C. Rehberg	G-01164	10N.13W.28.311	2002	1420	1200	-
W-5	Louis & Kathy Marrello	G-01410	10N.13W.31.223	-	-	-	-
W-6	William M. Callaghan	G-00862	10N.13W.32.111	1998	620	540	15 - 20
W-7	Kress & Cindy Barton	G-00318	09N.13W.05.124	1995	700	580	-
W-8	C & E. Concrete, Inc.	G-00336	09N.13W.04.114	1995	1040	-	60
W-9	C & E Concrete, Inc.	G-00336-S	09N.13W.04.114	1990	920	-	-
W-10	Beverly Offe	G-00341	09N.13W.05.413	1995	570	470	3

Source: New Mexico Office of the State Engineer water well records.

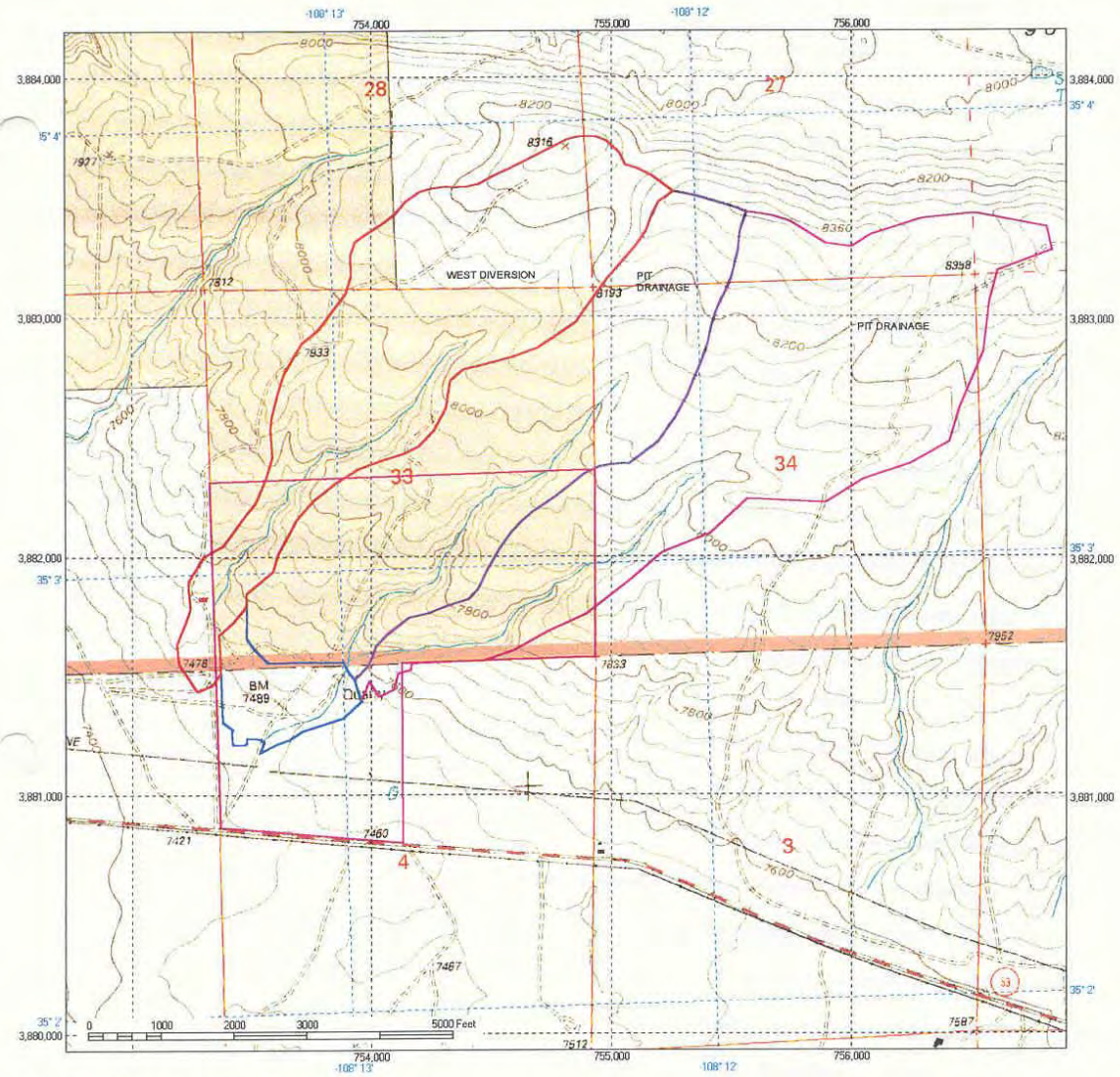
neighboring wells, indicated a drawdown of 2.4 feet on any well one mile from the pumping well after 100 years of pumping 22.77 acre-feet per year. The SEO concluded that pumping of the primary well (G-336) would not result in any detrimental effect on prior appropriation in the area (NMSEO, 1996). According to water meter records for wells G-336 and G-336-S, annual water requirements and pumpage at Tinaja Pit has averaged 22.4 acre-feet since the water meters were installed. Water use at the Tinaja Pit is required for dust abatement at crusher systems and along access and haul roads, testing lab, potable and sanitary use, tree nursery irrigation, and wet plant.

Surface Water

The permit area is located in an upland area immediately west of the Continental Divide. The permit area has an upper drainage area of about 1161 acres. The drainage system is ephemeral, flowing only in response to precipitation events. The drainage pattern exhibited is a parallel pattern (FIGURE C-2). Drainage direction is to the southwest.

Drainage channels above the current area of mine disturbance are steeply incised (30 to 120 percent side slopes) into the San Andres Limestone, producing armored channel beds and banks. Ephemeral runoff which may occur in channels above the disturbed area discharges to the pit. Much of the runoff within the graded facilities area is retained by berms along the downslope edges of the disturbed area. Unretained runoff from the facilities area flows to a sedimentation pond located in the southwestern portion of the permit area. According to longtime onsite mine personnel, there has been no discharge of storm water from the permit area or the sedimentation pond since 1985, when C & E Concrete, Inc. initiated operations at Tinaja Pit.

Surface water quality above the Tinaja Pit is typical of ephemeral drainages in New Mexico and is thus expected to exhibit high suspended sediment concentrations and relatively low dissolved solids concentrations during rainfall runoff events.



USGS BASE - Valle Largo 7.5 min. Quadrangle

FIGURE C-2
C & E CONCRETE
TINAJA PIT WATERSHED MAP

The Tinaja Pit maintains an NPDES storm water multi-sector general permit and pollution prevention plan (EXHIBIT I) which provides for control of storm waters and minimization of surface water quality alteration.

Below the designated outfall in the southwest corner of the permit area, there are no established water courses. The terrain is generally comprised of old lava flows with sink holes and internal drainage areas. Based on this topographic condition as represented by USGS topographic map coverage and local field reconnaissance, there are no receiving waters or defined drainages from the permit area.

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EXHIBIT D

CLIMATOLOGY AND AIR QUALITY OF THE TINAJA PIT AREA

EXHIBIT D

CLIMATOLOGY AND AIR QUALITY

The climate of the Tinaja Pit vicinity is arid continental. Low average humidity, combined with the effects of wind, encourage a rapid evaporation rate. Mean annual precipitation is 13.5 inches, based on a 33-year period of record for the El Morro National Monument Weather Station (Elev. 7225 feet), located about 8 miles west of the permit area (Gabin and Lesperance, 1977). A relatively large percentage of the precipitation occurs in light rainfalls, although heavy downpours are not unusual in conjunction with summer thunderstorms. About 53 percent of the annual average precipitation normally falls during the period July through October, typically as brief but often heavy thunderstorms. Low average humidity, combined with the effects of wind, encourage a rapid evaporation rate.

Average annual temperature is 47.4E F, as represented by the El Morro National Monument Weather Station, with a monthly average of 27.9E F in January and 68.6E F in July (Gabin and Lesperance, 1977).

Spring is the windy season, and, if the weather is dry, soil blows occasionally. A brief period of soil blowing can also occur just before a thunderstorm. Winds blow most frequently from the north in winter and from the south in summer.

Ambient air quality in the vicinity of Tinaja Pit is generally considered good, with the exception of occasional high concentrations of particulate matter as a result of localized blowing dust. The existing crusher system operates under New Mexico Air Quality Permit Number 0879-M1. The rock pulverizer system operates under New Mexico Air Quality Permit Number 2678. Copies of the air quality permits are provided in EXHIBIT J. Fugitive dust at the existing mine is controlled by watering of access road and haul roads, and by applying sprays at the crushers, screens, conveyor belts, and conveyor

transfer points.

There are presently no major sources of air pollution emissions in the project vicinity. However, vehicle emissions are generated by light traffic along NM 53 to the south of Tinaja Pit. No comprehensive air quality monitoring has been conducted in the mine vicinity to describe principal air quality parameters. However, background concentrations of principal parameters (e.g. PM_{10}, SO_2, NO_2, CO, and O_3) are expected to be well within New Mexico Ambient Air Quality Standards.

EXHIBIT E

VEGETATION

EXHIBIT E
VEGETATION

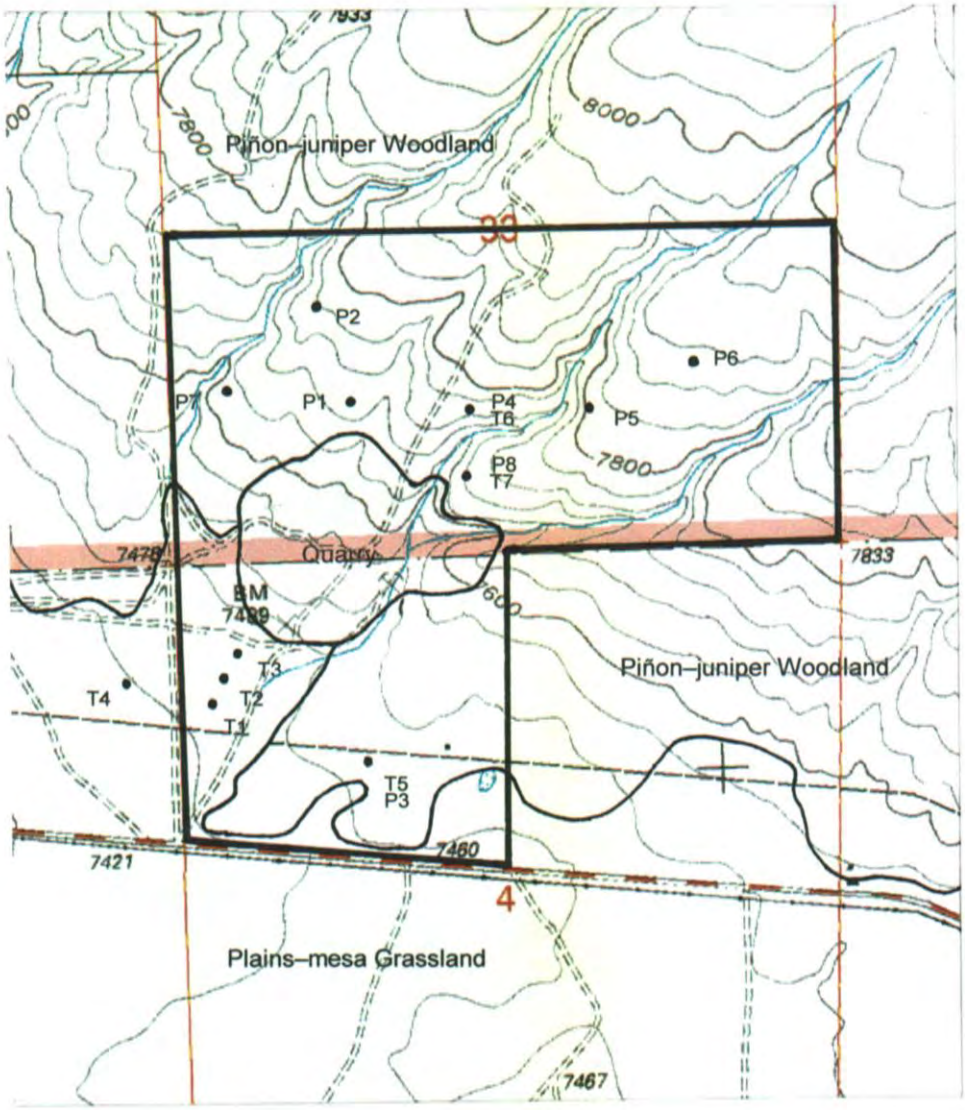
On 26 and 27 September 2002, a survey for federal and state T&E and rare plants, common plant species, noxious or invasive weeds, and Corps of Engineers jurisdictional wetlands was conducted on the land surrounding the Tinaja Pit, Cibola County, New Mexico. A qualified biologist conducted the reconnaissance survey on foot throughout the permit area. All identifiable species were noted. Review of the New Mexico Rare Plant Council webpage, U. S. Fish and Wildlife Service documents, and other literature resulted in a list of potential listed (Sensitive, Concern, Candidate, Proposed, Threatened, or Endangered) or rare species, both federal and state, for Cibola County.

Vegetation Types and Species

The vegetation in the survey area is composed of two types. Near the access road to the pit and in the far southwestern corner of Section 4 are small expanses of PlainsBmesa Grassland. The dominant vegetation, PiñonBjuniper Woodland, occurs in higher, rocky uplands (DickBPeddie *et al.* 1993) (FIGURE E-1). Several plants are common in the grasslands including blue grama (*Bouteloua gracilis*), rubber rabbitbrush (*Chrysothamnus nauseosus*), tarragon (*Artemisia dracunculus*), James= potato (*Solanum jamesii*), golden globemallow (*Sphaeralcea incana*), and summer cypress (*Kochia scoparia*). In general, grass cover and diversity are low and forb cover and diversity are high (see below), a reversal of the normal situation that was probably caused intensive grazing during the past century. Nevertheless, a large number of other grasses and forbs are also present. A list of the plants observed during the survey is in TABLE E-1.

The dominant plants in the uplands are Colorado piñon (*Pinus edulis*) and oneseed juniper (*Juniperus monosperma*). There is very little undergrowth and species diversity

FIGURE E–1
Vegetation Map and
Approximate Transect (T) and 50–Foot–Square Plot (P) Locations



Valle Largo, 1" = 0.216 Mi

TABLE E-1

LIST OF PLANTS SEEN IN SURVEYED AREA

AGAVACEAE (Agave Family)
Yucca baccata DATIL or BANANA YUCCA
Yucca glauca SMALL SOAPWEED

AMARANTHACEAE (Pigweed Family)
Amaranthus sp. AMARANTH

ANACARDIACEAE (Sumac Family)
Rhus trilobata SKUNKBUSH

ASTERACEAE (COMPOSITAE; Sunflower Family)
Ambrosia sp. RAGWEED
Artemisia dracunculus WORMWOOD
Artemisia frigida FRINGED SAGEBRUSH
Artemisia ludoviciana LOUISIANA SAGEBRUSH
Bahia dissecta RAGLEAF BAHIA
Berlandiera lyrata CHOCOLATE FLOWER
Bidens sp. BEGGARTICK
Brickellia sp. BRICKELLBUSH
@ Carduus nutans MUSKTHISTLE CLASS B NOXIOUS WEED
Chaetopappa (*Leucelene*) *ericoides* BABY ASTER
Chrysothamnus greenei GREENE=S RABBITBRUSH
Chrysothamnus nauseosus RUBBER RABBITBRUSH
Cirsium sp. THISTLE
Conyza canadensis CANADIAN HORSEWEED
Erigeron divergens SPREADING FLEABANE
Grindelia nuda aphanactis CURLYTOP GUMWEED
Gutierrezia sarothrae BROOM SNAKEWEED
Helianthus annuus COMMON SUNFLOWER
Heliomeris (*Viguiera*) *multiflora* SHOWY GOLDEN EYE
Heterotheca villosa GOLDENASTER
Hymenoxys richardsonii PINGUE
@ Lactuca serriola PRICKLY LETTUCE
Machaeranthera pinnatifida PERENNIAL GOLDENWEED
Machaeranthera tanacetifolia TANSYLEAF ASTER
Psilostrophe tagetina WOOLLY PAPERFLOWER
Sanvitalia abertii ABERT=S ZINNIA
Senecio multicapitatus BROOM GROUNDSEL
Tetradymia canescens SPINELESS HORSEBUSH
Tetraneuris (*Hymenoxys*) *argentea* PERKY SUE
Thelesperma megapotamicum HOPI TEA
@ Tragopogon dubius WESTERN SALSIFY
Verbesina encelioides COWPEN DAISY

BERBERIDACEAE (Barberry Family)
Mahonia (*Berberis*) *repens* OREGON GRAPE

BORAGINACEAE (Borage Family)
Lappula occidentalis DESERT STICKSEED

BRASSICACEAE (Mustard Family; CRUCIFERAE)
Dimorphocarpa wislizenii SPECTACLEPOD
Lesquerella sp. BLADDERPOD
Schoenocrambe linearifolia PURPLE MUSTARD
@ Sisymbrium altissimum TALL TUMBLEMUSTARD

CACTACEAE (Cactus Family)
Cylindropuntia (*Opuntia*) *imbricata* TREE CHOLLA rare
Echinocereus coccineus SCARLET HEDGEHOG CACTUS
Escobaria (*Coryphantha*) *vivipara* SPINYSTAR
Opuntia phaeacantha TULIP PRICKLYPEAR
Opuntia polyacantha PLAINS PRICKLYPEAR

CELASTRACEAE (Staff Tree Family)
Paxistima myrsinites MOUNTAIN LOVER, BOXLEAF MYRTLE

CHENOPODIACEAE (Goosefoot Family)
Atriplex canescens FOURWING SALTBUSH rare
Chenopodium album. LAMBSQUARTERS, QUELITE
@ Kochia scoparia SUMMER CYPRESS
Krascheninnikovia lanata (*Ceratoides lanata*; *Eurotia lanata*) WINTERFAT
@ Salsola tragus (*S. kali*) RUSSIAN THISTLE
Teloxys graveolens FETID GOOSEFOOT

COMMELINACEAE (Spiderwort Family)
Tradescantia occidentalis SPIDERWORT

CONVOLVULACEAE (Morning Glory Family)
@ Convolvulus arvensis FIELD BINDWEED

CUPRESSACEAE (Cypress Family)
Juniperus monosperma ONESEED JUNIPER
Juniperus scopulorum ROCKY MOUNTAIN JUNIPER

CYPERACEAE (Sedge Family)
Carex sp. SEDGE upland species

EUPHORBIACEAE (Spurge Family)
Chamaesyce serpyllifolia THYMELEAF SANDMAT

FABACEAE (LEGUMINOSAE; Pea Family)
Astragalus sp. MILKVETCH
Lotus wrightii WRIGHT=S DEERVETCH rare
@ Melilotus alba WHITE SWEETCLOVER

TABLE E-1 Cont.

LIST OF PLANTS SEEN IN SURVEYED AREA

FAGACEAE (Beech Family)
Quercus gambelii GAMBEL OAK

GERANIACEAE (Geranium Family)
@ Erodium cicutarium REDSTEM STORK=S BILL

GROSSULARIACEAE (Goosefoot Family)
Ribes cereum WAX CURRANT

HYDROPHYLLACEAE (Waterleaf Family)
Phacelia sp. SCORPIONWEED

LAMIACEAE (LABIATAE; Mint Family)
Hedeoma sp. FALSEPENNYROYAL
@ Marrubium vulgare HOREHOUND
Salvia reflexa LANCELEAF SAGE

LILIACEAE (Lily Family)
Allium cernuum NODDING ONION

LINACEAE (Flax Family)
Linum lewisii PRAIRIE FLAX

MALVACEAE (Mallow Family)
Sphaeralcea coccinea SCARLET GLOBEMALLOW
Sphaeralcea incana GOLDEN GLOBEMALLOW

NYCTAGINACEAE (FourBo=clock Family)
Mirabilis multiflora COLORADO FOUR O=CLOCK
Mirabilis oxybaphoides SMOOTH SPREADING FOUR O=CLOCK

ONAGRACEAE (Evening Primrose Family)
Gaura parviflora VELVETWEED

OXALIDACEAE (Oxalis or Woodsorrel Family)
Oxalis sp. WOODSORREL

PINACEAE (Pine Family)
Pinus edulis COLORADO PIÑON
Pinus ponderosa PONDEROSA PINE
Pseudotsuga menziesii INLAND DOUGLAS FIR rare

POACEAE (GRAMINAE; Grass Family)
Aristida purpurea FENDLER=S THREEAWN
Bouteloua curtipendula SIDEOATS GRAMA
Bouteloua gracilis BLUE GRAMA
Bromus sp. BROME
@ Bromus tectorum CHEATGRASS
Elymus longifolius (*Sitanion hystrix*) SQUIRRELTAIL
Elymus smithii (*Agropyron smithii*; *Pascopyrum smithii*) WESTERN WHEATGRASS
Muhlenbergia depauperata SIXWEEKS MUHLY
Muhlenbergia pauciflora NEW MEXICO MUHLY
Muhlenbergia torreyi RING MUHLY
Muhlenbergia wrightii SPIKE MUHLY
Munroa squarrosa FALSE BUFFALOGRASS
Oryzopsis hymenoides INDIAN RICEGRASS
Oryzopsis micrantha LITTLESEED RICEGRASS
Pleuraphis (*Hilaria*) *jamesii* GALLETA
Poa fendleriana MUTTONGRASS
Sporobolus airoides ALKALI SACATON
Sporobolus cryptandrus SAND DROPSEED
Stipa comata NEEDLEBANDB THREAD
Stipa scribneri SCRIBNER=S NEEDLEGRASS

POLEMONIACEAE (Phlox Family)
Ipomopsis aggregata SCARLET GILIA
Phlox (*Microsteris*) *gracilis* SLENDER PHLOX

POLYGONACEAE (Knotweed Family)
Eriogonum alatum WINGED BUCKWHEAT
Eriogonum cernuum NODDING BUCKWHEAT uncommon
Eriogonum jamesii JAMES= WILD BUCKWHEAT
Eriogonum racemosum REDROOT BUCKWHEAT

PORTULACACEAE (Purslane Family)
@ Portulaca oleracea PURSLANE
Talinum brevicaule (*T. pulchellum*) SHOWY FAMEFLOWER
Talinum confertiflorum ROCKY MOUNTAIN FAMEFLOWER

RANUNCULACEAE (Buttercup Family)
Thalictrum fendleri FENDLER=S MEADOWRUE

ROSACEAE (Rose Family)
Potentilla sp. CINQUEFOIL
Purshia stansburiana CLIFFROSE

SCROPHULARIACEAE (Figwort Family)
Castilleja integra WHOLELEAF INDIAN PAINTBRUSH
Penstemon barbatus SCARLET BEARDTONGUE
@ Verbascum thapsus COMMON MULLEIN

SOLANACEAE (Potato Family)
Lycium pallidum PALE WOLFBERRY
Physalis sp. GROUNDCHERRY
Solanum jamesii WILD POTATO

VERBENACEAE (Vervain Family)
Glandularia sp. MOCK VERVAIN
Verbena bracteata BIGBRACT VERBENA
Verbena macdougalii MACDOUGAL=S VERBENA

@ = adventive (alien) plant

is low. Small soapweed (*Yucca glauca*) and plains prickly pear (*Opuntia polyacantha*) are almost the only shrubby plants growing this habitat. Grass cover, with minor exceptions, is very poor, but (primarily annual) forb numbers, not cover, can be fairly high. A few places, often near the edges of the canyons, supported a greater growth of grasses.

Quarrying activities will result in the potential loss or modification of approximately 86 acres of PiñonBjuniper Woodland and about 30 acres of PlainsBmesa Grassland. The vegetation lost or modified as a result of the project will comprise an insignificant fraction of the total area of these habitats in the state. The plant species that will be affected are common in the area. Loss of vegetation will adversely affect livestock and wildlife for several years and will increase the likelihood of erosion by precipitation or runoff. With an adequately implemented reclamation plan, sufficient precipitation, and lack of further disturbance, vegetation similar to the natural vegetation will probably regrow after the end of the project.

Vegetation Sampling

Field Methods

Five sampling procedures were used to obtain different types of data (cover, shrub density, perennial production, tree density, and species diversity). A modified point intercept method (transect) was used to estimate foliar cover values and to register plant species presence. The transect was also used to collect shrub density numbers. Productivity was estimated by clipping all currentByear growth from perennial species within a 1BmeterBsquare PVC frame (quadrat). Tree and shrub density data were collected from 50Bfoot by 50-foot (2500 ft^2) plots in piñonBjuniper woodland. Plant species diversity information was obtained from the transects, quadrats, plots, and from general observations.

Choice of specific sample locations was based on visual characterization of a site.

Different data sheets were used to record the information collected in the field. Transects and quadrats were used in grasslands and grassy areas in the piñonBjuniper woodland to obtain foliar cover, shrub density, and perennial production. Grassland data were collected from four transects and associated quadrats: three within the survey area and one outside but adjacent to the survey area (FIGURE E-1). The location outside the survey area was sampled because it supported better grass growth (presumably more like the undisturbed vegetation) and because it may be used as a reference site for evaluating reclamation success.

In most cases, there was so little to measure in the piñonBjuniper woodland that transects and quadrats were not appropriate. Consequently, 50BfootBsquare plots were employed to obtain tree and shrub density data in the piñonBjuniper woodland, and, except for the grassy areas, no production data were collected from the plots. Data were gathered from eight 50BfootBsquare plots and from three transects in grassy areas (cover and production). Canopy cover in the woodlands was estimated visually. Species diversity information was collected at all locations.

TransectsBFoliar Cover. Transects were moreBorBless randomly located within a particular vegetation type. A oneBhundredBfoot plastic tape measure was stretched as tightly as possible between two fiveBfoot by 2 inch rebar posts and held relatively taut by staked cords aligned with the axis of the transect. The geographic locations of the stakes (waypoints) were obtained by using a hand held Garmin Etrex GPS unit. Data collected by these units are not differentially correctable so the coordinates are approximate. When extended the tape was normally about three feet above the ground surface. For each transect, data were collected at thirtyBthree intervals or locations every three feet, starting at three feet. One edge of a straight fourBfootBlong 2" x 2" wooden pole with a bubble level on one end (plumb stick) was held vertically and used to define an imaginary line between the tape and the ground. Data were collected where this line touched (Ahit≅) one or more plant parts.

At a minimum, data collected at each interval included one of three surface characters (bare, litter, rock) or a basal plant interception. A basal interception occurred when the edge of the plumb stick touched at or near the center of a plant where it emerged from the ground. The first contact with a plant stem or leaf was recorded as a foliar hit. All hits were recorded as to life form category (shrub, grass, forb) and species. Abbreviations were used to identify the species on the field data sheets and in many tables (see TABLE E-2) for a correlation between abbreviations and plant names).

TransectsBShrub Density. Shrub density data were collected along the same transects used to record cover data. All living shrubs, of any size or age, were counted individually by species within a rectangular strip or belt transect 100 feet by 6 feet in size (600 ft^2). The plumb stick discussed above was marked three feet from one end and used to delineate the rectangle as both sides of the measuring tape were walked. This technique was used in the grassland and in two places in the piñonBjuniper woodland. More accurate shrub and tree density was obtained in the piñonBjuniper woodland by using 50BfootBsquare plots (see below).

Quadrats (perennial production). Clippings were taken from four (rarely two) quadrat locations near every transect to determine perennial plant production. The quadrats were one meter square (inside dimensions). Two quadrats were randomly located about ten paces in different directions off each end of the transect. All perennial species from each quadrat were collected and bagged separately. The current year=s growth of perennial grasses and forbs was clipped with scissors to approximately a twoBinch stubble height. Ten typical branches of the current year=s growth were removed from shrubs. Clippings were placed in paper bags, stapled, and labeled with location, number, date, and species, then dried and weighed.

50BfootBsquare Plots (tree and shrub density). Starting at an initial point, two 100Bfoot tapes were stretched perpendicularly to each other. At 50 feet, the tapes= trajectories

TABLE E-2

CORRELATION OF ABBREVIATIONS AND NAMES FOR PLANTS

ARDR	*Artemisia dracunculus* TARRAGON
ARFR	*Artemisia frigida* FRINGED SAGE
BOGR	*Bouteloua gracilis* BLUE GRAMA
BRTE	*Bromus tectorum* CHEATGRASS
CHAFE	*Chamaesyce fendleri* FENDLER=S SANDMAT
CHER	*Chaetopappa ericoides* BABY DAISY
CHRGR	*Chrysothamnus greenei* RUBBER RABBITBRUSH
CHRNA	*Chrysothamnus nauseosus* GREENE=S RABBITBRUSH
ECCO	*Echinocereus coccineus* SCARLET HEDGEHOG CACTUS
ESVI	*Escobaria vivipara* SPINYSTAR CACTUS
FORB1	unidentifiable forb
GR1, GR2, GR3	three different unidentifiable grasses
HEVI	*Heterotheca villosa* GOLDENASTER
JUMO	*Juniperus monosperma* ONESEED JUNIPER
LILE	*Linum lewisii* LEWIS= FLAX
MIMU	*Mirabilis multiflora* COLORADO FOUR O=CLOCK
MIOX	*Mirabilis oxybaphoides* SMOOTH SPREADING FOUR O=CLOCK
MUPA	*Muhlenbergia pauciflora* NEW MEXICO MUHLY (grass)
OPPO	*Opuntia polyacantha* PLAINS PRICKLY PEAR CACTUS
ORMI	*Oryzopsis micrantha* LITTLESEED RICEGRASS
PIED	*Pinus edulis* COLORADO PIÑON
Pot. sp.	*Potentilla* species CINQUEFOIL
SOJA	*Solanum jamesii* JAMES= POTATO
SPCR	*Sporobolus cryptandrus* SAND DROPSEED
SPHsp	*Sphaeralcea* species GLOBEMALLOW species
TECA	*Tetradymia canescens* SPINELESS HORSEBUSH
VEMA	*Verbena macdougalii* MACDOUGAL=S VERBENA
YUBA	*Yucca baccata* DATIL or BANANA YUCCA

were moved 90E so that a rough square was described. All trees and shrubs (including cacti) within the plot were counted. Extrapolation of that data resulted in the number of trees and shrubs per acre. This technique was used only in the piñonBjuniper woodland.

Plant Species Diversity. Species diversity was ascertained by noting all plants observed during the survey (TABLE E-1). In some cases, specimens were collected to aid in identification. Nevertheless, some plants could not be identified due to lack of distinguishing structures (flowers, fruit).

Results

Perennial Foliar Cover. The estimation of the foliar cover is based on the number of first or upper Ahits≅ occurring along a transect. Each hit is equivalent to a 3% cover value (one hit every three feet along the 100Bfoot transect). Four transects were run in grasslands and three in grassy areas in piñonBjuniper woodland. The mean of the values for each plant species within each vegetation type was calculated to estimate percent foliar cover as well as total cover for the three plant lifeforms (grass, forb, shrub). TABLE E-3 presents a summary of cover data; and TABLE E-4 includes more complete information.

Mean total cover (including all grasses, forbs, and shrubs) was 61.5% and 16%, for grassland and piñonBjuniper woodland, respectively. Estimated tree canopy cover in piñonBjuniper woodland was determined by a different method (50BfootBsquare plots; see below). It is clear from the data and from field observation that the understory is poorly developed in piñonBjuniper woodland, while cover values in grassland are relatively high. The data also show that lifeforms in the grassland are about equal in relative percent cover.

Shrub Density. The size of the belt transect used to count shrubs is 600 ft^2, or

TABLE E-3

SUMMARY OF MEAN COVER VALUES MEASURED ALONG TRANSECTS

	Grassland	PiñonBjuniper Woodland
Grasses	21.75	13
Forbs	19.5	2
Shrubs	20.25	1
Total	**61.5**	**16**

TABLE E-4

COVER DATA FROM TRANSECTS

Grassland

	Foliar															TOTAL	TOTAL	Surface		
	Grasses					Forbs						Shrubs				FOLIAR	BASAL			
Species	BOGR	MUPA	ORMI	SPCR	TOTAL	ARDR	Pot. sp.	SATR	SOJA	SPHsp	VEMA	TOTAL	CHRGR	CHRNA	TECA	YUBA	TOTAL	COVER	COVER	Bare	Litter	Rock (1)
Transect																						
T1	6				6	24		3		6		33						39	6	45	48	
T2	21			3	24	21						21		24		3	27	72	6	21	72	
T3						12		3		3		3	24		48		48	72	3	12	84	
T4	57				57									3	3		6	63	27	24	48	
Sum	84			3	87	57		3		6		9	3	78	3	75	3	81	246	42	102	252	
Mean	21			0.75	21.75	14.25		0.75		1.5		2.25	0.75	19.5	0.75	18.75	0.75	20.25	61.5	10.5	25.5	63	
Std Dev	26			0	26	6		0		0		2	0	6	0	23	0		16	11	14	18	

Pinyon-juniper

T5	12			3	15					3		3						18	12	9	78	
T6		12			12					3		3				3	3	18	3	6	18	72
T7		12			12													12			24	75
Sum	12	24	3		39					6		6				3	3	48	15	15	120	147
Mean	4	8	1		13					2		2				1	1	16	5	5	40	49
Std Dev	0	0	0							0		0				0	0	3	6	2	33	2

(1) = rocks greater than 1/4 inch

Species = species acronym (see text for correlations)

Mean = average percent cover per unit area for each species, based on the number of transects within vegetation type, and average cover for each structural class

0.0137741 acres. The average number of each species was determined for each plant community and was divided by 0.0137741 to obtain an estimate of shrub density/acre. TABLE E-5 presents a summary of shrub density data; and TABLE E-6 includes more complete information.

Both tables clearly show that shrub species distribution is strongly tied to vegetation type, at least among the species encountered. Sampling shrub density using the transect method underestimates species diversity and consequently density of shrubs not encountered in the transects. It is not possible to compare the shrub density values measured by the different methods because only one shrub was counted in the transects (YUBA, *Yucca baccata*) while six were found in the 50Bfoot Bsquare plots. A comparison of tree density between the two methods shows that transects underestimate both *Juniperus monosperma* (JUMO) and *Pinus edulis* (PIED) when compared to the 50Bfoot Bsquare plots. The latter method presumably more accurately measures this parameter.

Perennial production. After drying, the clippings from each perennial species from every quad were weighed in grams on an analytical balance to 2 decimal points. These figures were converted from grams per square meter to pounds per acre by (1) dividing each sample weight by 454.59 (the number of grams per pound) to obtain pounds per square meter; (2) multiplying the sample weight in pounds per square meter by 4,046.82 (the number of square meters per acre) to obtain pounds per acre; that is, multiply grams per square meter by 8.9235. TABLE E-7 presents a summary of perennial production, and TABLE E-8 includes more complete information.

The data revealed several trends: (1) perennial production in grasslands is much greater than in piñonBjuniper woodland; (2) in the grasslands production by forbs outstrips that of grasses, although cover values of both lifeforms are nearly equal; (3) production by shrubs is low in grasslands and nonexistent (in reality very low) in

TABLE E-5

SUMMARY OF SHRUB DENSITY MEASURED ALONG TRANSECTS
(plants per acre)

	Grassland	PiñonBjuniper Woodland
Artemisia frigida	163	
Chrysothamnus greenei	145	
Chrysothamnus nauseosus	1688	
Opuntia polyacantha	18	
Tetradymia canescens	182	
Yucca baccata		339
Juniperus monosperma		97
Pinus edulis		48
Total	**2196**	**436**

TABLE E-6

SHRUB DENSITY FROM TRANSECTS

Grassland

Species	ARFR		CHRGR		CHRNA		OPPO		TECA		TOTAL	YUBA (1)		JUMO		PIED	
	Count	No./acre	Count	No./acre	Count	No./acre	Count	No./acre	Count	No./acre		Count	No./acre	Count	No./acre	Count	No./acre
Transect																	
T1	9	653	6	436	1	73	1	73	1	73	1307						
T2					42	3049			1	73	3122						
T3					48	3485					3485						
T4			2	145	2	145			8	581	871						
Sum		653		581		6752		73		726	8785						
Mean		163		145		1688		18		182	2196						

Pinyon-Juniper

														TOTAL
T5											2	145		145
T6							7	508	1	73	2	145		581
T7							7	508	1	73				581
Sum								1016		290		145		1307
Mean								339		97		48		436

(1) = ramets

Species = species acronym (see text for correlations)

Mean = average number of individuals (ramets for YUBA) of each species per acre within each vegetation type

TABLE E-7
SUMMARY OF PERENNIAL PRODUCTION
(pounds per acre)

	Grassland	PiñonBjuniper Woodland
Grasses	136	85
Forbs	197	13
Shrubs	5	0
Total	**338**	**98**

TABLE E-8

PERENNIAL PRODUCTION SUMMARY

GRASSLAND

	Grasses								Forbs													Shrubs				TOTAL PRO-
Species	BOGR	MUPA	MUPU	SPCR	GR1	GR2	GR3	TOTAL	ARDR	CHAFE	CHER	HEVI	LILE	MIOX	OXsp	SOJA	SPHsp	TABR	TROC	VEMA	FORB1	TOTAL	ARFR	CHRGR	CHRNA	TOTAL	DUCTIO
Transect																											
T1	95.28			10.51				105.79	107.80							12.89	154.96				0.56	276.21	2.61			2.61	384.61
T2	112.48		6.81	42.59				161.88	64.67				0.51			50.60	14.59				4.82	135.19			5.87	5.87	302.94
T3	53.76			2.45				56.21	257.87		13.61					1.52	33.17			56.69		362.86			8.28	8.28	427.35
T4	219.41							219.41		8.43						6.29						14.72		0.45		1.78	235.91
Sum	481		7	56				543	430	8	14		1			71	203			57	5	789	3	0	14	19	1351
Mean	120		2	14				136	108	2	3		0			18	51			14	1	197	1	0	4	5	338
Std Dev	71		0	21				70	101	0	0		0			22	76			0	3	154	0	0	2	3	85

PINYON-JUNIPER

T5	40.24				18.43	0.51		59.18											0.11			0.11				59.29
T6		124.91					0.92	125.83				4.02		21.92	0.47	2.25		0.20				28.86				154.69
T7		68.91						68.91							0.78	4.24		3.30				11.24				80.15
Sum	40	194			18	1	1	254				4		22	1	6		4	0			40				294
Mean	13	65			6	0	0	85				1		7	0	2		1	0			13				98
Std Dev	0	40			0	0	0	36				0		0	0	1		2	0			14				50

Species = species acronym (see text for correlations)
Mean = average dried production of current growing year within vegetation type (pounds / acre)

piñonBjuniper woodland; and (4) production overall is low. Transects could be run in the woodland in only a very few places that supported reasonably good grass growth.

Tree and shrub density. These data are derived from counts made within eight 50BfootBsquare plots. TABLE E-9 presents a summary of tree and shrub density data; and TABLE E-10 includes more complete information.

Field observation and the data show that *Pinus edulis*, *Juniperus monosperma*, and *Yucca baccata* are the dominant plants in piñonBjuniper woodland.

Plant Species Diversity. A list of the species observed in the survey area is in TABLE E-1. A total of 122 species in 37 families are listed in the table. Thirteen of them were introduced alien plants, about 10.7 % of the total. No threatened, endangered, or rare plants were seen, although one noxious weed is present (see below for details).

Noxious / Invasive Weed Species

The four noxious or invasive weeds that are known to occur in Cibola County are listed in TABLE E-11 (Lee 1999). One Class B noxious plant species was observed in the permit area at the time of the survey (musk thistle, *Carduus nutans*). Several other nonBnative plant species were observed during the survey (TABLE E-1).

The Musk thistle weed is biennial (that is, it lives two years, and produces flowers and seeds in the second year) and reproduces only by seed. A diligent effort should be made to kill this weed species in the quarry property. Several herbicides are suitable for use. A certified noxious weed specialist should be contacted if this method is employed.

Trucking of quarry products may cause musk thistle to be transported to other localities, including the nearby national monuments. It is imperative this plant be eliminated from

TABLE E-9

MEAN DENSITY OF TREES AND SHRUBS, AND TREE CANOPY ESTIMATE IN PIÑONBJUNIPER WOODLAND BASED ON 50BFOOTBSQUARE PLOTS (plants per acre)

	Mean Density
Trees	
Pinus edulis	224
Pinus edulis seedlings	200
Juniperus monosperma	129
J. monosperma seedlings	22
Succulents	
Echinocereus coccineus	90
Escobaria vivipara	2
Opuntia polyacantha	30
Yucca baccata	227
Shrubs	
Purshia stansburiana	33
Ribes cereum	4
	Mean % Cover
CANOPY ESTIMATE	**21**

TABLE E-10

TREE AND SHRUB DENSITY IN PINON-JUNIPER WOODLAND FROM 50-FOOT-SQUARE PLOTS

Species		PIED				JUMO				ECCO		ESVI		OPPO		YUBA (1)		Purshia stansburiana		Ribes cereum		
	Canopy Estimate	Count	No. / Acre	Seed-lings	No. / Acre	Count	No. / Acre	Seed-lings	No. / Acre	Count	No. / Acre	Count	No. / Acre	Count	No. / Acre	Count	No. / Acre	Count	No. / Acre	Count	No. / Acre	TOTAL SHRUB
Plot																						
1	30	11	192	5	87	9	157	1	17	1	17	1	17	2	35	13	227					296
2	25	12	209	35	610	14	244	4	70					4	70	9	157					227
3	25	6	105	11	192	6	105							1	17					2	35	17
4	20	13	227	2	35	2	35	1	17							31	540					540
5	20	11	192	7	122	5	87									4	70	5	87			157
6	15	17	296	12	209	11	192	4	70	1	17			7	122	15	261	1	17			418
7	17	15	261	13	227	7	122			1	17					3	52	8	139			209
8	15	18	314	7	122	5	87			1	17					29	505	1	17			540
Sum	167		1795		1603		1028		174		70		17		244		1812		261		35	2404
Mean	21		224		200		128		22		9		2		30		227		33		4	301
Std Dev	5		67		178		66		30		0		0		46		196		59		0	186

(1) = ramets

Species = species acronym (see text for correlations)

Mean = average estimated canopy cover, or average number of trees or shrubs per acre, based on 8 plots

TABLE E-11

NOXIOUS OR INVASIVE WEEDS OCCURRING IN CIBOLA COUNTY [1]

Common Name	Scientific Name	Class [2]
Russian Knapweed	*Acroptilon repens*	B
Hoary Cress or Whitetop	*Cardaria draba*	A
# Musk Thistle	*Carduus nutans*	B
Perennial pepperweed	*Lepidium latifolium*	A

[1] = Lee 1999
[2] A = Alien plants currently with limited distribution in New Mexico; B = Alien plants found in a portion of New Mexico (Lee 1999)
= found in the surveyed area

the mine property so that it does not spread.

Because of the large volume of haul truck traffic, other noxious or invasive weeds may be brought in from elsewhere and may become established in the disturbed areas of the quarry. If they gain a foothold, the site may then become a source for the plants= dissemination to other places. The quarry area should be monitored during the growing season for any new noxious weed occurrences. If any are found, the location(s) should be determined, and the infestation destroyed by appropriate means as soon as possible.

A detailed account for musk thistle follows. The status acronyms are the same as in TABLE E-2.

> ***Carduus nutans*** MUSK THISTLE **Class:** B; **Distribution:** grows in most of New Mexico, including Cibola and surrounding counties; also in Arizona, Colorado and other western states; originally from Eurasia; **Presence:** at least 100 plants grow in the cleared area above and just east of the active pit; both firstByear rosettes and secondByear flowering stems were observed

Threatened, Endangered, or Rare Plants

Threatened, endangered, or rare plants known to occur in Cibola County in habitats similar to those in the study area are identified in TABLE E-12 (New Mexico Rare Plant Technical Council). Although potentially suitable habitat exists for Laguna flameflower, none were observed at the time of the survey. None are federally listed as candidate, proposed, threatened, or endangered.

The plants recognized as rare by the state of New Mexico are now only those listed in

TABLE E-12

TARGET RARE PLANTS OCCURRING IN CIBOLA COUNTY

Scientific Name	Common Name	Status [1]	Habitat
Astragalus missouriensis var. *accumbens*	Zuni milkvetch	BSS, FSS, rare	gravelly clay banks and knolls in dry, alkaline soils; in piñonBjuniper
Talinum brachypodum	Laguna flameflower	FSS, rare	calcareous substrates; open piñonBjuniper woodlands

[1] BSS = BLM Sensitive Species, FSS = Forest Service Sensitive Species, rare = globally rare according to the New Mexico Rare Plant Technical Council (NMRPTC)

the New Mexico Rare Plant Technical Council website (see Bibliography). This includes plant species that are listed as federal endangered, threatened, candidate, or proposed, species of concern, state endangered, or globally rare. The *Inventory of rare and endangered plants of New Mexico* (Sivinski & Lightfoot 1995), published by the state, is out of date and is no longer used by the state botanist (pers. comm.).

Since no plant species classified as threatened or endangered were found in or near the survey area, no impact is expected.

Wetlands

No wetland plants, no temporarily or permanently saturated soils, and no indications of wetland hydrology were observed in the survey area. Therefore, no Corps of Engineers jurisdictional wetlands were identified. Since no Corps of Engineers jurisdictional wetlands were identified, there will be no impacts.

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EXHIBIT F

WILDLIFE AND WILDLIFE HABITAT

EXHIBIT F

WILDLIFE

On 26 and 27 September 2002, a survey for federal and state T&E wildlife, was conducted in the permit area. The biologist walked throughout the permit area and its margins searching for vertebrate wildlife. All identifiable species were noted. Review of the BISONBM webpage, New Mexico Game and Fish Department and U. S. Fish and Wildlife Service documents, and other literature resulted in a list of potential listed (Sensitive, Concern, Candidate, Proposed, Threatened, or Endangered) or rare species, both federal and state, for Cibola County.

Habitat Setting

The permit area is situated on the edge of the Zuni Mountains on the lower southwestBfacing slope of Oso Ridge and the alluvial flat lands at its base. The terrain in the permit area slopes from the northeast corner (about 7980 feet) to the southwest corner (about 7440 feet [2268 m]). The northern twoBthirds of the permit area (S 2 of Section 33) and most of the NW 3 of Section 4 is underlain by Permian San Andres Limestone and, in many places, by an upper layer of Triassic Chinle Formation claystone, siltstone, or sandstone where soils are shallow. About oneBthird of the southwest part of the permit area (NW 3 of Section 4) is alluvial with deep soils. (See EXHIBIT B for information on soils.) Draining the upland area are three conspicuous, narrow, unnamed small canyons which contain ephemeral channels. There is no natural surface water (e.g. perennial streams or springs in the permit area. Average annual precipitation at El Morro National Monument (a few miles west) is about 13 inches (Gabin & Lesperance 1977).

The vegetation in the permit area is composed of two types. Near the access road to the quarry and in the far southwestern corner of Section 4 are small expanses of PlainsBmesa Grassland. The dominant vegetation, PiñonBjuniper Woodland, occurs in

higher, rocky uplands (DickBPeddie *et al.* 1993). Several plants are common in the grasslands including blue grama (*Bouteloua gracilis*), rubber rabbitbrush (*Chrysothamnus nauseosus*), tarragon (*Artemisia dracunculus*), James= potato (*Solanum jamesii*), golden globemallow (*Sphaeralcea incana*), and summer cypress (*Kochia scoparia*). In general, grass cover and diversity are low and forb cover and diversity are high, a reversal of the normal situation that was probably caused intensive grazing during the past century. Nevertheless, a large number of other grasses and forbs are also present. (See EXHIBIT E for more vegetation information.)

Wildlife Species

One bird (horned lark) was observed and pocket gopher burrows and elk and mule deer tracks were noted in the permit area. Lack of animal observations, particularly birds, is probably due to disturbance from the quarrying activities. Deer, elk, and turkeys have been noted by mine personnel to pass through the area. No nests of any birds were noted in the permit area. Lists of vertebrate wildlife occurring in and near El Morro National Monument are in TABLES F-1 to F-3.

Under the Migratory Bird Treaty Act (16 USC 703B7111), it is unlawful to take, capture, possess or kill any bird species, nest, or egg listed in CFR 10.13. Horned lark is classified as migratory. The proposed pit expansion will have negative and permanent impacts on wildlife that currently use the site. Resident small mammals, such as ground squirrels and pocket gophers, will be injured, killed, and/or displaced by blasting and quarrying activities. Some birds that normally would breed will abandon the area. After the end of quarrying and when vegetation has been reestablished, many of the original species will likely return.

Domestic Livestock

There is no evidence of recent livestock grazing. The last use by cattle was a few years ago (Ronnie Cash, pers. comm.). Previously the area was grazed by cattle and before

TABLE F-1

AMPHIBIANS AND REPTILES OF EL MORRO NATIONAL MONUMENT

AMPHIBIANS	
Arizona tiger salamander	*Ambystoma tigrinum*
Plains spadefoot toad	*Spea bombifrons* (*Scaphiopus bombifrons*)
New Mexico spadefoot toad	*Spea multiplicata* (*Scaphiopus multiplicatus*)
Red-spotted toad	*Bufo punctatus*
Woodhouse=s toad	*Bufo woodhousii*
Canyon treefrog	*Hyla arenicolor* (hypothetical; found in El Malpais Nat. Mon.)
Western chorus frog	*Pseudacris triseriata* (hypothetical; rare in nw Cibola County)
Northern leopard frog	*Rana pipiens*
REPTILES	
Western collared lizard	*Crotaphytus collaris* (hypothetical; found in Zuni Mountains ara and El Malpais Nat. Mon.)
Lesser earless lizard	*Holbrookia maculata*
Short-horned lizard	*Phrynosoma douglasii*
Sagebrush lizard	*Sceloporus graciosus* (hypothetical)
Prairie lizard	*Sceloporus undulatus*
Tree lizard	*Urosaurus ornatus*
Side-blotched lizard	*Uta stansburiana* (hypothetical; found in El Malpais Nat. Mon.)
Plateau striped whiptail	*Cnemidophorus velox*
Many-lined (variable) skink	*Eumeces multivirgatus*
Great Plains skink	*Eumeces obsoletus* (hypothetical; found in El Malpais N.M.)
Ringneck snake	*Diadophis punctatus* (rare)
Striped whipsnake	*Masticophis taeniatus*
Bullsnake, gopher snake	*Pituophis melanoleucus*
Blackneck garter snake	*Thamnophis cyrtopsis* (rare)
Western terrestrial garter snake	*Thamnophis elegans*
Western diamondback rattlesnake	*Crotalus atrox*
Prairie rattlesnake	*Crotalus viridis*

TABLE F-2

BIRDS OF EL MORRO NATIONAL MONUMENT

Mallard	occasional	Ash-throated flycatcher	common
Bufflehead	rare (winter)	Cedar waxwing	hypothetical *
Turkey vulture	uncommon	Northern shrike	rare
Northern goshawk	rare	Loggerhead shrike	rare
Sharp-shinned hawk	uncommon/rare	@ European starling	rare
Cooper's hawk	uncommon	Say=s phoebe	common
Red-tailed hawk	common	Dusky flycatcher	uncommon
Swainson's hawk	uncommon	Hammond=s flycatcher	uncommon
Rough-legged hawk	hypothetical *	Gray flycatcher	fairly common
Ferruginous hawk	uncommon	Western flycatcher	fairly common
Golden eagle	uncommon	Buff-breasted flycatcher	rare
Northern harrier	uncommon	Western wood pewee	uncommon
Prairie falcon	common	Olive-sided flycatcher	uncommon
Peregrine falcon	hypothetical *	Horned lark	occasional
Merlin	occasional	Violet-green swallow	common
American kestrel	common	Tree swallow	hypothetical *
Scaled quail	occasional	Bank swallow	hypothetical *
Wild turkey	hypothetical *	Northern rough-winged swallow	uncommon
Killdeer	rare	Barn swallow	occasional
Franklin=s gull	hypothetical *	Cliff swallow	common
Rock dove	hypothetical *	Purple martin	rare
Mourning dove	fairly common	Steller=s jay	rare
Greater roadrunner	hypothetical *	Scrub jay	common
Western screech owl	uncommon	Common raven	common
Flammulated owl	uncommon	American crow	uncommon
Great horned owl	fairly common	Piñon jay	fairly common
Pygmy owl	occasional	Clark=s nutcracker	hypothetical *
Burrowing owl	hypothetical *	Black-capped chickadee	hypothetical *
Long-eared owl	rare	Mountain chickadee	common
Poorwill	rare	Plain titmouse	fairly common
Common nighthawk	common	Bushtit	fairly common
White-throated swift	common	White-breasted nuthatch	common
Black-chinned hummingbird	common	Red-breasted nuthatch	hypothetical *
Broad-tailed hummingbird	common	Pygmy nuthatch	fairly common
Rufous hummingbird	common	Brown creeper	uncommon
Calliope hummingbird	rare	House wren	uncommon
Belted kingfisher	occasional	Bewick=s wren	common
Common flicker	common	Rock wren	common
Acorn woodpecker	hypothetical *	Canyon wren	fairly common
Lewis= woodpecker	fairly common	Northern mockingbird	uncommon
Yellow-bellied sapsucker	uncommon	Gray catbird	hypothetical *
Williamson=s sapsucker	uncommon	Sage thrasher	fairly common
Hairy woodpecker	fairly common	Bendire=s thrasher	hypothetical *
Downy woodpecker	hypothetical *	American robin	common
Western kingbird	common	Hermit thrush	hypothetical *
Cassin=s kingbird	common	Swainson=s thrush	hypothetical *

Western bluebird	common	Mountain bluebird	common

TABLE F-2 Continued

BIRDS OF EL MORRO NATIONAL MONUMENT

Townsend=s solitaire	common	Western tanager	fairly common
BlueBgray gnatcatcher	uncommon	Hepatic tanager	fairly common
GoldenBcrowned kinglet	hypothetical *	Summer tanager	occasional
RubyBthroated kinglet	uncommon	BlackBheaded grosbeak	uncommon
Gray vireo	hypothetical *	Evening grosbeak	rare/uncommon
Solitary vireo	fairly common	Blue grosbeak	hypothetical *
Warbling vireo	uncommon	Lazuli bunting	occasional
OrangeBcrowned warbler	uncommon	Cassin=s finch	rare/uncommon
Nashville warbler	rare (migrant)	House finch	common
Virginia=s warbler	fairly common	Pine siskin	uncommon
Yellow warbler	rare	American goldfinch	hypothetical *
YellowBrumped warbler	fairly common	Lesser goldfinch	common
BlackBthroated gray warbler	fairly common	Red crossbill	rare/uncommon
Townsend=s warbler	rare	GreenBtailed towhee	common
Grace=s warbler	uncommon	RufousBsided towhee	common
Common yellowthroat	rare	Brown towhee	common
YellowBbreasted chat	hypothetical *	Lark bunting	hypothetical *
MacGillivray=s warbler	uncommon	Vesper sparrow	common
Wilson=s warbler	fairly common	Lark sparrow	common
@ House sparrow	hypothetical *	BlackBthroated sparrow	hypothetical *
Western meadowlark	uncommon	Sage sparrow	hypothetical *
YellowBheaded blackbird	hypothetical *	DarkBeyed junco	common
RedBwinged blackbird	hypothetical *	American tree sparrow	hypothetical *
Brewer=s blackbird	hypothetical *	Chipping sparrow	common
BrownBheaded cowbird	uncommon	Brewer=s sparrow	common
Common grackle	rare	WhiteBcrowned sparrow	fairly common
GreatBtailed grackle	hypothetical *	WhiteBthroated sparrow	rare
Scott=s oriole	hypothetical *	Song sparrow	uncommon
Northern oriole	uncommon		

* (hypothetical = found in El Morro area but not in the monument proper)

TABLE F-3

MAMMALS OF EL MORRO NATIONAL MONUMENT

Desert shrew	*Notiosorex crawfordii* (hypothetical; found in El Malpais N.M.)
California myotis bat	*Myotis californicus* (hypothetical; found in El Malpais Nat. Mon.)
Western smallBfooted myotis bat	*Myotis ciliolabrum* (syns = *M leibii*, in part; *M. subulatus*) (hypothetical; found in Zuni Mountains and El Malpais N.M.)
LongBeared myotis bat	*Myotis evotis* (hypothetical; found in El Malpais Nat. Mon.)
Fringed myotis bat	*Myotis thysanodes* (regular visitor; also in Zuni Mountains and El Malpais N.M.)
LongBlegged bat	*Myotis volans* (rare; also in El Malpais Nat. Mon.)
SilverBhaired bat	*Lasionycteris noctivagans* (rare; also in El Malpais Nat. Mon.)
Big brown bat	*Eptesicus fuscus* (also in El Malpais Nat. Mon.)
Hoary bat	*Lasiurus fuscus* (rare; also in Zuni Mountains area)
Townsend=s bigBeared bat	*Plecotus townsendii* (hypothetical; found in El Malpais N.M.)
Brazilian (Mexican) freeBtailed bat	*Tadarida brasiliensis* (hypothetical; found in El Malpais N.M.)
Desert cottontail	*Sylvilagus auduboni*
BlackBtailed jackrabbit	*Lepus californicus*
Cliff chipmunk	*Eutamias dorsalis*
Spotted ground squirrel	*Spermophilus spilosoma*
Rock squirrel	*Spermophilus variegatus*
WhiteBtailed (Gunnison=s) prairie dog	*Cynomys gunnisoni*
Abert=s (tasselBeared) squirrel	*Sciurus aberti* (rare; common in Zuni Mountains)
Botta=s pocket gopher	*Thomomys bottae*
Plains pocket mouse	*Perognathus flavescens*
Silky pocket mouse	*Perognathus flavus* (hypothetical; found in El Malpais N.M.)
Ord=s kangaroo rat	*Dipodomys ordi*
Bannertail kangaroo rat	*Dipodomys spectabilis* (hypothetical; found in El Malpais N.M.)
Western harvest mouse	*Reithrodontomys megalotis* (hypothetical; in El Malpais N.M.)
Brush mouse	*Peromyscus boylei*
Deer mouse	*Peromyscus maniculatus*
Piñon mouse	*Peromyscus truei*
Rock mouse	*Peromyscus difficilis*
Northern grasshopper mouse	*Onychomys leucogaster*
WhiteBthroated woodrat	*Neotoma albigula*
Mexican woodrat	*Neotoma mexicana*
Porcupine	*Erethizon dorsatum*
Coyote	*Canis latrans*
Kit fox?	*Vulpes macrotis* (rare?)
Gray fox	*Urocyon cinereoargenteus* (hypothetical; found in El Malpais N.M.)
Black bear	*Ursus americanus* (hypothetical; found in Zuni Mountains and El Malpais N.M.)
Racoon	*Procyon lotor*
ShortBtailed weasel, ermine?	*Mustela erminea* (rare?)
Badger	*Taxidea taxus*
Spotted skunk	*Spilogale gracilis*
Striped skunk	*Mephitis mephitis*

Mountain lion	*Felis concolor*

TABLE F-3 Continued

MAMMALS OF EL MORRO NATIONAL MONUMENT

Bobcat	*Lynx rufus*
Elk	*Cervus canadensis*
Mule deer	*Odocoileus hemionus*
Pronghorn	*Antilocapra americana* (hypothetical; found in El Malpais N.M.)

that by sheep. Because domestic livestock do not use the area, there will be no impacts.

Threatened, Endangered, and Rare Wildlife

Rare (target) wildlife known to occur in Cibola County in habitats similar those found in the survey area are listed in TABLE F-4. Potentially suitable habitat exists for most of the species but none were seen. The species most likely to be present in the quarry area are northern sagebrush lizard and loggerhead shrike. Fringed bat occurs in the Zuni Mountains and El Morro and El Malpais National Monuments. The other animals may use the area for foraging, but the quarrying activities probably discourage them from breeding. Since no listed or rare wildlife species were observed or are very likely to occur in the project area, no impacts are expected.

A detailed speciesBbyBspecies account for the target species follows. The status abbreviation are the same as in TABLE 4.

Northern sagebrush lizard *Sceloporus graciosus graciosus* **Status:** FSC; **Habitat:** terrestrial but usually in dense vegetation; piñonBjuniper woodland, sagebrush, oak, ponderosa; often sandy or clayey soils; **Distribution:** the species is found in large parts of the western US; ssp. *graciosus*; occurs in northwestern NM and is known from Cibola County; **Presence:** not observed; suitable habitat appears to exist in portions of the survey area; nearest known locations are the Zuni Mountains (unspecified area) and El Morro National Monument; **Impacts:** the quarrying should have no significant impacts on the longBterm survival of the species, if it occurs in the area

Ferruginous hawk *Buteo regalis* **Status**: FSC, FSS, BSS; **Habitat**: grasslands, scrublands, juniper savanna, agricultural and riparian areas; **Distribution**: occurs in large parts of the western US; regular but uncommon to rare in New Mexico; potentially present throughout the state as migrants or during winter, breeds in a few counties; occurs in Cibola County primarily in the winter and as a migrant; not definitely known to breed in Cibola County; **Presence**: not observed; potentially suitable habitat exists for foraging, but birds are unlikely to be present because of the quarrying; birds have been observed in El Malpais National Monument area; **Impacts:** no impacts are anticipated

TABLE F-4

TARGET RARE WILDLIFE OCCURRING IN CIBOLA COUNTY

Common Name	Scientific Name	Status[1]	Habitat
REPTILE			
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	FSC	sandy soils, in or near dense vegetation in piñonBjuniper woodlands, sagebrush
BIRDS			
Ferruginous hawk	*Buteo regalis*	FSC, BSS, FSS	grasslands, scrublands, juniper savanna, agricultural, and riparian
Western burrowing owl	*Athene cunicularia hypogaea*	FSC, BSS	grasslands, open areas, usually with prairie dogs
Mexican spotted owl	*Strix occidentalis lucida*	**FT**, FSS, SSC	thickly wooded canyons and forests
Loggerhead shrike	*Lanius ludovicianus*	FSC, BSS	grasslands and shrublands
Gray vireo	*Vireo vicinior*	FSS, ST	undergrowth in juniper savanna or dry woodlands, slopes and mesas
MAMMALS			
Fringed myotis bat	*Myotis thysanodes thysanodes*	FSC, BSS, SSC	many habitats below ponderosa zone; roosts in caves, crevices, mines
LongBlegged myotis bat	*Myotis volans interior*	FSC, BSS, FSS, SSC	ponderosa zone and higher; roosts in trees; feeds near water; migrates
Big freeBtailed bat	*Nyctinomops macrotis*	FSC, BSS, SSC	below 6000 ft; piñonBjuniper woodlands, grasslands, deserts; summer in cliff crevices; migrates

[1] First letter: F = Federal; S = State of New Mexico; Subsequent letters: T = Threatened; SC = Species of Concern (US Fish and Wildlife Service; or, informal designation for New Mexico); BSS = BLM Sensitive Species; FSS = Forest Service Sensitive Species; FederallyBlisted T species in **bold**

Western Burrowing owl *Athene cunicularia hypogaea* **Status**: FSC; **Habitat**: grasslands, open areas, usually with prairie dogs; **Distribution**: found throughout the western US; summer territory mostly north of about Roswell, yearBround generally south of Roswell; summers in Cibola County; **Presence**: neither owls nor prairie dogs observed; although often associated with prairie dogs, their burrows are not required for the bird=s presence; potentially suitable habitat occurs in the flat ground near the quarry and it is possible that some birds may have utilized the area at one time; they are unlikely to be present because of the lack of prairie dogs and the disturbance caused by quarrying; **Impacts**: no impacts are expected

Mexican spotted owl *Strix occidentalis lucida* **Status:** *FT*, FSS, SSC; **Habitat:** primarily thicklyBwooded canyons and forests; **Distribution:** southwestern US and Mexico; summers and perhaps breeds in Cibola County in the Zuni Mountains; **Comment:** small areas of critical habitat has been designated in several NM counties (but not Cibola County); it includes BLM and NPS land but not Forest Service, state, or private land (FR 2001) ; **Presence:** not observed; habitat in the survey area is marginally suitable for foraging, but owls are unlikely to utilize it due to the quarrying activities; **Impacts:** none are anticipated

Loggerhead shrike *Lanius ludovicianus* **Status**: FSC, BSS; **Habitat**: grasslands and shrublands; **Distribution**: occurs in much of the US and is a yearBround resident in the southern half of the country, including most of New Mexico; a summer or permanent resident and probably breeds in Cibola County; **Presence**: not observed; habitat appears to be suitable, but it is unlikely to be used because of quarrying activities; **Impacts**: no impacts are expected

Gray Vireo *Vireo vicinior* **Status:** FSS, ST; **Habitat:** undergrowth in juniper savanna or dry woodlands, slopes and mesas; **Distribution:** winters in Mexico and southward; breeds from southern California to western Oklahoma and northern Mexico; scattered in the western twoBthirds of New Mexico, including Cibola County, where it may breed; **Presence:** not observed; suitable habitat appears to exist in the area, but it is unlikely to be utilized because of quarrying activities; no known local occurrences; **Impacts:** if the bird is present in the summer, there should be no significant impacts

Fringed myotis bat *Myotis thysanodes thysanodes* **Status**: FSC; BSS, SSC; **Habitat**: occupies a range of habitats including grasslands, shrubland, woodland, ponderosa forests, and riparian; roosts in caves, buildings, and mines; **Distribution**: widespread in western US; occurs in the western threeBquarters of New Mexico, including Cibola County in the Zuni MountainsBEl MalpaisBEl Morro area; **Presence**: regular summer visitor in El Morro National Monument; unlikely to utilize the quarry area except on transient basis because of quarrying activities;

Impacts: none are anticipated

LongBlegged myotis bat *Myotis volans interior* **Status**: FSC; BSS, SSC; **Habitat**: primarily ponderosa forests and higher; feeds near water; roosts in trees and crevices; **Distribution**: widespread in western US; probably migrates from the south to New Mexico for the summer; breeds and roosts at higher elevations in the western twoBthirds of the state; known from El Morro and El Malpais National Monuments; **Presence**: rare at El Morro National Monument; unlikely to utilize the quarry area except on transient basis because of lack of adequate feeding and roosting habitat; **Impacts:** none are likely

Big freeBtailed bat *Nyctinomops macrotis* (syns: *Tadarida macrotis*, *Tadarida molossa*?) **Status:** FSC, BSS, FSS; **Habitat:** usually found below 6000 feet, rarely to 8000 feet; roosts in sandstone or lava cliff crevices; **Distribution:** western US, Mexico; scattered occurrences in the state, including Cibola County; summers in NM from May through October; migrates southward for the winter; **Presence:** not observed; little or no suitable habitat present in the survey area and quarrying activities would deter its presence; **Impacts:** no impacts are expected

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EXHIBIT G

MINING OPERATION IMPACT
ON LOCAL COMMUNITIES

EXHIBIT G

MINING OPERATION IMPACT ON LOCAL COMMUNITIES

The Tinaja Pit permit area is located in west central Cibola County, which is an area of very low population density, scattered rural residences, and primarily livestock grazing activity. The lands within a three-mile radius of the permit area are private, private inholdings with the Cibola National Forest, or Cibola National Forest. The nearest population cluster to the permit area is the El Morro Subdivision, west of the Tinaja Pit and comprising an estimated 20 dwellings and year-round population of about 50 people. The nearest incorporated community is Ramah, New Mexico, about 19 miles to the west on NM 53. The incorporated communities of Grants and Milan are located 35 miles by highway to the northeast.

The permit area is within the 2000 Census Tract 9745, Block Group 2, Block 2355. Demographic characteristics for Block 2355 are outlined in TABLE G-1. The vicinity of the Tinaja Pit, as represented by Census Block 2355, had a total 2000 population of 64, comprising 25 households and dwelling units. The elderly population (over 65 years of age) was 6.3 percent of the total in the vicinity, compared with 10.7 percent in the county. Minority population (Hispanic population) in the vicinity is 4.7 percent, substantially lower than the 33.4 percent minority in the county overall.

The Tinaja Pit generates employment of 15 persons at the site. Employees are hired from the existing available local labor force to the extent that qualified labor is available. The employment level is expected to remain stable for the projected 40-year life of mine. The average annual payroll of $516,000 is mostly expended in the local economy. Gross receipts tax from commercial sale of the aggregate averages about $92,000 per year.

No adverse impact to county population, area growth, land development, public facilities, or emergency response services is expected to result from continued

operation of the Tinaja Pit. The operation will not cause disruption of community cohesion in the vicinity. The project does not have any disproportionately high or adverse health or environmental effects on any minority or low income populations near the project vicinity.

TABLE G-1

Category	Census Tract 9745 Block Group 2 Block 2355		Cibola County	
Total population	64		25,595	
Hispanic population	3	(4.7% of total)	8,555	(33.4% of total)
Non-Hispanic population	61	(95.3% of total)	17,040	(66.6% of total)
Population over age 65	4	(6.3% of total	2,734	(10.7% of total)
Number of Households	25		8,327	
Average no. of persons per household	2.56	2.95		
Number of families	15		6,281	
Number of occupied dwelling units	25		8,327	

EXHIBIT H

SPILL PREVENTION CONTROL AND
COUNTERMEASURE PLAN

C & E CONCRETE, INC.
TINAJA PIT
CIBOLA COUNTY, NEW MEXICO

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN (SPCC PLAN)

PREPARED BY
METRIC CORPORATION
ALBUQUERQUE, NEW MEXICO

FEBRUARY 2003

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C & E CONCRETE, INC.
SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

INTRODUCTION

The purpose of this Spill Prevention Control and Countermeasure (SPCC) Plan is to prevent the discharge of petroleum related products from the C & E Concrete Tinaja Pit into waters of the United States. The plan endeavors to prevent the occurrence of spills, control spills should they occur, and initiate timely and proper notification to appropriate agencies. It is developed for the Tinaja Pit in accordance with Title 40, Code of Federal Regulations, Part 112, AS REVISED IN July 2002.

This document by reference is a component of the C & E Concrete, Inc. Tinaja Pit NPDES Storm Water Pollution Prevention Plan, prepared in accordance with Title 40, Code of Federal Regulations, Part 122.

PLAN CERTIFICATION

Facility Name: Tinaja Pit

Facility Type: Limestone rock quarry

Date that initial operation began: 1985

Facility Address: C & E Concrete, Inc.

P.O. Box 2547

Milan, New Mexico 87021

Designated person accountable for spill prevention control and countermeasure enforcement and reporting at the facility:

Walter L. Meech, President and Operation Manager

Management Approval Statement:

This SPCC Plan will be implemented as herein described:

Signature:

Name:

Title:

Certifying Engineer=s Statement:

I hereby certify that the C& E Concrete Ready Mix Plant located in Grants, New Mexico, has been inspected by my agent and being familiar with the provisions of 40 CFR, Part 112, attest that the SPCC Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, incorporates procedures for required testing and inspections, and is adequate for the facility. This certification does not apply to the structural integrity of the containments, tanks, or underground piping.

Gary L. Richardson, P.E.

Signature

Date: _____ New Mexico Registration No.:

GENERAL FACILITY INFORMATION

Facility Description

The Tinaja Pit functions to excavate, crush, and grade limestone rock and sand for sale in the northwestern New Mexico region. Raw materials stored on site include pulverized limestone and a variety of aggregate products. Liquid petroleum substances stored at the facility include diesel fuel, engine oil, gear oil, transmission fluid, hydraulic fluid, and grease (FIGURE 1). All storage tanks are above ground containers. All petroleum liquids and grease are stored in drums at the diesel fuel storage tank secondary containment. There are no process water streams discharged from this facility.

Storage Tanks

There are no underground storage tanks on site. Four above ground steel storage tanks are currently provided for diesel fuel storage. An approximate 100-gallon tank is provided for butane at the testing lab. There are also fueling tanks associated with generators for the crusher system and limestone pulverizer plant. There is no pipeline system at the plant.

Loading and Unloading Operation

Component substances for facility operations, such as diesel fuel and engine oil, are trucked into the facility from time to time by a vendor. Used oil is stored temporarily on site and periodically hauled to C & E=s Grants facility. During the colder seasons, the used oil is transported back to the Tinaja Pit to be utilized for fueling space heaters. No shipments of component substances are accepted after 3:00 p.m.

Surface Drainage

The facility has three designated drainage areas (FIGURE 1). Drainage areas 1 and 2 drain to the active pit and the wet plant pond, respectively. Flows in drainage area 3 are directed to the incised storm water sediment retention pond.

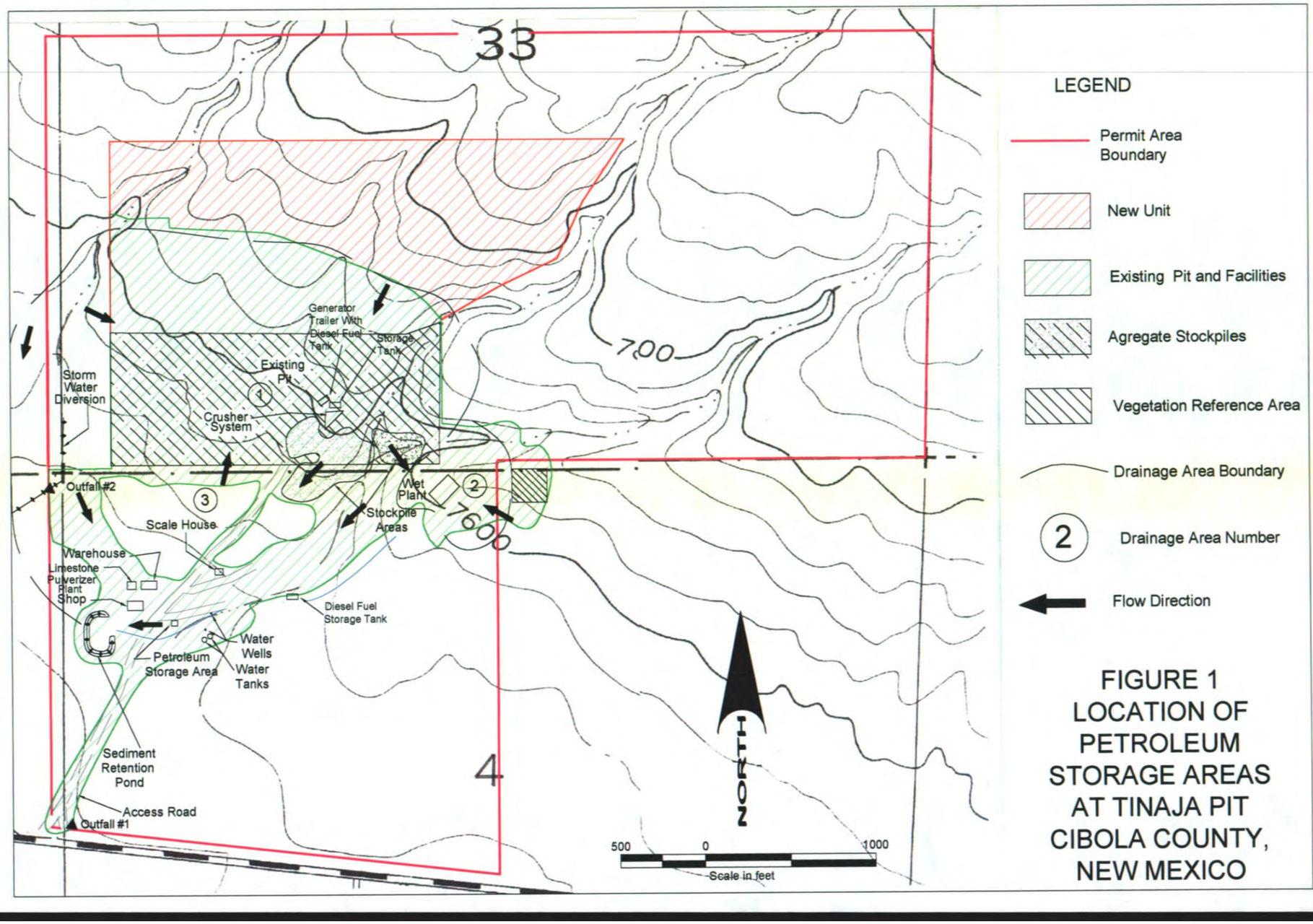

FIGURE 1
LOCATION OF
PETROLEUM
STORAGE AREAS
AT TINAJA PIT
CIBOLA COUNTY,
NEW MEXICO

OIL SPILL PREVENTION MEASURES

Security and Lighting

The facility is fenced and provided with a locked gate. The facility is manned during operation hours, presently on a 24-hour basis, 7 days per week. Some lighting is provided in the vicinity of the scale house.

Spill Containment

The Tinaja Pit plans to provide secondary containment to contain diesel and other petroleum product releases should they occur at the storage areas. A concrete secondary containment is provided for the 10,000 gallon diesel tank located in the southern portion of the site (FIGURE 1). Secondary containments are planned for 1) the 3500-gallon reserve diesel fuel tank, east of the 10,000 gallon tank. The 1,000 gallon diesel tank and 500 gallon diesel tank at this location are planned to be removed. The planned secondary containment for the 3500-gallon tank will be designed for a capacity which will exceed tank volume. The two remaining 100-gallon diesel fuel tanks are contained within generator trailers. A 500-gallon diesel tank is mounted on the Cedar Rapids secondary crusher.

Rain water which accumulates in the secondary containments will be allowed to evaporate. The area experiences a 13.5-inch average annual rainfall. No outlets will be provided in the planned containments.

Inspections and Testing

Storage tanks and secondary containments at the facility are comprehensively inspected monthly. The inspections are conducted by responsible facility personnel. The visual inspection includes at a minimum the following:

- ∃ Rusted areas on the tank and piping
- ∃ Structural integrity of the tank
- ∃ Breathing vent

TABLE 1

EXISTING AND PLANNED SECONDARY CONTAINMENT AREAS AT C & E CONCRETE, INC. TINAJA PIT PLANT

Secondary Containment Area	Storage Tanks	Tank Capacity (gallons)	Secondary Containment Capacity (gallons)
Off-road Diesel Tank Containment Area			17,726[1]
	Diesel Tank	10,522[1]	
Highway Diesel Tank (Gray) Containment Area			[2]
	Gray Diesel Tank	517[1]	742[1]
Highway Diesel Tank (White) Containment Area			[3]
	White Diesel Tank	500[2]	

[1] Volume calculated by field measurement.
[2] Volume provided by C & E Concrete.
[3] Tank is planned to be removed from site by May 1, 2004

- ∃ Hoses and associated connections
- X Valving
- X Condition of paint
- X Integrity of joints in the secondary containment

Inspection observations are recorded in a daily journal maintained at the site. Informal visual inspections of the petroleum storage areas are also conducted during daily patrols by plant personnel.

Corrective action for potential problems detected during the inspection is taken as necessary and is recorded in the daily journal.

The tanks have no associated underground piping, and are not operated under pressure. Testing of the tanks is accomplished by periodic visual inspection.

Personnel Training

All technical personnel serving the Tinaja Pit receive training in oil spill prevention, safe handling procedures for products and wastes, and methods for recognizing and responding to oil spills and waste releases. The training is conducted annually by supervisory personnel. The personnel training includes:

- ! Applicable Laws and Regulations
  - X Require spill prevention
  - X Waste handling procedures
  - X Reporting requirements
- ! Safe Response Planning
  - X Equipment location
  - X Employee precautions
- ! Spill/Release Prevention

- X Secondary containment and maintenance
- X Inspections
- X Operational precautions

! Spill/Release Control Equipment

- X Proper use and limitations
- X Inspections

! Oil and Waste Release Response

- X Response to minor release
- X Response to significant release
- X Personal protective equipment

Training documents and employee records are kept on file at the facility office. Safety meetings conducted daily for plant personnel provide a forum for periodic review of spill control information in order to maintain awareness and readiness of personnel.

OIL SPILL EMERGENCY PLAN

The intent of the emergency response plan for the Tinaja Pit is to provide information and protocol to follow for proper response to a spill event. As each potential spill is unique, spill response varies for each event.

The principal objectives in response to a spill event are:

1) Stop the source of release
2) Contain the release, and
3) Commence remedial action.

The order of priority of these objectives varies by the kind of event and the stage at which the release is detected. A tank spill which has breached the secondary containment is to be contained to prevent the petroleum product from spreading . Remedial action is to be commenced first for spills associated with fires, in order to prevent the fire from spreading. The general procedure for oil spill emergency response is as follows:

1) Report the spill to the Operation Manager, or his designee.

2) The person in charge of the facility at the time of the event will determine if and which outside assistance organizations are to be contacted, how the leak should be stopped and contained, and the form of remedial action necessary, and then initiate necessary action.

3) The Operation Manager or the designee will notify the New Mexico Environment Department Spill Hotline (505-428-2525), in order to determine which additional government agencies may need to be notified and ensure that these notifications are made.

Emergency Response Equipment

Equipment will be available on site for spill response. A spill cleanup kit is provided at the scale house to allow quick response to small spills or leaks. The kits contain the following items.

1) Sealed drum banded to a two-wheel cart
2) Shovel
3) Goggles (2)
4) 5-gallon pail of absorbent granules
5) Absorbent pillows or socks (3-5)
6) Neoprene gloves (2 pairs)
7) Rubber boots

In addition to the spill cleanup kit, equipment, such as front end loader, is available on site to respond to larger spills or incidents.

Additionally, contractors are available locally for assistance in spill control and remediation.

Supervisor Response

The Operation Manager or the designee when notified that a spill has occurred, will develop the spill information as outlined in APPENDIX A. Determination will then be made of the following facts and the most appropriate spill or release response will be implemented.

- Exact location of spill or release
- Extent of injuries (if any)
- Whether the event is still occurring and when first observed
- The extent of spill or release
- Methods to safely control the occurrence

- If spill containment devices are working
- Which outside contractor will be utilized
- Present and forecast weather conditions at the facility
- Applicable agency notification required.

Other Considerations

Drum Leaks

If a leaky drum is detected, the contents remaining in the drum will be transferred to an intact drum, if safely possible. The empty drum will be put in an appropriate protected and covered location for disposal or reclamation. If the contents cannot be safely transferred to another drum, the leaking drum will be placed in a DOT-approved overpack drum for offsite disposal. Any spillage and cleanup materials will also be placed into an overpack drum for disposal. A label will be placed on the overpack drum, identifying the contents and the original date it was placed in storage.

Arrangements will Local Authorities

This SPCC Plan contains the information that is most pertinent to outside authorities and response organizations. The scale house contains additional information (e.g. MSDS) which will be provided to police, fire fighters, hospitals, and other emergency response personnel as needed. A copy of the SPCC Plan is available to provide to outside organizations in the event of a spill.

REPORTING

Spills and Releases

In any case of a spill of oil or other petroleum product, the New Mexico Environment Department Spill Hotline (505-428-2525) should be notified if possible within 24 hours of the occurrence. Information regarding the spill, as outlined in APPENDIX A, should be available at the time of the notification.

When a discharge of oil or other petroleum product leaves the plant property, a reportable spill has occurred. The Operation Manager or the designee will evaluate the nature of the spill to determine reportability. If it is determined that the spill is reportable, the following reporting procedure will be followed:

1) Call the National Response Center at (800) 424-8802 and report that a spill has occurred (APPENDIX A).

2) A spill documentation report will be filed with the Environmental Protection Agency at:

   U.S. Environmental Protection Agency
   Region 6, Contingency Planning Section
   1445 Ross Avenue (6E-EP)
   Dallas, Texas 85202

When the plant has Adischarged more than 1000 gallons off property in a single spill event or discharged harmful quantities, as defined in 40 CFR 110, in two spill events occurring within any twelve month period≅ then a written report of the incident must be prepared for the EPA and a copy of the SPCC Plan attached.

Plan Amendment

In the event the plant has a reportable event, the Operation Manager will review the

circumstances causing the event and determine if amendment of this plan is necessary. Every three years the SPCC Plan will be reviewed for completeness by the company and recertified. Further modifications and changes in operations at the pit which materially affect this plan will be incorporated into a revised plan within 6 months after such changes occur.

APPENDIX A

VERBAL OIL SPILL REPORTS

VERBAL OIL SPILL REPORTS

The Operation Manager will be responsible for seeing that all necessary notifications to governmental agencies are made. The following information is expected in a telephone report of an oil spill:

1. Name and telephone number of person reporting spill
2. Date, location, and time of spill
3. Has spill been contained and/or stopped?
4. Where known, the name, address and telephone number of the party responsible for the spill.
5. Location of discharge
6. Material(s) spilled and quantity lost
7. What type of clean-up is underway?
8. Personnel injuries and/or fires associated with spill
9. Fish kill or other environmental damage associated with spill

NOTE: A written report and a copy of this SPCC plan must be submitted to the EPA within 60 days of spill if more than 1,000 gallons of oil is spilled.

APPENDIX B

FEDERAL OIL POLLUTION REGULATIONS
40 CFR PART 112

EXHIBIT I

NPDES STORM WATER
POLLUTION PREVENTION PLAN

C & E CONCRETE, INC.
TINAJA PIT
CIBOLA COUNTY, NEW MEXICO

STORM WATER POLLUTION PREVENTION PLAN
PERMIT NO. NMR 05B190

PREPARED BY
METRIC CORPORATION
ALBUQUERQUE, NEW MEXICO

APRIL 2003

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INTRODUCTION

The purpose of this Pollution Prevention Plan is to identify sources of pollution or contamination on the C & E Concrete, Inc. Tinaja Pit site (FIGURE 1) and to select and carry out actions which prevent or control the pollution of storm water discharges. The plan endeavors to prevent pollution at the source and to outline measures or practices to reduce the amount of pollution which may enter surface water, air, land, or groundwater in the vicinity environment. It is developed for the Tinaja Pit in accordance with Title 40, Code of Federal Regulations, Part 122 (F. R. Monday, October 30, 2000), Sector J. Requirements for pollution prevention plan content developed under the final NPDES storm water multi-sector general permit are indicated in APPENDIX A of this plan. This pollution prevention plan incorporates by reference the Spill Prevention Control and Countermeasure (SPCC) plan for the facility, which is prepared as a companion document.

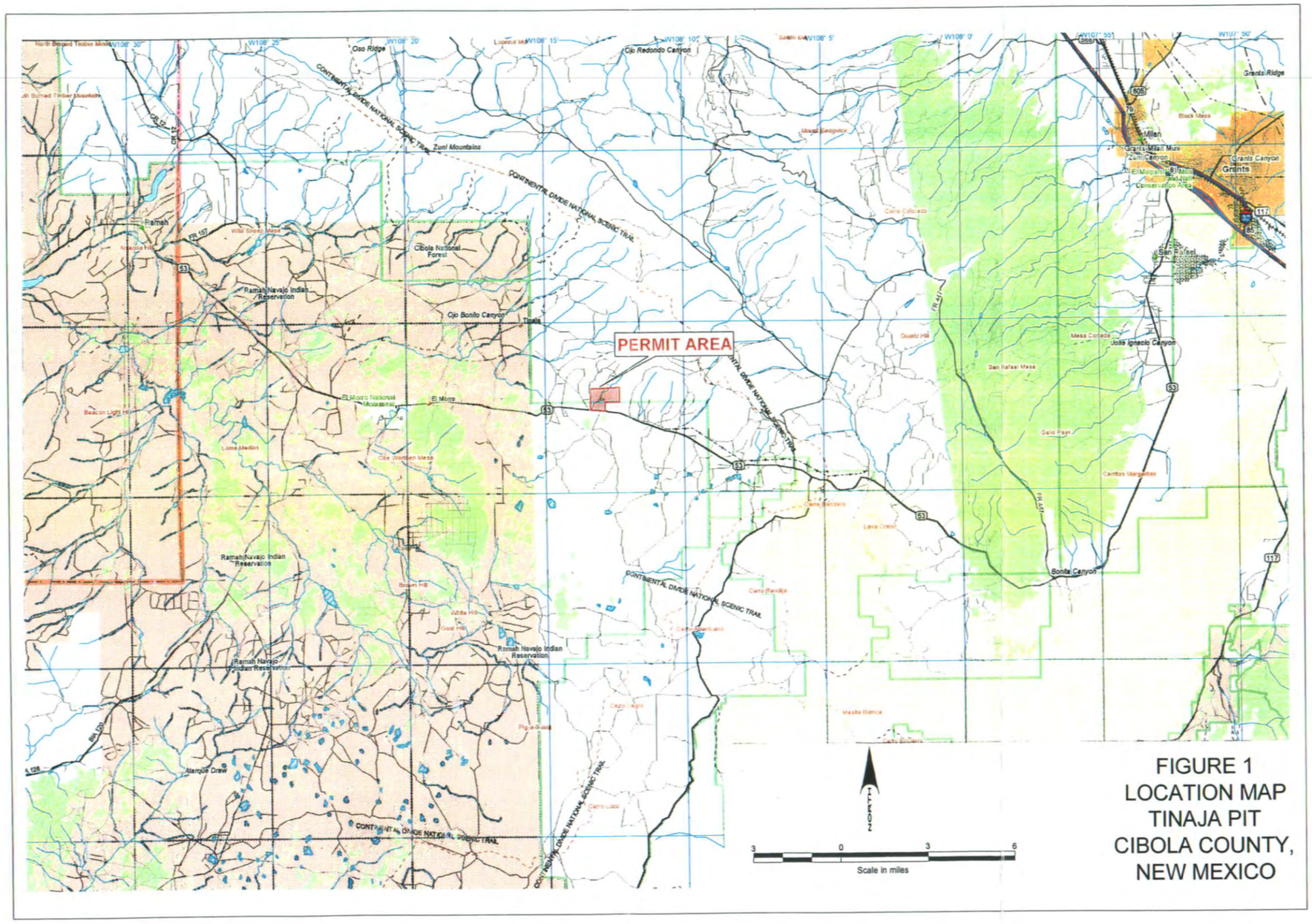

FIGURE 1
LOCATION MAP
TINAJA PIT
CIBOLA COUNTY,
NEW MEXICO

PLAN CERTIFICATION

Facility Name: Tinaja Pit

Facility Type: Limestone rock quarry

Current NPDES Multi-sector storm water general permit number: NMR05B190

Date that initial operation began: Prior to 1985

Facility Address: C & E Concrete, Inc.
P.O. Box 2547
Milan, New Mexico 87021

Facility Location: 35 miles south of Grants, NM on NM 53

Emergency Contact: Walter L. Meech, Plant Manager
505-552-6555

Operating Schedule: 24 hours per day, 7 days per week

Number of Employees: 15

Average Process Water Discharge: Zero

Management Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations.

This Storm Water Pollution Prevention Plan will be implemented as herein described.

Signature: _____ Name:

Title: _____ Date:

POLLUTION PREVENTION TEAM

Below is outlined a Member Roster, identifying individuals within the facility organization who comprise the storm water pollution prevention team and are responsible for implementation, maintenance and revision of the plan.

Leader: Walter L. Meech

Title: Plant Manager

Office Phone: 505-287-2944

Responsibilities: Coordinates all components of plan implementation; signatory authority; coordination of employee training program; keeps employee training records; oversees operation.

Team Members:

Name: Richard Chee

Title: Maintenance Foreman

Office Phone: 505-287-2944

Responsibilities: Plant maintenance; plant safety; keeps inspection records; ensures all site storage areas are orderly and clean.

Name: Carl Caudle

Title: Crusher Foreman

Office Phone: 505-287-2944

Responsibilities: Conducts quarterly visual storm water examinations and analytical monitoring; conducts inspections.

GENERAL FACILITY INFORMATION

Facility Description

The Tinaja Pit functions as a limestone quarry to produce rock and sand products, as well as pulverized limestone, for sale in the west central region of New Mexico. Raw materials stored on site are overburden, rock, and sand aggregates, and pulverized limestone. Other substances stored at the facility associated with equipment operation and maintenance are diesel fuel, engine oil, gear oil, transmission fluid, hydraulic oil, grease, power steering fluid, brake fluid, antifreeze, waste oil, and a water clarifying polymer. Waste oil is produced by routine motor maintenance and is temporarily stored on site.

Site Drainage Map

The facility comprises about 94.5 acres of activity area indicated on FIGURE 2, and consists of three drainage areas. There is no pollutant drainage from above the facility, but some natural turbidity may occur. Drainage area #1 is the active pit and marginal areas, and exhibits internal drainage. Drainage area #2 is the wet plant and pond vicinity which is also internally drained. Drainage area #3 drains the majority of the site, including facility and stockpile areas, and directs flows to the storm water and sediment retention pond located in the southwest portion of the site (FIGURE 2). Drainage area size is indicated as follows:

Drainage Area	Acreage
1	34.7
2	4.6
3	55.2

Outfall #1 is designated for drainage area #3 at the southwest corner of the permit area boundary (FIGURE 3). But since drainage within drainage area #3 is controlled by the storm water retention pond and no discharge at Outfall #1 has historically occurred, no quarterly monitoring has been conducted during the storm water permitting periods.

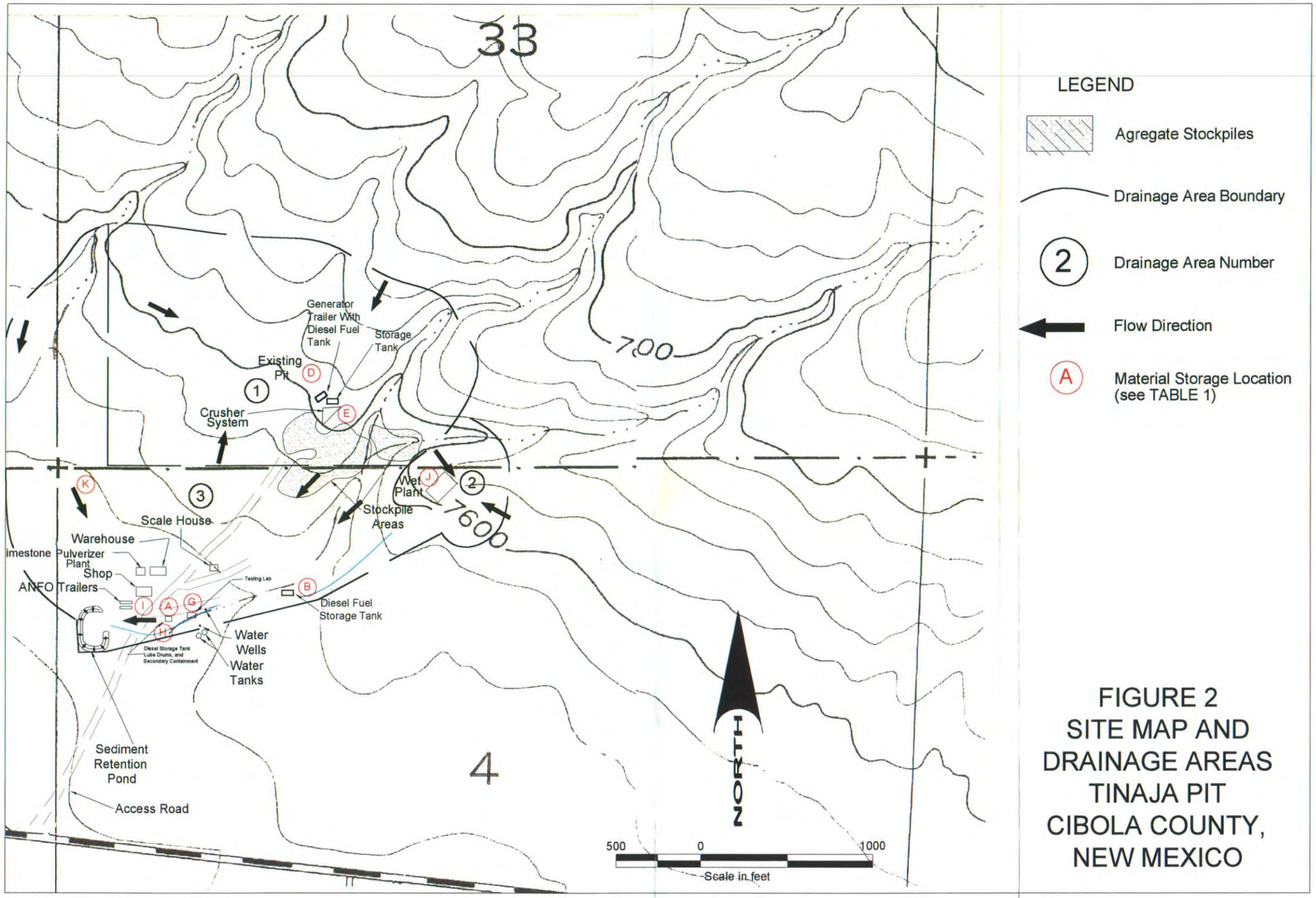

FIGURE 2
SITE MAP AND
DRAINAGE AREAS
TINAJA PIT
CIBOLA COUNTY,
NEW MEXICO

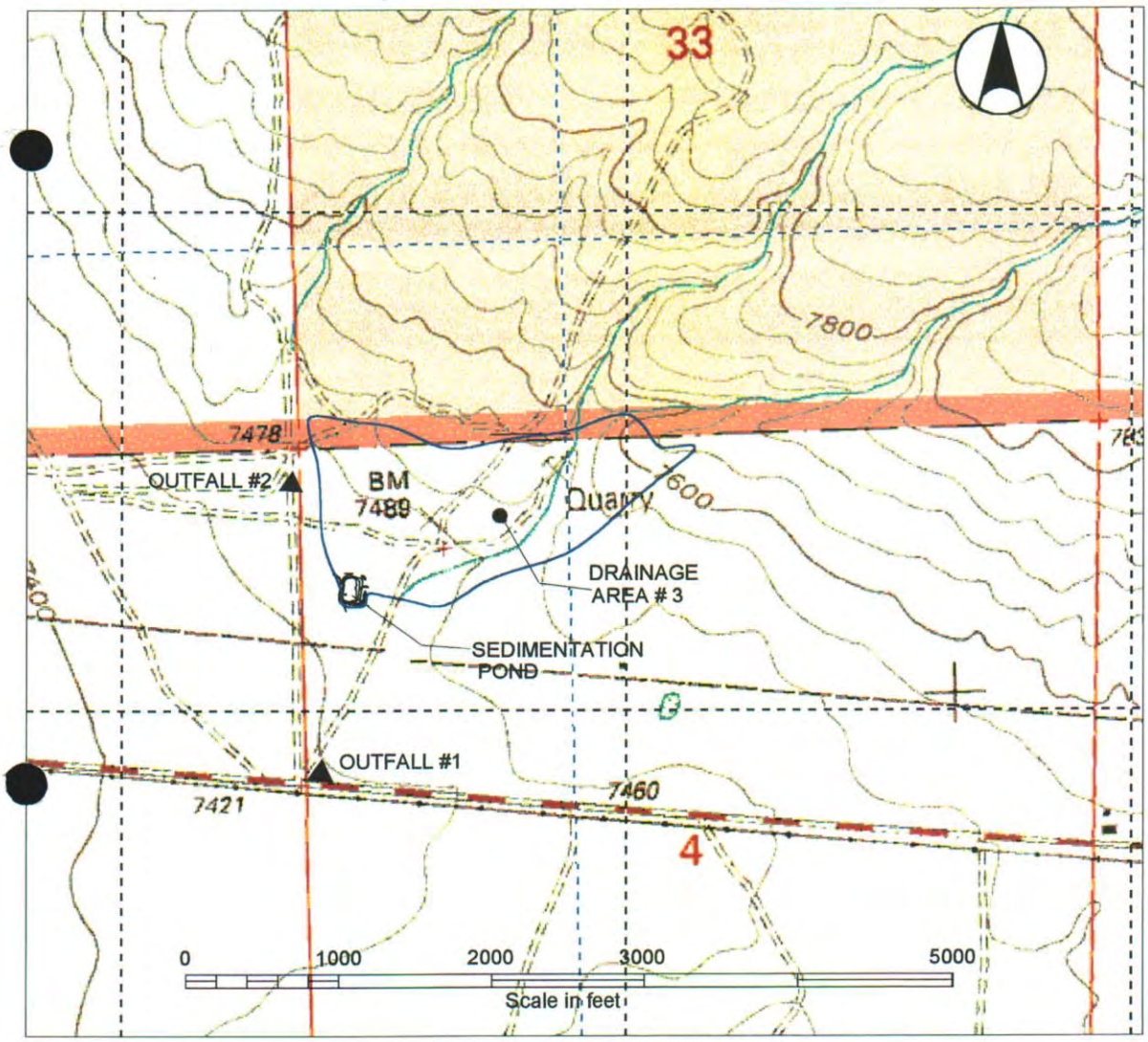

FIGURE 3
LOCATION OF OUTFALL #1 AND #2
TINAJA PIT

Below Outfall #1 in the southwest corner of the permit area, there are no established water courses. The terrain is generally comprised of old lava flows with sink holes and internal drainage areas. Based on this topographic condition, as represented by the USGS topographic map coverage for the vicinity and by a local field reconnaissance, there are no defined receiving waters for drainage from the permit area.

A 36-year record of data indicates annual rainfall at the El Morro National Monument weather station located about 8 miles west of the Tinaja Pit. Annual rainfall is 13.5 inches. The evaporation rate is 31.0, with an evaporation deficit of 18.9 inches.

Process Summary

A number of activities are conducted at the Tinaja Pit which comprise the mining process. Premining activity includes grubbing of grass and woody vegetation. Soil and rock overburden (5 to 20 feet in thickness) are removed by loaders from the top of the approximate 70-foot thick limestone bed. The overburden material is either temporarily stockpiled or used to backfill portions of the pit. The limestone is drilled and shot first to a depth of 35 feet. The limestone is picked up by loaders and transported to the primary crusher and then conveyed to a screen, followed by a secondary crusher. The material is screened again and recycled to the secondary crusher until the desired size grade is attained. Material is then stockpiled on site. At the time of market delivery, road trucks are loaded with aggregate product, passed over the weigh scale, and transported to the job site. A portion of the limestone product is transported to an onsite limestone pulverizer plant for additional processing and bagging of the product. This bagged product is prepared for power plant use.

DESCRIPTION OF POTENTIAL POLLUTION SOURCES

Source Locations

Potential pollutant sources are identified in FIGURE 2. Existing and proposed best management practices (BMP=s) to prevent potential discharge of pollutants to the environment are discussed below.

Diesel fuel (off road) is stored in a 10,000 gallon steel tank with secondary containment sufficient to contain the tank volume. Hydraulic oil, motor oil, antifreeze, grease, gear oil, power steering fluid, brake fluid, and transmission fluid are stored in drums within the diesel secondary containment. A 3500-gallon stand-by diesel fuel tank is provided with an adequate secondary containment. Diesel fuel stored at the limestone pulverizer plant, crusher plant, and parts storage area are stored within trailers to eliminate exposure to rainfall and runoff. The principal pollutant parameter associated with these stored products is total petroleum hydrocarbons. Storage of petroleum products at the plant is controlled under a certified SPCC plant for the Tinaja Pit. Waste oil is stored within the warehouse building and is used as space for heating fuel.

Ammonium nitrate/fuel oil, blasting caps, and other blasting supplies are stored in enclosed trailers south of the shop and are protected from rainfall and runoff. The principal pollutant parameters of concern are nitrate and total petroleum hydrocarbons.

The crusher facility and sand and gravel stockpiles process and temporarily store relatively clean (low silt and clay) aggregate. The stockpiles are located on gentle slopes, and are exposed to rainfall and runoff. The pollutant parameters of concern are total suspended solids and pH.

Disturbed ground surface within Drainage Areas 1 and 2 are internally drained to the pit, and will not result in potential discharge of water or sediment off site. Disturbed area in Drainage Area 3 may incur sediment loss during rainfall events. Although much

of this area is stabilized by gravel cover, runoff in the drainage area is directed to an excavated sediment retention pond. The potential pollutants of concern regarding the disturbed area are total suspended solids and pH.

Material Inventory

Fuels, lubricants, and other materials are delivered periodically to the Tinaja Pit operation by truck. Locations of these stored materials are identified on FIGURE 1 corresponding to the material inventory outlined in TABLE 1. Diesel fuel storage tanks (1000 gallons each) for the wet plant and crusher generators are contained within trailers, and not exposed to rainfall or runoff. The 500-gallon diesel fuel tank for the Cedar Rapids crusher is mounted on the crusher assembly. Spills which may occur associated with these diesel tanks will be mitigated by spill response measures. The 10,000-gallon diesel tank is provided with a concrete secondary containment exceeding the volume of the storage tank. Drummed lubricants are also stored within this containment. The standby diesel fuel tank (black), is planned to be provided with secondary containment which will restrict releases should they occur in the storage area. Two adjacent diesel tanks (white and gray), which are currently empty, are planned to be removed from the site.

Blasting materials (ANFO, blasting caps, booster dynamite) are stored in enclosed trailers and not exposed to rainfall or runoff.

The rock and sand stockpiles and the overburden stockpile are exposed to rainfall and runoff, as are the haul roads and the crusher yard. Although these are considered sources of pollution, they are not considered to have high potential to contaminate storm water with suspended solids. This potential is mitigated with a sediment retention pond located at the base of drainage area #1 (FIGURE 1) and provided as a best management practice (BMP).

TABLE 1

MATERIAL INVENTORY OF

MATERIALS USED, PRODUCED, OR STORED ON SITE

Map Location	Material	Purpose	Quantity (units)			Exposure in Last 3 Years	Likelihood of Contact with Storm Water	Any Past Significant Spill or Leak
			Used	Produced	Stored			
A	Diesel fuel (off road)	fuel for loaders, generators, and crushers	240,000 gal/yr		10,000 gal	No	None	No
B	Diesel fuel (stand by)	reserve fuel	500 gal/yr		3500 gal	No	None	No
C	Diesel fuel	wet plant generator	100 gal/day		1000 gal	No	None	No
D	Diesel fuel	crusher (Spokane)	150 gal/day		1000 gal	No	None	No
E	Diesel fuel	crusher (Cedar Rapids)	125 gal/dy		500 gal	No	None	No
F	Diesel fuel	crusher, generator	175 gal/day		1000 gal	No	None	No
G	Butane	testing lab	400 gal/yr		100 gal	No	None	No
H	Hydraulic oil	loaders	1400 gal/yr		350 gal	No	None	No
H	Motor oil	all motors	1400 gal/yr		350 gal	No	None	No
H	Antifreeze	motors	110 gal/yr		55 gal	No	None	No

TABLE 1

Continued

H	Grease	crusher and motors	110 gal/yr		55 gal	No	None	No
H	Gear oil	loaders and crushers	7.5 gal/yr		15 gal	No	None	No
H	Power steering fluid	loaders	5 gal/yr		1 gal	No	None	No
H	Brake fluid	loaders	5 gal/yr		1 gal	No	None	No
H	Transmission fluid	loaders	5 gal/yr		1 gal	No	None	No
H	Waste oil			250 gal/mo	250 gal	No	None	No
I	Ammonium Nitrate/Fuel oil	rock blasting	2800 bags/yr		750 bags	No	None Covered	No
I	Blasting caps	rock blasting	12-15 caps/yr		24 caps	No	None Covered	No
I	Booster/dynamite	rock blasting	30 boxes/yr		5 boxes	No	None Covered	No
J	Polymer	wet plant	1300 gal/yr		650 gal	No	None	No
K	Overburden	reclamation material		variable	variable	Yes	Exposed Stockpile	No
Product Stockpile	4" to 8" riprap	market product			5000 tons	Yes	Exposed Stockpile	NA
Product Stockpile	1 1/2" leach rock	market product			1000 tons	Yes	Exposed Stockpile	NA
Product Stockpile	1" rose stone	market product			1000 tons	Yes	Exposed Stockpile	NA

TABLE 1
Continued

Product Stockpile	3/4" rock	market product			50,000 tons	Yes	Exposed Stockpile	NA
Product Stockpile	1" concrete rock	market product			2000 tons	Yes	Exposed Stockpile	NA
Fines Stockpile	Crusher fines	market product			3000 tons	Yes	Exposed Stockpile	NA
Fines Stockpile	1/8" rock waste	market product			30,000 tons	Yes	Exposed Stockpile	NA

Significant Spills and Leaks

Spills and leaks, should they occur, are most susceptible at diesel storage tanks near the crusher system, limestone pulverizer plant, main diesel and lube storage area, and the backup diesel storage area.

No significant spills or leaks of toxic or hazardous pollutants have occurred in the past three years at areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the Tinaja Pit.

Existing Sampling Data on Surface Water Quantity and Quality

During the Year 2 analytical monitoring period, as well as other times during the term of the permit, no surface water discharge quantity and quality data was generated at the facility site. Discharge monitoring reports are provided in APPENDIX B.

POLLUTION PREVENTION AND RESPONSE MEASURES

Structural BMP Measures

Structural best management practice (BMP) measures employed at the Tinaja Pit function to reduce the potential for pollutants to leave the site. These measures include earth berms, internally drained areas (open mine pit), sediment retention pond, enclosures and containers, secondary containments, base course, gravel, and asphalt covers, and dense vegetation stands above Outfall #1.

The Tinaja Pit site is graded to minimize erosion potential. The site does not exhibit substantial erosion or sedimentation activity. Sediment movement which may occur is directed to the sediment retention pond. The pond is kept clear of sediment buildup. Sediment which is removed from the pond is disposed of by placement in the pit.

Outfall #1 is about 1000 feet south of the sediment pond. The slope from the pond to the outfall is 1 to 2 percent and has a highly dense cover of native grass as a BMP. This BMP provides stabilization to the nearly flat terrain to potentially control or prevent sediment from leaving the property, should a discharge occur.

Drainage areas #1 and #2 are internally drained (FIGURE 1). Rock, sand and overburden stockpiles are located within drainage area #3. The stockpiles are sufficiently spaced in order to prevent blockage of storm water drainage.

reclamation of the Tinaja Pit will be conducted as a BMP following termination of aggregate mining and processing operations. the reclamation plan for the facility was submitted to the New Mexico Mining and Minerals division (MMD) for technical review. Once the application for mine permit and mine and reclamation plan are approved by the MMD, the reclamation plan for the mine will be incorporated into the pollution prevention plan by reference.

Non-Structural BMP Measures

Good Housekeeping Procedures

Good housekeeping practices at the site are designed to maintain a clean and orderly work environment. This is accomplished through proper operation and maintenance of machinery and processes. Careful material storage practices have been implemented and others are being improved. Principal good housekeeping procedures are as follows:

- X The material inventory is kept up to date, and all containers are labeled with the name, type of substance, and stock number.
- X Material safety data sheets (MSDS) are provided at the Shop Building to ensure that operation staff are aware of hazards and pollution potential.
- X Routine cleanup operations are ongoing and scheduled to ensure that the storage areas and maintenance areas are clean and orderly.
- X Good housekeeping, including cleanup procedures and disposal requirements, are incorporated into employee training.

Security and Lighting

The tract on which Tinaja Pit operations are located is fenced. A locking gate is provided along the access to NM 53. The facility is presently manned full time, 24 hours per day, Monday through Sunday.

Some lighting is provided in the vicinity of the scale house.

Spill Prevention Measures and Response Procedures

Leak detection is ensured by daily visual inspection of liquid storage at the diesel storage areas. The plan provides for secondary containment for the 10,000-gallon storage tank, and the 3500 gallon reserve tank (black), and 1000 gallon diesel tanks (white and gray) should a release occur.

Removal of accumulated liquids from the containments is accomplished by use of absorbents, portable pump, or other technique, and waste material is properly

disposed.

The principal objectives in response to a spill event are:

1. Stop the source of leakage
2. Contain the leakage, and
3. Commence remedial action.

The general procedure for spill or release emergency response is as follows:

1. Report the spill event to the Operation Manager, or his designee.
2. The person in charge of the site at the time of the event will determine if and which outside assistance organizations are to be contacted, how the leak should be stopped and contained, and the form of remedial action necessary, and then initiate necessary action.
3. The Operation Manager or his designee will notify the New Mexico Environment Department Spill Hotline (505-428-2525), in order to determine which additional government agencies may need to be notified and ensure that these notifications are made.
4. If the event involves a petroleum product, procedures for notification and reporting will be followed as provided in the facility=s SPCC plan, a companion document to this PPP.

Equipment is available on site for spill response. The Tinaja Pit plans to maintain a spill kit at the scale house. The kit will include shovel, goggles (2), 5-gallon pail of absorbent granules, absorbent pillows or socks (3-5), neoprene gloves (2 pair), and rubber boots. The facility also maintains a front-end loader to respond to larger spills or incidents. Additionally, contractors are available locally for assistance in spill control and remediation.

Inspections and Preventative Maintenance Procedures

Daily inspections of all storage facilities are conducted as a part of operation. Formal

monthly inspections for the storm water pollution prevention plan are conducted and recorded on forms. Results of monthly inspections are provided in APPENDIX C.

Monthly inspections include at a minimum the following:

- X Structural integrity of storage tanks and secondary containments.
- X Rusted areas and condition of paint on tanks.
- X Tank breathing vent.
- X Fuel hoses, associated connections, and valving.
- X Oil stains in the site area from truck and equipment maintenance.
- X Evidence of storm water discharge other than to the storm water and sediment retention pond.
- X Integrity of berms and incised sediment pond.
- X Evidence of leaks from drum storage in Lube Storage Area.
- X Evidence of erosion at facilities and storage areas and along margins of disturbed areas.

Personnel Training

Personnel training is conducted annually to instruct personnel, at all levels of responsibility, in the components and objectives of the storm water pollution plan for the site. Training for compliance with the site=s SPCC plan is conducted concurrently.

The training scope will include the following topics:

I. Introduction to NPDES Storm Water Permits
   A. Background information
   B. Status of permit
II. Pertinent components of the permit for this facility
   A. Storm Water Management Plan
      1. Spill response and clean-up procedures

2. Good housekeeping procedures.
3. Best management practices
    a. What they are and where they apply
    b. Implementation
    c. Maintenance
4. Inspections

B. Monitoring and sampling (if required)

III. Reporting and record keeping

IV. Enforcement

Newly hired employees are briefed on the components and goals of the pollution prevention and SPCC plans, as a part of employee orientation.

Safety meetings conducted daily provide a forum for review of pollution prevention and control information, in order to maintain readiness and awareness of personnel.

Any contractor, vendor, or temporary personnel whose work could potentially cause a spill or who could prevent a spill, is informed of the Tinaja Pit operating procedures and features with which they may become involved. Records of personnel training conducted, including personnel in attendance, date of training, and scope of training, are kept at the site or at the main C & E office in Grants.

Personnel training is documented in APPENDIX D.

<u>Record Keeping and Internal Reporting Procedures</u>

Records documenting spills, leaks, and other discharges which may occur at the site will be maintained with the pollution prevention plan. The records of incidents include the following information:

X date and time of incident

X duration

- X cause
- X environmental problems
- X response procedures
- X equipment needed to prevent recurrence
- X agency notifications and reporting

Records of all inspections, whether routine or detailed, are maintained as a basis for preventative maintenance. Keeping a log of all maintenance activities enables the Tinaja Pit to evaluate effectiveness of practices, equipment, and operation.

NON-STORM WATER DISCHARGE CERTIFICATION

Testing or evaluation for the presence of non-storm water discharges was accomplished by visual inspection at the Tinaja Pit on October 17, 2002. The day was clear and dry, with no recent rainfall. The mine site was visually evaluated to determine the areas where non-storm water was present on that day. Outfall #1 was visually examined for sign of discharge. None was evident. A single source of non-storm water was identified as the wet plant, where fines are removed from aggregate. The wet plant location is within Drainage Area 2 which is internally drained to the pit. Although commingling occurs with rainfall, no potential for discharge from the site is possible.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations.

Signature: _____ Name:

Title: _____ Date:

COMPREHENSIVE SITE COMPLIANCE EVALUATION

Comprehensive site evaluations are conducted during the fourth quarter of each calender year, or as needed, for the purpose of 1) confirming the accuracy of the description of potential pollution sources addressed in the plan, 2) determine the effectiveness of the plan, and 3) assess compliance with the terms and conditions of NPDES multi-sector storm water general permit # NMR05B190. Comprehensive site evaluation reports are incorporated into the PPP (APPENDIX E).

Specifically, material handling and storage areas, processing areas, and other potential sources of pollution are visually inspected for evidence of actual or potential pollutant discharges to the drainage system. Erosion controls and structural storm water management devices are examined to ensure that each is operating correctly.

The results of each comprehensive site evaluation are documented as a report, signed by the Operation Manager. The report indicates the date of the evaluation, and major observations relating to implementation of the storm water pollution prevention plan. Each report is retained for at least 3 years following the evaluation. Additionally, the pollution prevention plan may be updated or modified according to site evaluation findings within 2 weeks of the evaluation.

ENDANGERED SPECIES AND HISTORIC PLACES DOCUMENTATION

Current information on listed species and critical habitat which relates to Cibola County, New Mexico, and which is available from the US Fish and Wildlife Service, the New Mexico Rare Plant Technical Council, and the New Mexico Department of Game and Fish, was reviewed by a qualified contract biologist. No FederallyBlisted endangered or threatened plant or wildlife species which are known to occur within Cibola County are in proximity to the Tinaja Pit or along the drainages where authorized discharges may reach waters of the US. Additionally, there is no designated critical habitat at the pit site or along immediate downstream drainages. Based on this finding, there is no expected jeopardy to any FederallyBlisted species or critical habitat from storm water discharge or storm waterBrelated activities attributable to the site activities and thus the facility meets eligibility for coverage under the permit. This evaluation has addressed the intent and procedures outlined in Addendum A, Endangered Species Guidance, of the 2000 NPDES Storm Water MultiBSector General Permit.

Determination of whether cultural properties listed on the National Register of Historic Places, or eligible for listing, would be affected by storm water discharges or storm water discharge-related activities associated with the Tinaja Pit has been conducted. A qualified archaeologist has reviewed site records for the facility at the Archeological Records Management Section of the State of New Mexico Office of Cultural Affairs at the Laboratory of Anthropology. Based on this review, there is no expected effect on cultural properties listed or eligible for listing on the National Register. Thus, the facility meets eligibility coverage under this permit. This evaluation has addressed the intent and procedures outlined in Addendum B, Historic Properties Guidance. of the 2000 NPDES Storm Water Multi-Sector General Permit.

STORM WATER MONITORING AND REPORTING

Analytical Monitoring and Reporting

Limestone crushing facilities are required to monitor their storm water discharges for specified parameters as pollutants of concern. However, at the Tinaja Pit a storm water and sediment retention pond is provided to intercept all storm water from drainage area #3. Drainage areas #1 and #2 drain internally and have no outfall from the site. A potential outfall for drainage area #3 is identified on FIGURE 2. Although the storm water and sediment pond to date have not failed to retain all storm water from drainage area #3, should a breach or bypass of the pond occur in a major storm event, monitoring of the flow will be conducted at the outfall during Year 4 of the permit (October 1, 2003 to October 1, 2004).

Parameters are required by the USEPA and by the New Mexico Environment Department (NMED) as follows for outfall monitoring:

Agency	Pollutant of Concern
USEPA	Total Suspended Solids (TSS)
USEPA	Nitrate + Nitrite N

In addition to the flow sampling and analysis, the following data must be tabulated for each sampling event during Year 4:

- ∃ Date and time of sampling
- ∃ Duration (in hours) of storm event sampled
- ∃ Estimate or measurement (in inches) of the storm event that generated the sampled runoff
- ∃ The duration between the storm event sampled and the end of the previous measurable (>0.1") rainfall storm event

- ∃ Estimate of total volume (in gallons) of the discharge sampled

Results of the Year 4 quarterly monitoring, which will not be required if there are no flows at the outfall, are to be submitted on Discharge Monitoring Report Forms to the respective agencies no later than January of the year 2005. The report for the Tinaja Pit, if no flow occurs at the outfall, will report no flows. One signed Discharge Monitoring Report for each quarter of Year 4 will be completed.

Reporting will be made to the following offices:

EPA, Region VI
Enforcement and Compliance Assurance Division (EN-WC)
EPA SW MSGP
First Interstate Bank Tower at Fountain Place
P.O. Box 50625
Dallas, TX 75205

Program Manager, Point Source Regulation Section
Surface Water Quality Bureau
New Mexico Environment Department
1190 St. Francis Drive
Santa Fe, NM 87504-0968

Quarterly Visual Examination of Storm Water Quality

NPDES Storm Water Multi-Sector Permit requirements for monitoring storm water runoff are addressed by visual examination of storm water from Outfall #1, should a flow occur (FIGURE 2). No analytical tests are required to be performed on these samples.

Sample Collection and Visual Inspection

An approximate one pint sample will be collected in a clear glass beaker or other clear receptacle at the outfall during the first 30 minutes (or as soon as practical, but not exceeding 1 hour) of when the runoff or snow melt begins discharging. In a well lighted area, the samples are inspected immediately following collection of the samples. The observer will note and record for each sample the color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm

water pollution. Whenever practical the sample collection and visual description is performed by the same individual throughout the life of the permit. The current pollution prevention team designates the Operation Manager as the observer.

Visual Examination Reporting

Visual examination reports are prepared for each outfall flow and descriptions are kept with the pollution prevention plan. Each report is compiled on an examination sheet and includes the examination date and time, examination individual, rainfall runoff or snow melt, visual quality of the storm water discharge, and probable sources of any observed storm water contamination. Visual examination reports are provided in APPENDIX F.

Adverse Climate Conditions

When a sample of storm water runoff cannot be collected during a calendar quarter as a result of adverse climate conditions, the reason for not performing the visual examination is documented on the visual examination report for the quarter, and is kept with the records of visual examination. Adverse weather conditions which may prohibit the collection of samples include drought or conditions dangerous to personnel, such as high winds or electrical storms.

APPENDIX A

NPDES STORM WATER MULTI-SECTOR PERMIT
POLLUTION PREVENTION PLAN REQUIREMENTS FOR
STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY FROM
CONCRETE MANUFACTURING FACILITIES

APPENDIX B

DISCHARGE MONITORING REPORTS

APPENDIX C

MONTHLY INSPECTION REPORTS

APPENDIX D

PERSONNEL TRAINING

APPENDIX E

COMPREHENSIVE SITE COMPLIANCE EVALUATION REPORT AND RECOMMENDATIONS

C & E CONCRETE, INC.

TINAJA PIT

2002 COMPREHENSIVE SITE COMPLIANCE EVALUATION REPORT

NPDES STORM WATER GENERAL PERMIT NO. NMR05B190

On October 17, 2002, an annual comprehensive site compliance evaluation was conducted at the Tinaja Pit by Walter L. Meech, leader of the Tinaja Pit Pollution Prevention Team, and Peter H. Metzner, environmental consultant from METRIC Corporation. The evaluation comprised 1) a review of the current pollution prevention plan for compliance with the storm water program, 2) a review of the current spill prevention control and countermeasure plan for compliance with the Oil Pollution Act, and 3) a site inspection of the facility in order to identify conditions relating to pollution prevention compliance. Findings of the evaluation are outlined as follows:

- The Tinaja Pit is in substantial compliance with the October 30, 2000 NPDES Storm Water Multi-Sector Permit Regulations. The pollution prevention plan has been recently updated to account for minor changes within the mine activity area.

- On October 17th, the day was clear and dry. No non-storm water was in evidence at the Tinaja Pit which would potentially intermingle with storm water runoff and which could discharge from the property. Water at the wet plant was determined to be within the confines of the pit.
- Potential pollutant source locations at the mine have not changed over the past year.

- The material inventory, as outlined in TABLE 1 of the plan, has not substantially changed over the past year in types or amounts of materials or material management practices that could affect the exposure of material to storm water.

- No significant spills or leaks have occurred in the past year in areas exposed to rainfall or runoff.

- Secondary containments (concrete, plastic tubs, watering troughs) with capacity greater than that of the tanks, need to be provided at the diesel storage location east of the testing lab.

- Oily water which may accumulate in the concrete diesel and lube storage secondary containment should be periodically evacuated and properly disposed of in order to provide maximum capacity.

- Unusable spare parts and materials, which may be potential sources of contamination (e.g. oily/greasy metal), and general refuse should be removed from areas of rainfall and runoff exposure.

- Be sure to maintain the capacity of the sediment pond to the south of the shop.

Overall, the current pollution prevention plan for the facility is sufficient in addressing the storm water permit requirements. Pollution prevention team members and their responsibility are outlined in the plan. Potential pollutant sources, which are exposed to rainfall are identified, and pollutant parameters which affect storm water discharge quality are indicated. Structural BMP=s, such as berms and secondary containments, are indicated on the site drainage map, and their function discussed.

Periodic inspections carried out at the facility need formal documentation on a appropriate form. The inspection reports or forms must be maintained for at least 3 years. Deficiencies noted in the inspection must be corrected within 14 days after the inspection.

Compliance with the pollution prevention plan and storm water permit regulations is only marginally being met overall. In particular, emphasis needs to be placed on implementation of good housekeeping measures periodic inspections and reporting, and personnel training to ensure that all personnel are clear on the objectives and procedures for pollution prevention at the site. Additionally, the above outlined items need to be mitigated to approach compliance.

This report will be retained for 3 years following the report date. The 2002 comprehensive site compliance evaluation inspection and reporting was conducted by the undersigned.

Walter L. Meech Date
President
C & E Concrete, Inc.

Peter H. Metzner Date
Environmental Scientist
METRIC Corporation

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations.

Walter L. Meech Date
President
C & E Concrete, Inc.

APPENDIX F

STORM WATER SAMPLING AND EXAMINATION REPORT
FOR DRAINAGE AREA #3 OUTFALL

TINAJA PIT
STORM WATER SAMPLING AND EXAMINATION REPORT
FOR DRAINAGE AREA #3 OUTFALL

Year:
Calendar Quarter (circle): 1st 2nd 3rd 4th
Sample Collection and Examination Date:_____ Time:
Name of Sampler/Examiner:
Source of Sample Water (circle): Rainfall Runoff Snow Melt Runoff
Visual Quality of Storm Water

- Color:
- Odor:
- Clarity:
- Floating Solids:
- Settled Solids:
- Suspended Solids:
- Foam:
- Oil Sheen:
- Other Observations:

Probable Source(s) of Observed Storm Water Contamination:

Reason for Not Performing Storm Water Sample Collection and Examination:

____ Drought/Insufficient Precipitation
____ Other Reason (explain)
_

EXHIBIT J

NSR AIR QUALITY PERMIT NO. 0879-M1
AND
NSR AIR QUALITY PERMIT NO. 2678

EXHIBIT K

STATEMENT FROM LANDOWNERS
REGARDING POST-MINING LAND USE

Walter L. Meech
P.O. Box 2479
Milan, New Mexico 87020

October 24, 2003

To Whom It May Concern,

As land owners of the North ½ Section 4 and all of Section 33, we have decided as a post mine land use in 40 years we would do the following: Where the roads, buildings, scales, fuel island, and existing pad areas are we would like to leave all this and use the pit floor for stockpiling sand and gravel. The post mine land use will be a sand and gravel operation. At the current rate we are mining this pit we should have a life span of 394 years. We intend to continue mining as a family operation for as long as we can.

This letter represents the feeling of the land owners of the property. I have been given permission to sign in there behalf.

Sincerely,

Walter L. Meech

EXHIBIT L

ARCHEOLOGICAL SURVEY REPORT FOR NEW UNIT AREA
(46 ACRES)

QUIVIRA RESEARCH CENTER

AN ARCHEOLOGICAL SURVEY OF 46 ACRES OF PRIVATE LAND
IN T10N R13W SECTION 33, C & E CONCRETE'S TINAJA PIT,
ZUNI MOUNTAINS, CIBOLA COUNTY, NEW MEXICO
FOR
METRIC CORPORATION

Quivira Research Center Publications 454

Prepared under Contract

between

Quivira Research Associates and METRIC Corporation

NMCRIS Activity No. 84238

by

Carol J. Condie

July 2003

1809 Notre Dame NE
Albuquerque, New Mexico 87106
(505) 255-9264

AN ARCHEOLOGICAL SURVEY OF 46 ACRES OF PRIVATE LAND IN T10N R13W SECTION 33, C & E CONCRETE'S TINAJA PIT, ZUNI MOUNTAINS, CIBOLA COUNTY, NEW MEXICO FOR METRIC CORPORATION

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ABSTRACT

An intensive (100%) archeological survey was conducted by Quivira Research Associates on July 3 and 23, 2003 of 46.25 ac/18.72 ha of private land in T10N R13W Sec. 33, C & E Concrete's Tinaja Pit, Cibola County, New Mexico for METRIC Corporation. The purpose of the project was to permit compliance with the New Mexico Mining Act, the NPDES Storm Water Pollution regulations, and the National Historic Preservation Act of 1966, as amended.

The most recent listing of cultural properties in New Mexico shows no sites on or pending nomination to the State Register of Cultural Properties [SR] or the National Register of Historic Places [NR] in or immediately adjacent to the study area. New Mexico Cultural Resource Information System [NMCRIS] records show two sites, LA 38145 and LA 38570, in Secs. 4 and 33 near the project area. In response to a request for comments on the Tinaja Pit Mine Permit Application from the Mining and Minerals Division of the state Energy, Minerals, and Natural Resources Department, the Historic Preservation Division recommended that these two sites be re-located and that a pedestrian survey of the proposed new unit be conducted to identify any additional sites. (It should be noted that Sec. 4 is split estate [private surface, U.S. minerals], but Sec. 33 is private surface and sand and gravel rights).

QRA was able to re-locate LA 38570 (Sec. 4) and update the site form. The site has been disturbed by mechanical equipment. Whether LA 38570 is potentially eligible to the NR is uncertain. A testing program will be necessary to ascertain whether subsurface cultural deposits exist and assess the site's eligibility. C & E Concrete proposes no future activities near the site.

However, LA 38145 has been completely obscured by grading and stockpiling activities. We were able to identify only one chert flake near what would have been the south site boundary.

QRA identified one isolated occurrence (IO) but no sites within the area of the proposed new unit. QRA recommends that clearance be granted for this project, with the proviso that if unsuspected subsurface cultural deposits are identified during project activities, work in that area will cease immediately (see "Recommendations," below).

INTRODUCTION

Project description/proposed modification: C & E Concrete proposes to sell crushed limestone to be used in scrubbers, which brings the mine under the purview of the New Mexico Mining Act. Both surface and subsurface modification of the survey area will occur.

Date fieldwork performed: July 3 and 23, 2003.

Sponsoring agency: Energy, Minerals and Natural Resources Department, State of New Mexico.

Project sponsor: METRIC Corporation, 8429 Washington Place NE, Suite A, Albuquerque, NM 87113, (505) 828-2801. **Company representative:** Peter H. Metzner.

NMCRIS Activity No.: 84238.

Permit authority: None—private land.

Field crew: Carol J. Condie (P.I.), Monte S. Ballejos, Landon D. Smith, Daniel W. Stiteler, and Erik R. Stout (July 3); Condie, Smith, and Jude Stern (July 23).

Land status: Sec. 4 = private surface/U.S. minerals. Sec. 33 = private surface/private sand and gravel rights.

Total area surveyed: 46.25 ac/18.72 ha.

Map reference: USGS Valle Largo, NM 7.5' quad, 1995 (35108-A2). Scale: 1:24,000. Contour interval: 40 ft.

Location (Fig. 1): **Legals:** T10N R13W Sec. 33, S ½ NW ¼ SW ¼; S ½ NE ¼ SW ¼; N ½ SE ¼ SW ¼; S ½ NW ¼ SE ¼; and NW ¼ SW ¼ SE ¼. **UTM's:** Z-12 NE corner: E754420 N3882240; SE corner: E754080 N3881870; NW corner: E753460 N3882140; SW corner: E753460 N3882000. (UTM coordinates are NAD 27. The coordinates are scaled.)

Prior disturbance: Except for a two-track, there has been very little prior mechanical disturbance in the survey area. A great deal of tree cutting has occurred in the past, presumably for fence posts, to judge from the diameters of most of the stumps.

ENVIRONMENTAL SETTING

Topography and soils: The project area lies in the Acoma-Zuni Section of the Colorado Plateau Physiographic Province. Hawley (1986:25) remarks:

> The Acoma-Zuni Section is characterized by extensive upper Cenozoic volcanics that form a discontinuous cover on erosional and constructional landforms typical of the neighboring Navajo Section. The northeastern Acoma-Zuni area is dominated by Mount Taylor.... Cabezon Peak at the northeast edge of the section is a particularly prominent plug-type volcanic neck. To the west, the elongate upwarp of the Zuni Mountains...with a core of Precambrian crystalline rocks, is flanked by hogback and cuesta belts that have dipslopes and scarps capped by Permian and Triassic limestone and sandstone.... Broad plains south and east of the Zuni uplift are covered with Quaternary basalt flows and dotted with numerous cinder and lava cones.

Dane and Bachmann (1955) show the geologic formation as Permian age San Andres limestone. Maker et al. 1978(map + pp. 118-120) show the soil association as Eutroboralfs-Argiborolls, noting

> This association consists generally of the Zuni Mountains in McKinley and [Cibola] counties. The altitude ranges from about 7,000 feet to 9,256 feet on the crest of Mt. Sedgwick, but is most commonly between 7,500 and 8,500 feet. The topography is varied, ranging from nearly level to strongly sloping in the valley areas to steep and very steep on the mountain side slopes, upland ridges, and escarpment or breaks areas. There are also moderately extensive areas of ridge and mesa tops that are gently sloping to

moderately steep and rolling. The soils are forming dominantly in materials weathered from granite, schist, gneiss, and sedimentary rocks including sandstone, shale, limestone, and siltstone.

Flora/fauna: Brown and Lowe (1980) classify the biotic community as Petran Montane Conifer Forest. Local vegetation consists of an overstory of piñon and juniper (plus a rare ponderosa in the arroyos) and an understory of thinly distributed yucca (Y. baccata), prickly pear, mammillaria, verbena, cliff rose, buckwheat, Oregon grape (one specimen), three-leaved sumac (one specimen), four o'clock (one specimen), and a few scattered tufts of grass.

We noted one cast deer antler, and two or three deposits of deer and elk droppings. Since there is almost no browse except for an occasional cliff rose, it was a little surprising to find any evidence of deer or elk.

Ground cover/visibility: Ground cover averaged 10%. The survey area consisted of open forest with some forest duff and a lot of limestone shatter. Visibility was good.

Elevation: 7600 ft to 7800 ft.

SURVEY METHODS

The area was surveyed in parallel transects spaced 15 m apart.

PRIOR INVESTIGATIONS

There are no discoverable prior investigations of QRA's specific survey area.

OVERVIEW OF PREHISTORY AND HISTORY

Since no archeological sites were identified, no overview will be presented here. However, see Tainter and Gillio (1980) and Stuart and Gauthier (1981) for overviews of the prehistory and history of the general area.

CULTURAL RESOURCES

Previously identified sites in or adjacent to the study area: Two sites, LA 38145 and 38570, were identified by Steven Koczan in 1982. The first, LA 38145, was 250 m long by 150 m wide and straddled the Sec. 4/Sec. 33 line. Koczan's site form shows artifacts numbering in the thousands. This site has now been completely obscured by grading and stockpiling activities. We were able to find only one chert flake at the extreme south edge of the site in an undisturbed piñon-juniper stand.

LA 38570, a Basketmaker III—Pueblo II site, is still present, though it has undergone some mechanical disturbance from two-tracks (see Fig. 2,a for Koczan's map and Fig. 2,b for the modified site map). Koczan listed artifact density in the hundreds to thousands (we saw only 40 to 50 items), but felt the site had been insufficiently evaluated for purposes of recommending assignment to the National Register of Historic Places (NR). Koczan's site description, with our comments in brackets, is repeated here:

> This is a large, primarily lithic scatter....One B/W sherd was located; however, it was too small to identify. The rough texture suggests it is an early B/W type though. Flakes include many cherts and quartzites from white, to gray, to red, to purple and white mixtures. Some obsidian was also noted. Flakes were a variety of sizes and include some core material. [QRA noted the same colors, rock types, and size variations; we also saw cores.] This was probably a multi-activity tool preparation area. The artifacts are concentrated in the feature area and in drainage to east of this. The only identifiable feature is an unusual rectangular arrangement of large sandstone slabs. It resembles a small shelter but amount of rubble suggests masonry walls were not more than 50 cm high. Rest of walls must have been adobe or wood. [QRA didn't see this.] 3 m south of this is a 50 by 50 cm rectangular rock arrangement. It is not well defined and not more than two courses of stone high. I have no idea what that is. [QRA didn't see this, either, but it sounds like the work of children.] There are probably other features in area but they are not readily apparent. ...This site does not extend into limestone outcrop. In addition, there are a few eroded artifacts to south and east of site area as it is defined here.

It appears that the rectangle of large sandstone slabs and the smaller rectangular rock arrangement were removed when the two-tracks were graded in. We saw no mounds,

depressions (suggesting kivas or pit houses), charcoal stains, sheet midden, or any other indication of subsurface cultural deposits and were unable to arrive at an assessment of the site's potential for eligibility to the NR. Testing will be required to determine whether subsurface cultural deposits exist that might make the site eligible to the NR.

[We should note that the present owner/operator of the Tinaja Pit would have had no easy way of knowing that LA 38145 and 38570 existed when they purchased the property. We did not query the owner, but we believe the damage to these sites was probably inadvertent.]

Cultural resources identified by this survey: QRA identified one isolated occurrence (IO). See Appendix I for location. We identified no archeological sites.

Isolated Occurrences

IO-1. Semi-translucent colorless complete chert projectile point (Fig. 3) and one chert thinning flake 10 m apart. Although it fits none of her type descriptions exactly, the point exhibits some of the characteristics of Irwin-Williams' Proto-Basketmaker points (Types AEM 13-15) from Unit B2 at En Medio Shelter in its convex base, serrated blade edges, bi-convex cross-section, and size—3.54 cm long by 1.55 cm wide, and may date to 800-1000 B.C., within her Late Archaic Armijo Phase (Irwin-Williams and Tompkins 1968:10, 30).

RECOMMENDATIONS

QRA recommends that clearance be granted for this project. However, if unsuspected subsurface cultural deposits are identified anywhere within the project area during project activities, work should cease immediately and the State Historic Preservation Officer should be notified. Work should not be resumed until the deposits have been inspected by a qualified archeologist and a treatment plan has been prepared and implemented.

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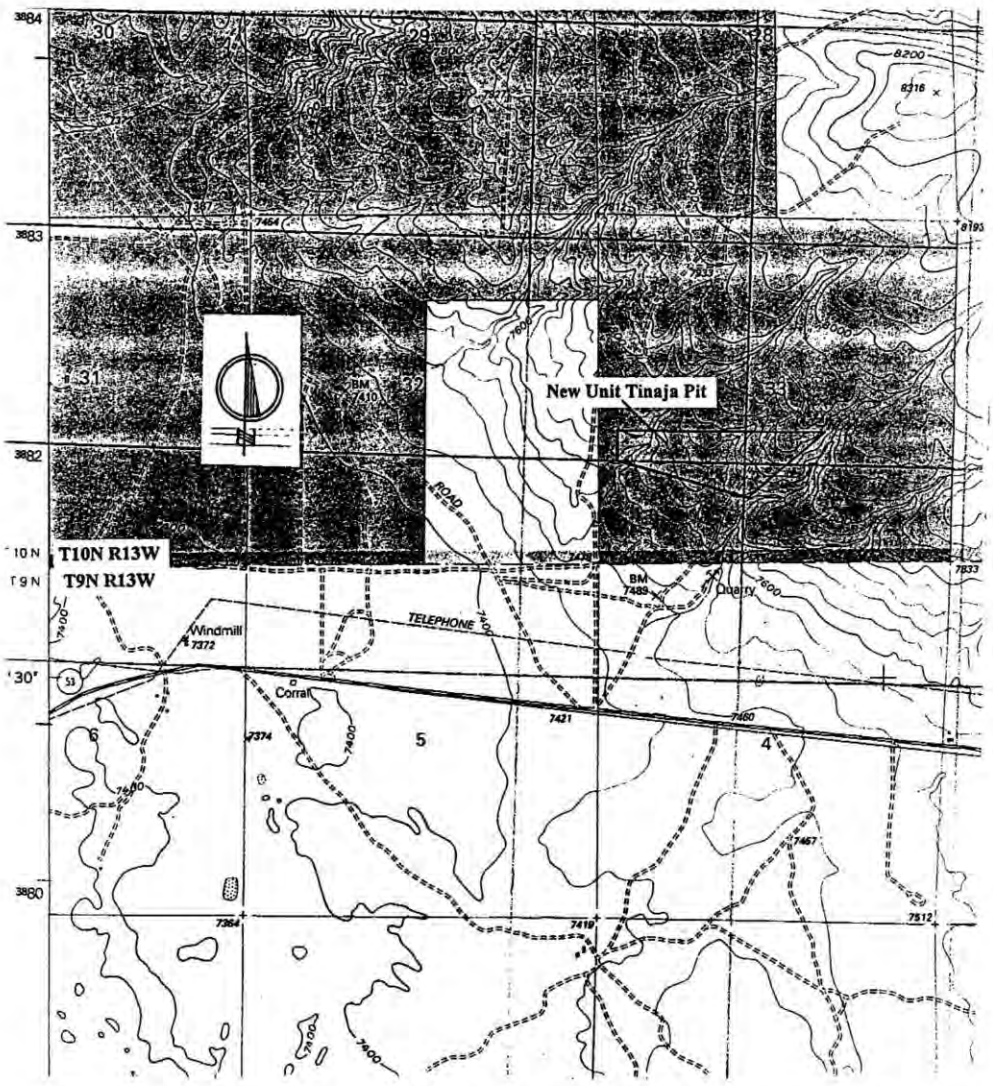


Fig. 1. Portion of USGS Valle Largo, NM 7.5' quad, 1995 (35108-A2), showing location of project area in T10N R13W, Sec. 33. Scale: 1:24,000. Contour interval: 40 ft.

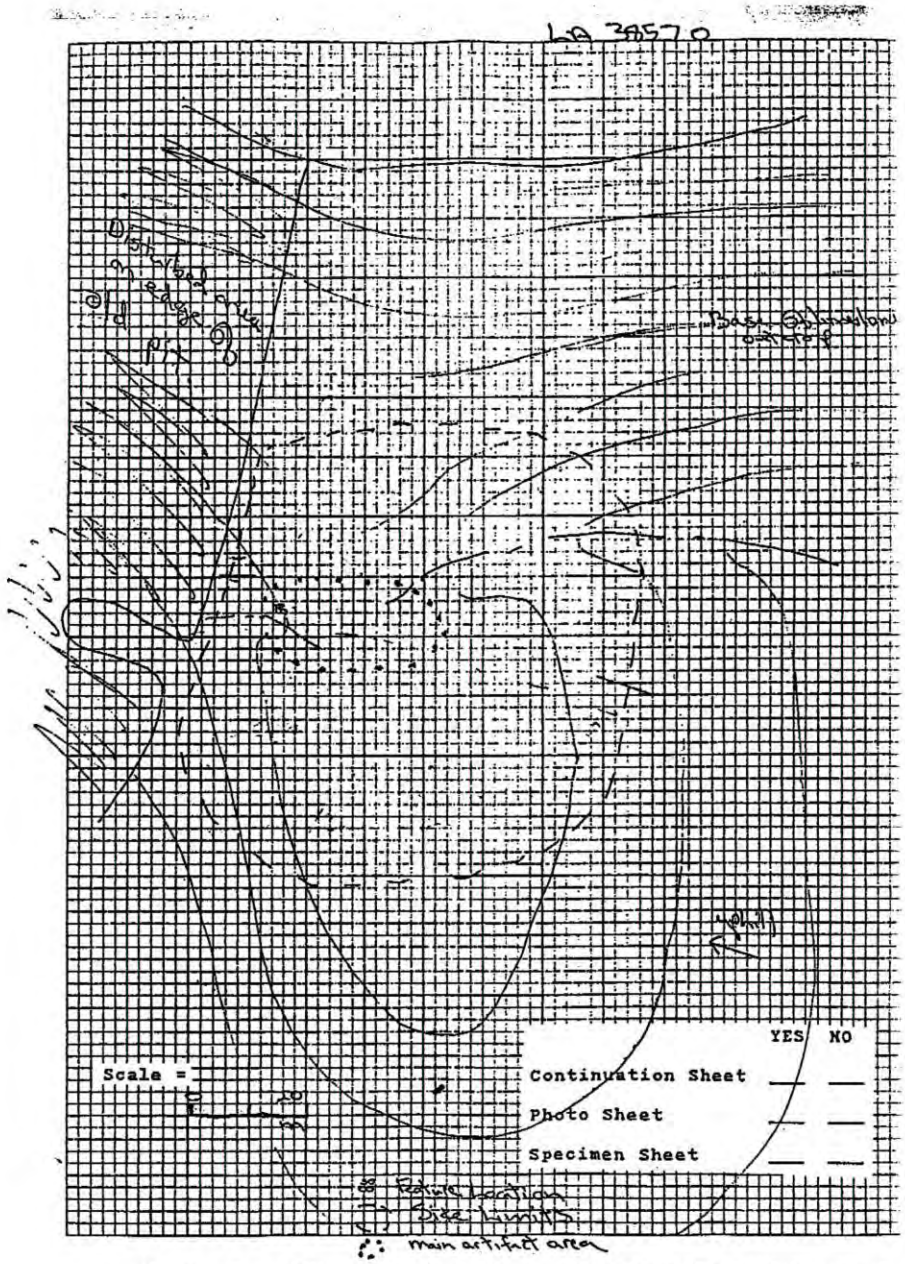


Fig. 2,a. Copy of Steve Koczan's sketch map of LA 38570, 1982 (slightly reduced).

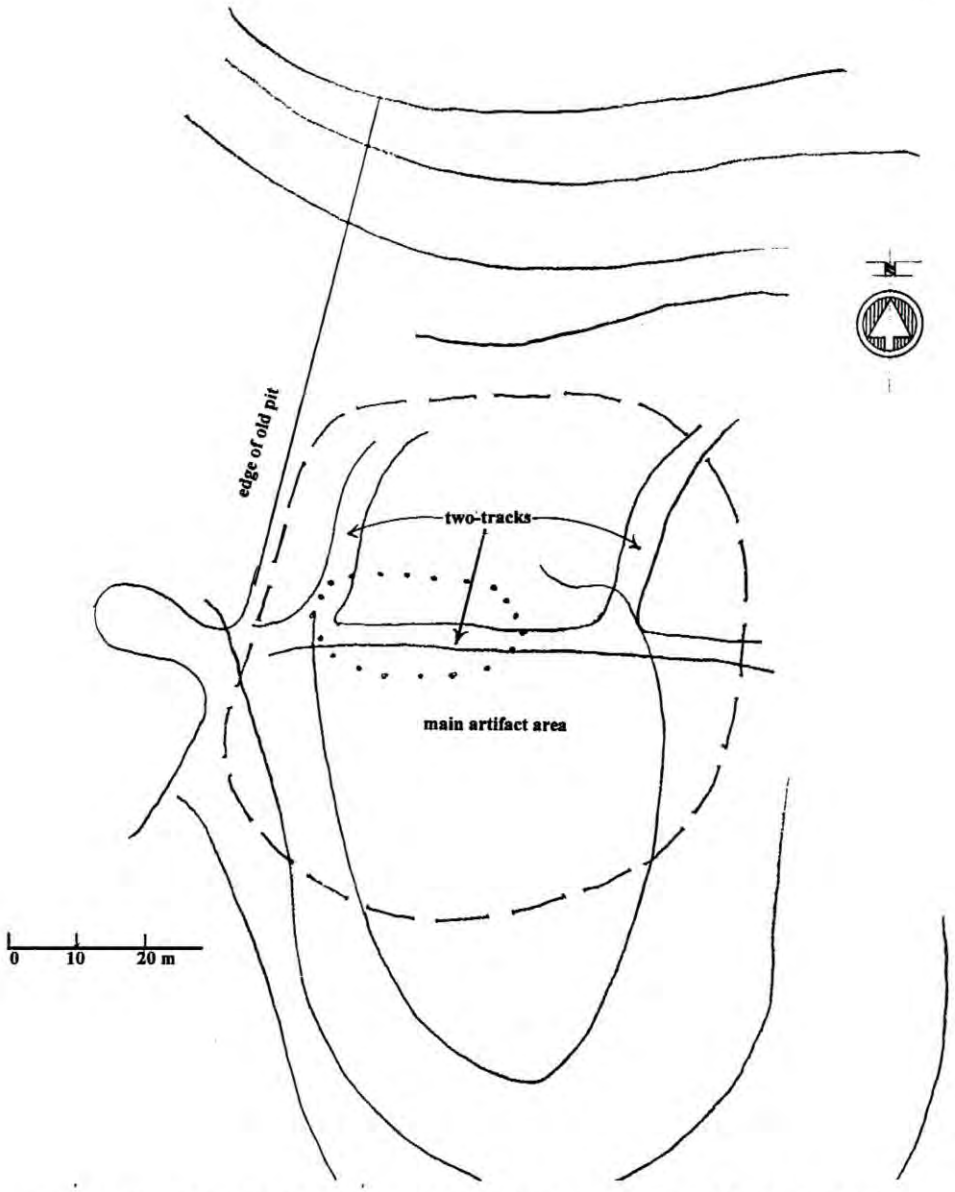


Fig. 2,b. Sketch map of LA 38570, after Koczan's 1982 map, modified by QRA in July 2003 to include two-tracks and to show absence of rectangular structure of large sandstone slabs recorded on Koczan's map.

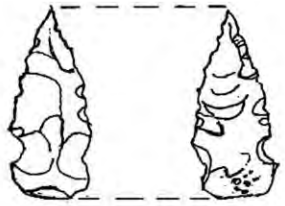


Fig. 3. Sketch of chert projectile point at IO-1. Actual size.

APPENDIX I. LOCATIONS OF IO-1, LA 28145, AND LA 38570.

[Note: Information on the location of cultural resources is confidential and is exempt from the Freedom of Information Act. Do not release to public.]

Site/IO	Legals	UTM's (all Z-12; NAD 27)
IO-1	T10N R13W Sec. 33 SW ¼ NW ¼ SE ¼	E754118 N3882046 (GPS)
LA 38145	T10N R13W Sec. 33 SE ¼ SW ¼ SW ¼ T9N R13W Sec. 4 NE ¼ NW ¼ NW ¼	E753660 N3881600
LA 38570	T9N R13W Sec. 4 NE ¼ NE ¼ NW ¼	E754000 N3881400

Map reference

USGS Valle Largo, NM 7.5' quad, 1995 (35108-A2). Scale: 1:24,000. Contour interval: 40 ft.

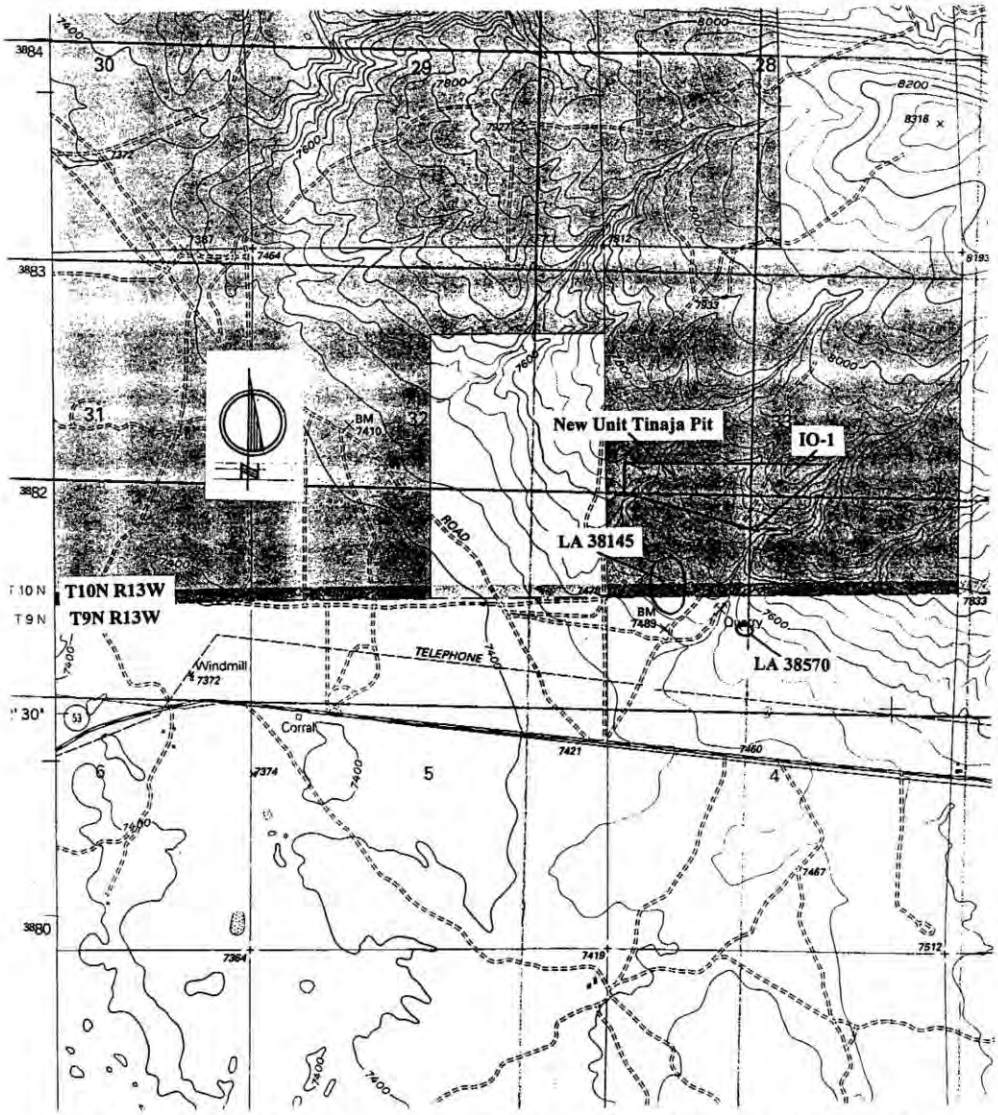
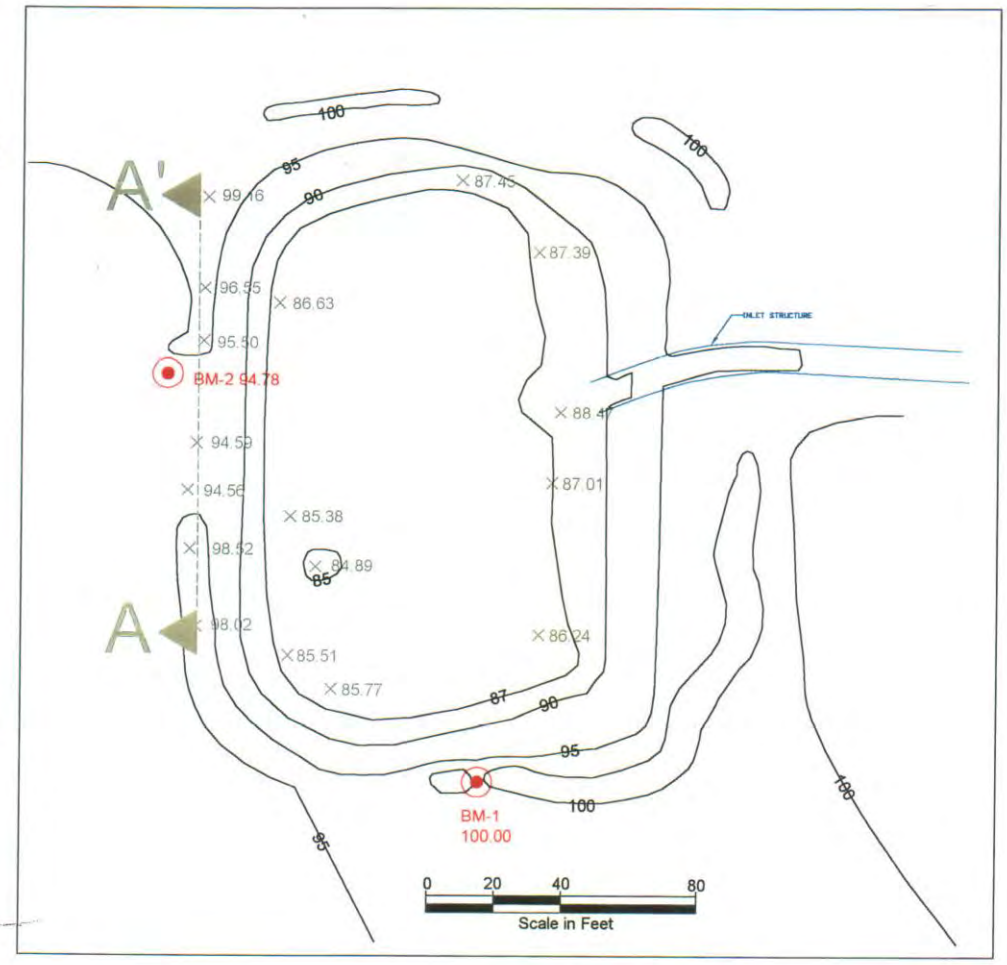


Fig. 4. Portion of USGS Valle Largo, NM 7.5' quad, 1995 (35108-A2), showing locations of IO-1, LA 38145, and LA 38570 in relation to project area. Scale: 1:24,000. Contour interval: 40 ft

EXHIBIT M

STORM WATER CONTROL STRUCTURE INFORMATION



DONALD R. BRIGGS
NEW MEXICO
14912
REGISTERED PROFESSIONAL ENGINEER
10/23/09

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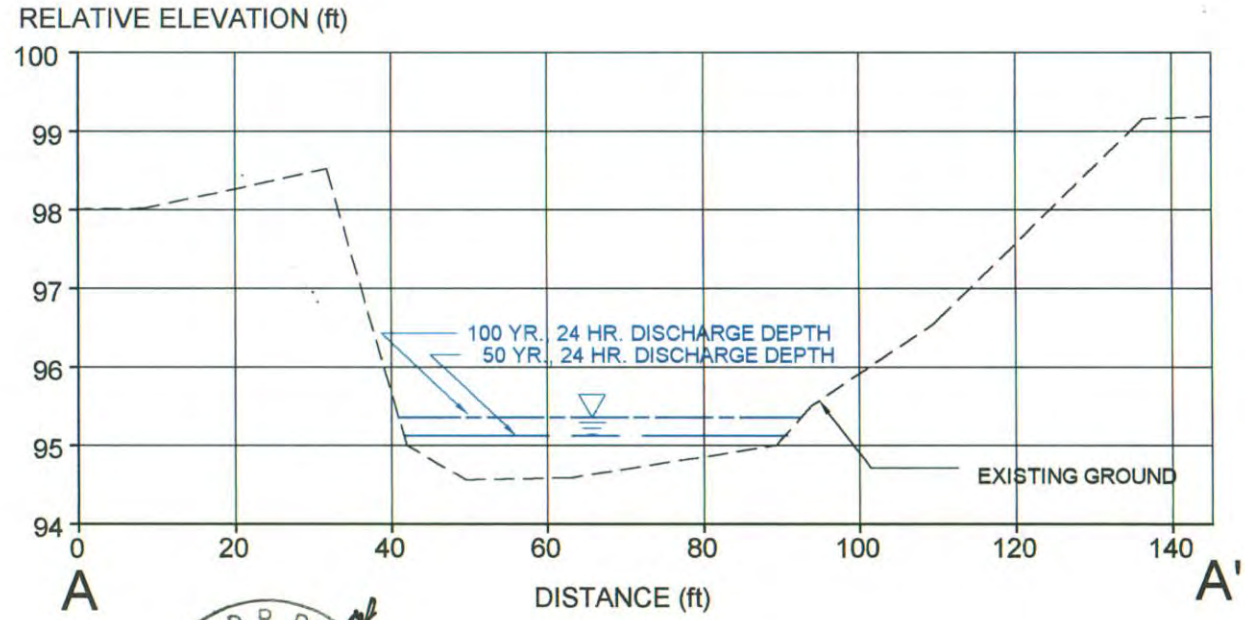
TINAJA PIT
FACILITIES AREA
SEDIMENT RETENTION POND
AS-BUILT PLAN



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10/23/07

TINAJA PIT
FACILITIES AREA
SEDIMENT RETENTION POND
SPILLWAY CROSS SECTION

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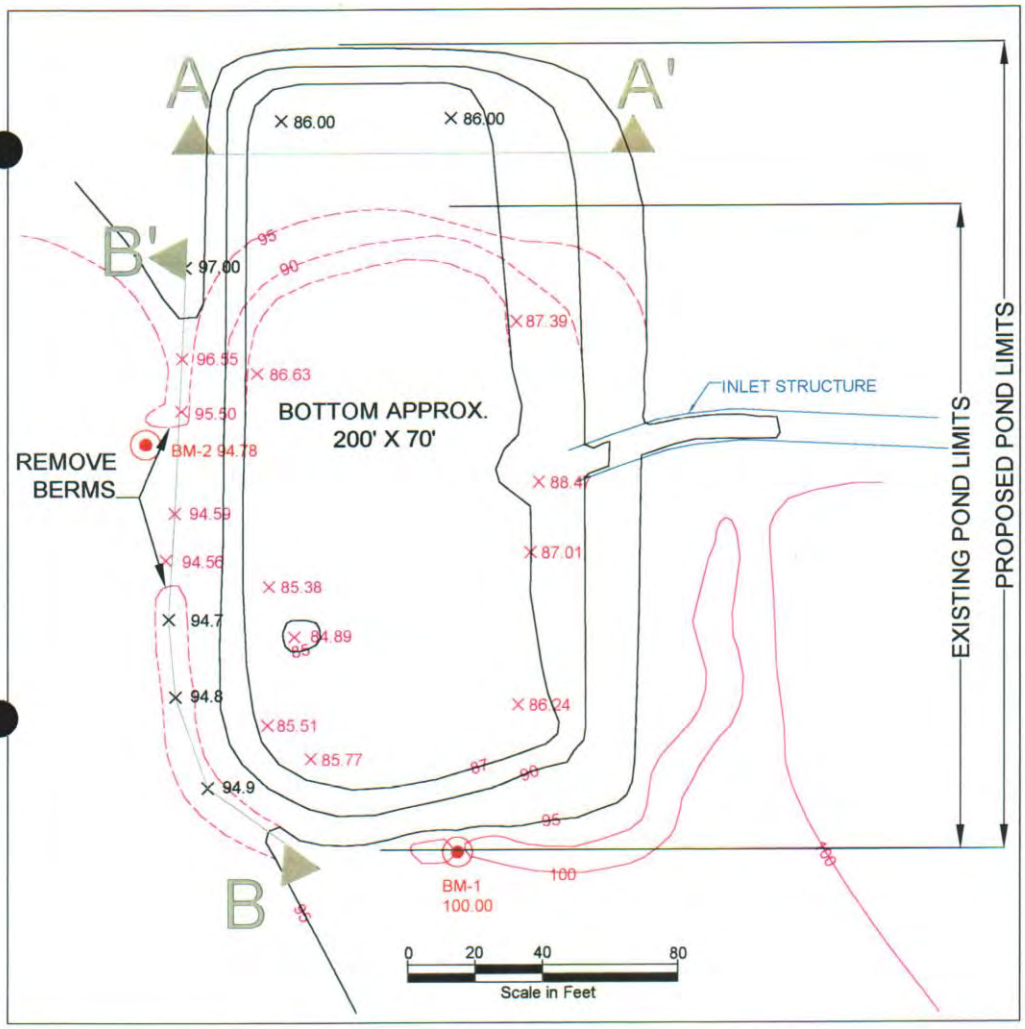

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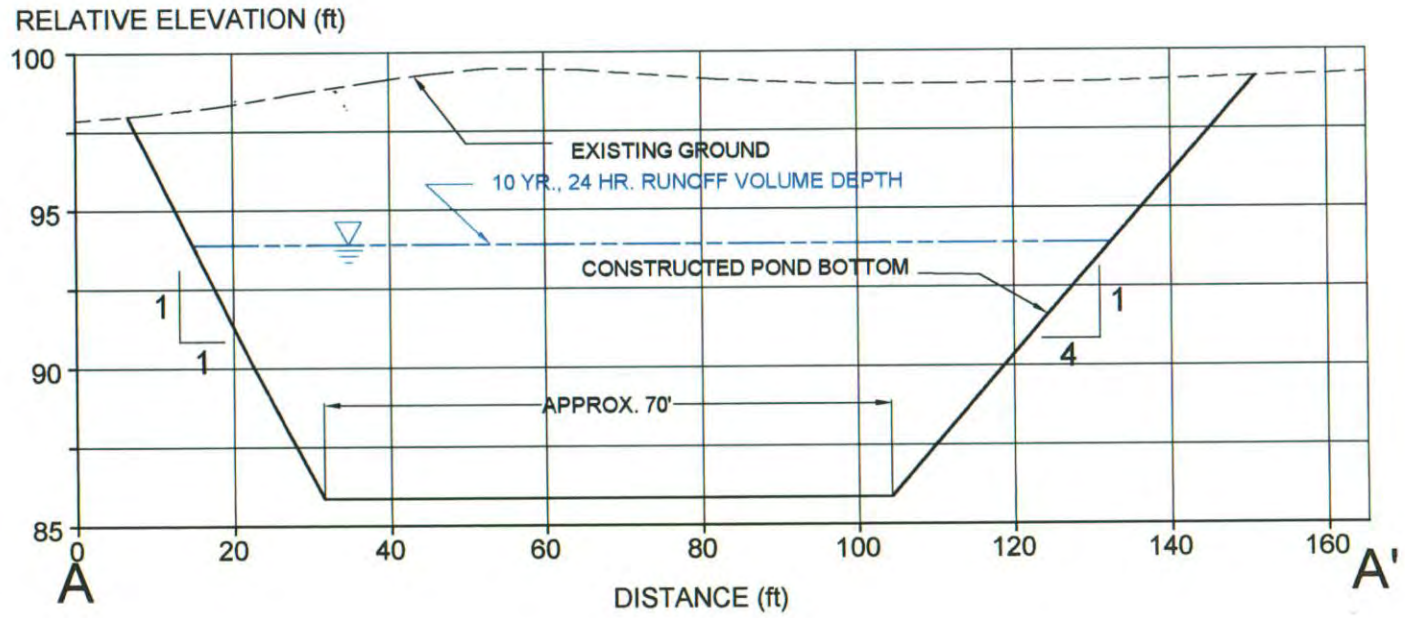
TINAJA PIT
PROPOSED
FACILITIES AREA
SEDIMENT RETENTION POND EXPANSION



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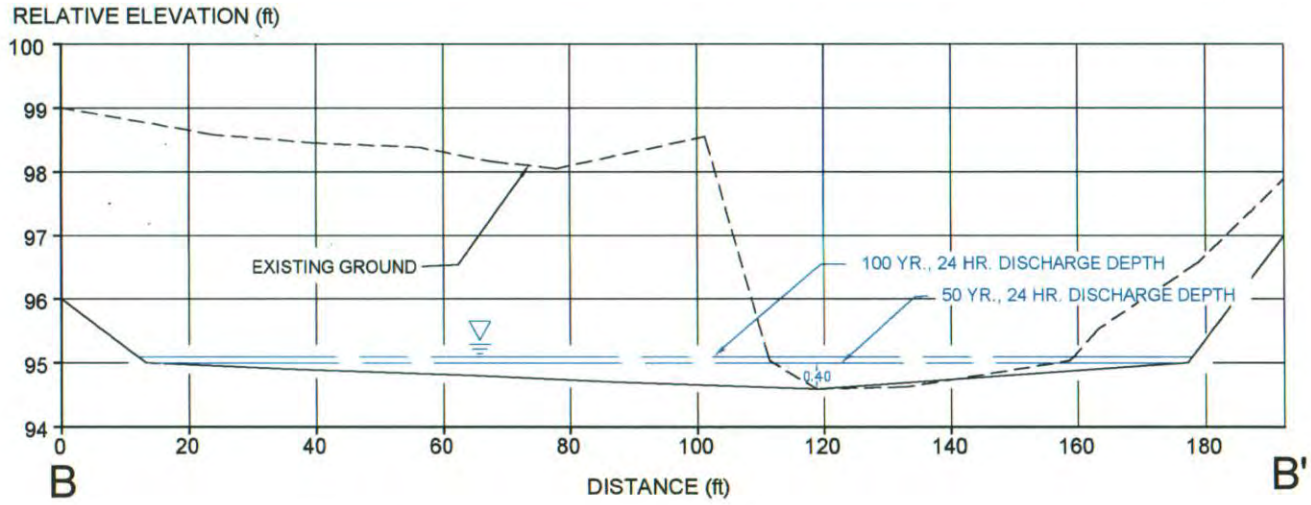
TINAJA PIT
PROPOSED
FACILITIES AREA SEDIMENT RETENTION POND EXPANSION
CROSS SECTION A-A'



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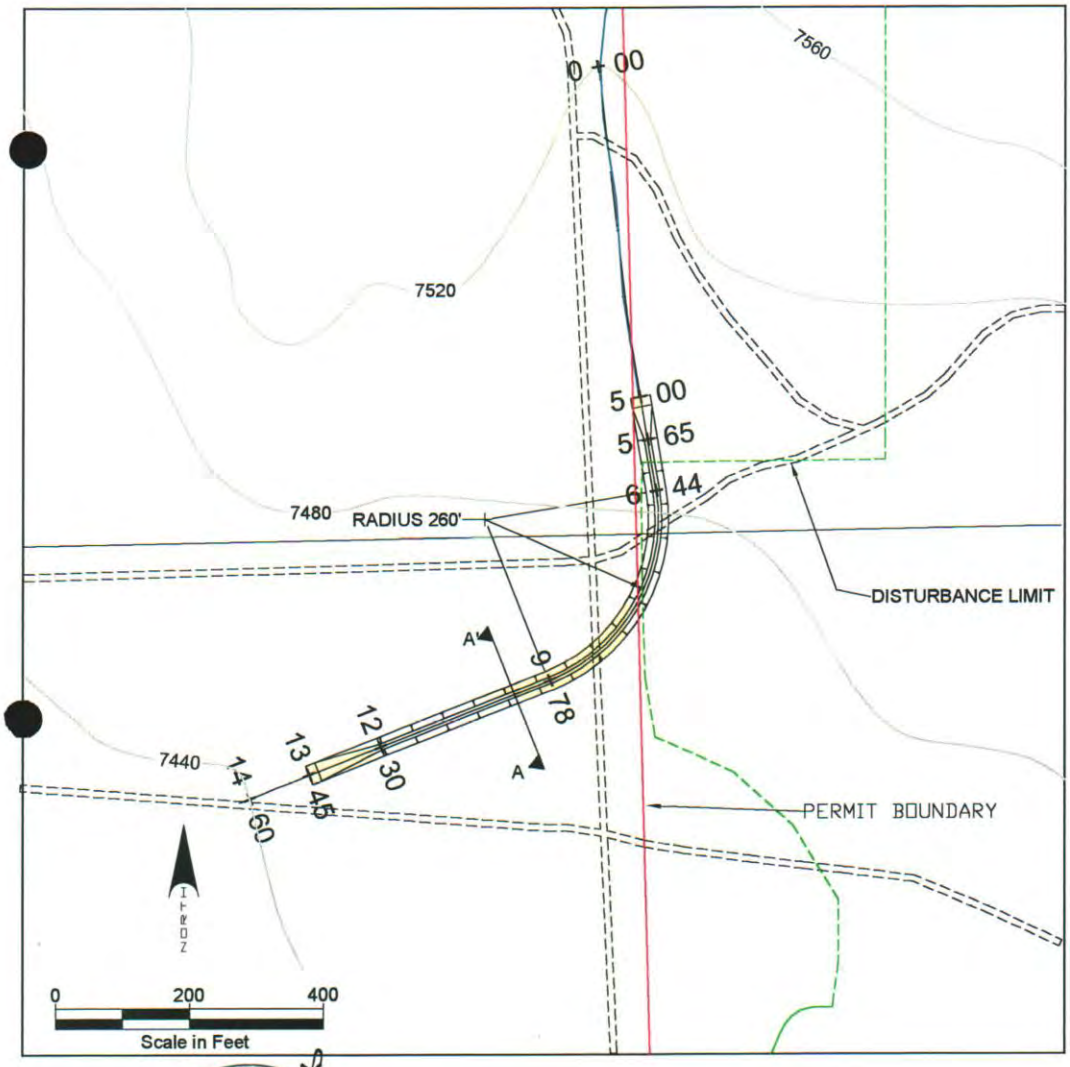
TINAJA PIT
FACILITIES AREA
SEDIMENT RETENTION POND
RE-CONSTRUCTED SPILLWAY CROSS SECTION



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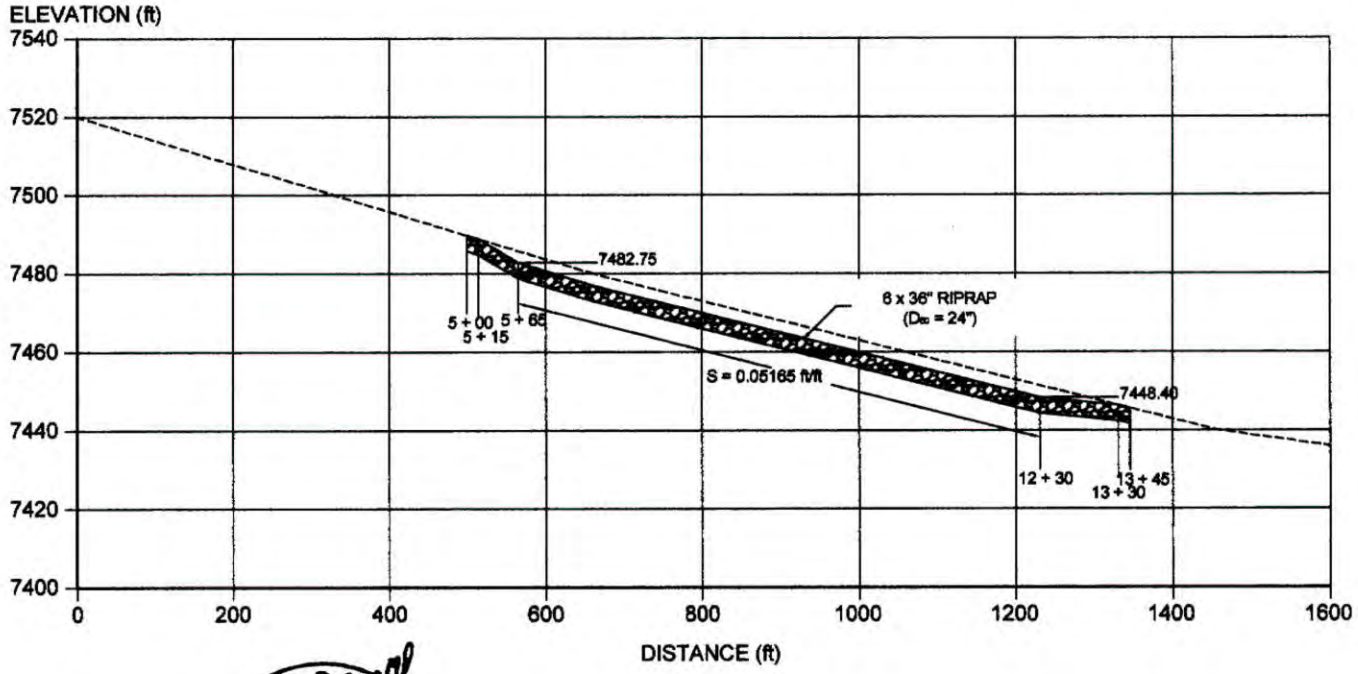
TINAJA PIT
WEST DIVERSION
PLAN



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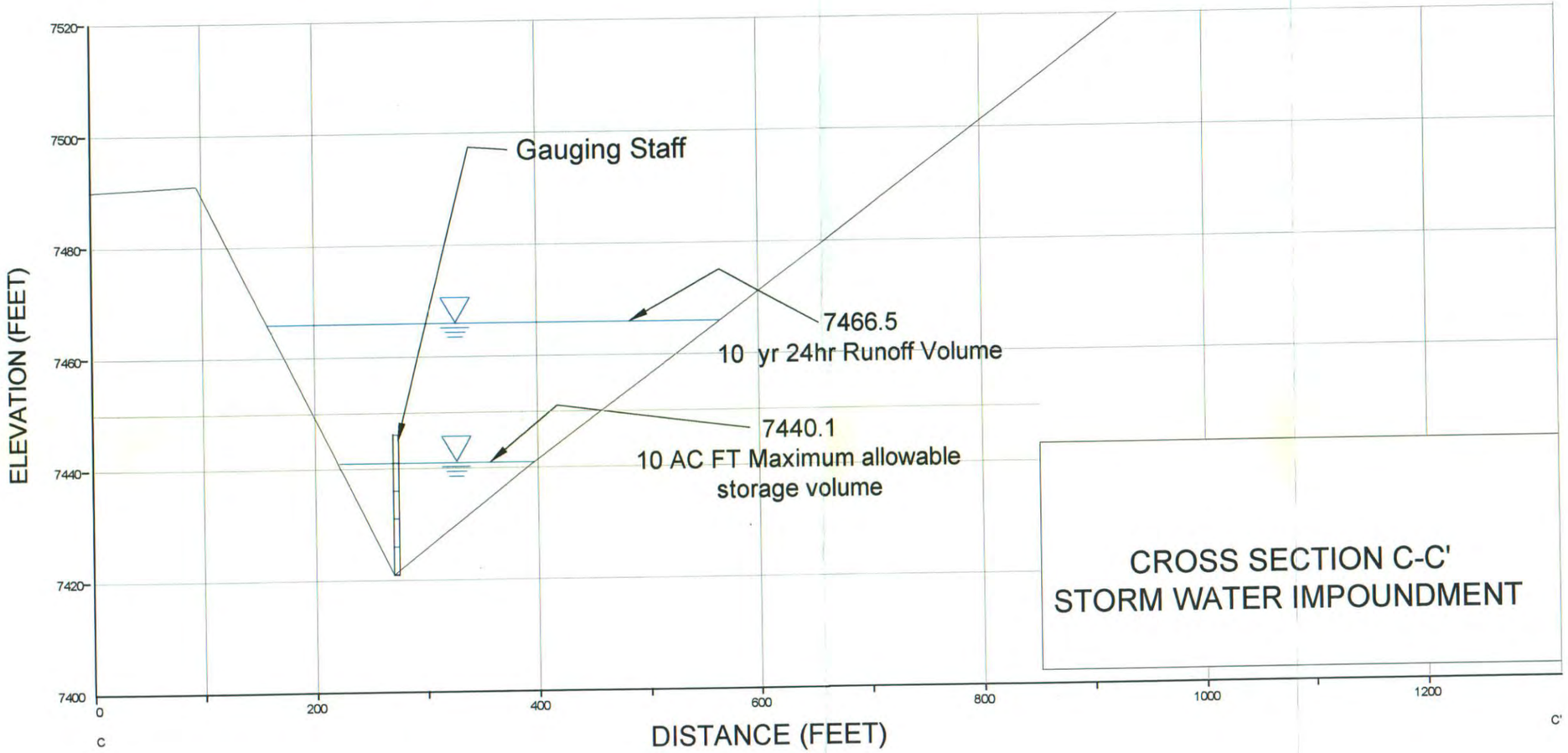
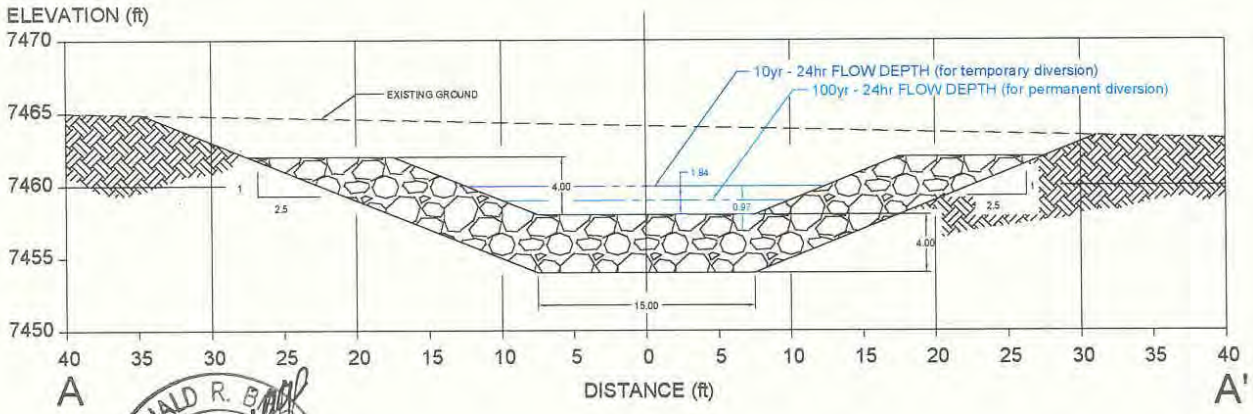
TINAJA PIT
WEST DIVERSION
PROFILE


7520
7500
7480
7460
7440
7420
7400
ELEVATION (FEET)
Gauging Staff
7466.5
10 yr 24hr Runoff Volume
7440.1
10 AC FT Maximum allowable
storage volume
0
200
400
600
800
1000
1200
C
C'
DISTANCE (FEET)
CROSS SECTION C-C'
STORM WATER IMPOUNDMENT



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NEW MEXICO
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TINAJA PIT
WEST DIVERSION
CROSS SECTION A-A'

HYDROLOGY DATA SHEET

C & E Concrete
Tinaja Pit

Prediction Point: Sediment Retention Pond — Date: 9/29/03

Drainage Area	A=	42	acres
Runoff Curve Number	CN=	91	
Watershed Length	L=	1918	feet
Elevation Difference	d=	143	feet
Tc	Tc=	0.12	hours
cfs/ac/in		2.16	cfs/ac/in
(REFERANCE SCS 1985)			
2-year 24-hour rainfall	p2=	1.40	inches
2-year 24-hour direct runoff	q2=	0.66	inches
2-year 24-hour volume	V2=	2.31	ac-ft
2-year 24-hour discharge	Q2=	59.84	cfs
5-year 24-hour rainfall	p5=	1.80	inches
5-year 24-hour direct runoff	q5=	0.99	inches
5-year 24-hour volume	V5=	3.47	ac-ft
5-year 24-hour discharge	Q5=	89.88	cfs
10-year 24-hour rainfall	p10=	2.00	inches
10-year 24-hour direct runoff	q10=	1.16	inches
10-year 24-hour volume	V10=	4.07	ac-ft
10-year 24-hour discharge	Q10=	105.57	cfs
25-year 24-hour rainfall	p25=	2.40	inches
25-year 24-hour direct runoff	q25=	1.52	inches
25-year 24-hour volume	V25=	5.32	ac-ft
25-year 24-hour discharge	Q25=	137.87	cfs
50-year 24-hour rainfall	p50=	2.60	inches
50-year 24-hour direct runoff	q50=	1.70	inches
50-year 24-hour volume	V50=	5.96	ac-ft
50-year 24-hour discharge	Q50=	154.38	cfs
100-year 24-hour rainfall	p100=	3.00	inches
100-year 24-hour direct runoff	q100=	2.07	inches
100-year 24-hour volume	V100=	7.25	ac-ft
100-year 24-hour discharge	Q100=	187.91	cfs

EXISTING
FACILITIES AREA SEDIMENT RETENTION POND
STAGE/STORAGE TABLE

ELEVATION (ft)	AREA (sq ft)	AVERAGE AREA (sq ft)	CHANGE IN ELEVATION (ft)	VOLUME (cu ft)	VOLUME (ac ft)	CUMULATIVE VOLUME (ac ft)
84.89	0					
		42.9	0.11	4.72	0.000	0.00
85	85.8					
		6140.75	2	12281.50	0.28	0.28
87	12195.7					
		14491.75	3	43475.25	1.00	1.28
90	16787.8					
		20087.85	5	100439.25	2.31	3.59
95	23387.9					

POND OVERFLOW ELEVATION = 94.56 ft.
POND VOLUME = 3.38 ac. ft.

PROPOSED EXPANDED
FACILITIES AREA SEDIMENT RETENTION POND
STAGE/STORAGE TABLE

ELEVATION (ft)	AREA (sq ft)	AVERAGE AREA (sq ft)	CHANGE IN ELEVATION (ft)	VOLUME (cu ft)	VOLUME (ac ft)	CUMULATIVE VOLUME (ac ft)
84.89	0					
		42.9	0.11	4.72	0.000	0.00
85	85.8					
		8251.55	2	16503.10	0.38	0.38
87	16417.3					
		19506.75	3	58520.25	1.34	1.72
90	22596.2					
		26307.25	5	131536.25	3.02	4.74
95	30018.3					

POND OVERFLOW ELEVATION = 94.56 ft.
POND VOLUME = 4.48 ac. ft.
10 yr. 24 hr. VOLUME = 4.08 ac. ft.
10 yr. 24 hr. VOLUME ELEVATION = 93.90 ft.

METRIC
Corporation

HYDROLOGY DATA SHEET

Project: C & E CONCRETE TINAJA PIT

Prediction Point: WEST DIVERSION

Date: 9/23/03

Drainage Area	A=	342	acres
Runoff Curve Number	CN=	90	
Watershed Length	L=	11088	feet
Elevation Difference	d=	846	feet
Tc	Tc=	0.46	hours
cfs/ac/in		1.01	cfs/ac/in
(REFERANCE SCS 1985)			

2-year 24-hour rainfall	p2=	1.40	inches
2-year 24-hour direct runoff	q2=	0.61	inches
2-year 24-hour volume	V2=	17.27	ac-ft
2-year 24-hour discharge	Q2=	208.49	cfs
5-year 24-hour rainfall	p5=	1.80	inches
5-year 24-hour direct runoff	q5=	0.93	inches
5-year 24-hour volume	V5=	26.39	ac-ft
5-year 24-hour discharge	Q5=	318.49	cfs
10-year 24-hour rainfall	p10=	2.00	inches
10-year 24-hour direct runoff	q10=	1.09	inches
10-year 24-hour volume	V10=	31.18	ac-ft
10-year 24-hour discharge	Q10=	376.36	cfs
25-year 24-hour rainfall	p25=	2.40	inches
25-year 24-hour direct runoff	q25=	1.44	inches
25-year 24-hour volume	V25=	41.10	ac-ft
25-year 24-hour discharge	Q25=	496.08	cfs
50-year 24-hour rainfall	p50=	2.60	inches
50-year 24-hour direct runoff	q50=	1.62	inches
50-year 24-hour volume	V50=	46.18	ac-ft
50-year 24-hour discharge	Q50=	557.49	cfs
100-year 24-hour rainfall	p100=	3.00	inches
100-year 24-hour direct runoff	q100=	1.98	inches
100-year 24-hour volume	V100=	56.55	ac-ft
100-year 24-hour discharge	Q100=	682.57	cfs

HYDROLOGY DATA SHEET

C & E Concrete
Tinaja Pit

Prediction Point	Permanent West Diversion	Date 10/21/03		
Drainage Area		A=	28	acres
Runoff Curve Number		CN=	91	
Watershed Length		L=	2658	feet
Elevation Difference		d=	230	feet
Tc		Tc=	0.14	hours
cfs/ac/in			2.02	cfs/ac/in
(REFERANCE SCS 1985)				
2-year 24-hour rainfall		p2=	1.40	inches
2-year 24-hour direct runoff		q2=	0.66	inches
2-year 24-hour volume		V2=	1.54	ac-ft
2-year 24-hour discharge		Q2=	37.22	cfs
5-year 24-hour rainfall		p5=	1.80	inches
5-year 24-hour direct runoff		q5=	0.99	inches
5-year 24-hour volume		V5=	2.31	ac-ft
5-year 24-hour discharge		Q5=	55.91	cfs
10-year 24-hour rainfall		p10=	2.00	inches
10-year 24-hour direct runoff		q10=	1.16	inches
10-year 24-hour volume		V10=	2.72	ac-ft
10-year 24-hour discharge		Q10=	65.67	cfs
25-year 24-hour rainfall		p25=	2.40	inches
25-year 24-hour direct runoff		q25=	1.52	inches
25-year 24-hour volume		V25=	3.55	ac-ft
25-year 24-hour discharge		Q25=	85.77	cfs
50-year 24-hour rainfall		p50=	2.60	inches
50-year 24-hour direct runoff		q50=	1.70	inches
50-year 24-hour volume		V50=	3.97	ac-ft
50-year 24-hour discharge		Q50=	96.03	cfs
100-year 24-hour rainfall		p100=	3.00	inches
100-year 24-hour direct runoff		q100=	2.07	inches
100-year 24-hour volume		V100=	4.83	ac-ft
100-year 24-hour discharge		Q100=	116.89	cfs

10-22-2003
CLIENT C&E CONCRETE
PROJECT TINAJA PIT

PREDICTION POINT WEST DIVERSION

d50 RANGE = 1.421 TO 1.968(ft) RIPRAP SHAPE IS CRUSHED
STABILITY DISCHARGE 376 (cfs)
CAPACITY DISCHARGE 500 (cfs)

d50 (in)	N	W (ft)	S (ft/ft)	SS	Vs (fps)	Ds (ft)	Vc (fps)	Dc (ft)	P/R ROCK	P/R CHANNEL
17.5	0.042	27	0.05165	2.5	9.1	1.4	10.0	1.6	28.1	28.5
18.0	0.042	26	0.05165	2.5	9.1	1.4	10.1	1.7	26.2	27.2
18.5	0.042	24	0.05165	2.5	9.3	1.5	10.3	1.7	24.5	25.1
19.0	0.043	22	0.05165	2.5	9.4	1.5	10.4	1.8	22.9	23.1
19.5	0.043	21	0.05165	2.5	9.5	1.6	10.5	1.9	21.5	22.1
20.0	0.043	19	0.05165	2.5	9.7	1.7	10.7	2.0	20.1	20.2
20.5	0.043	18	0.05165	2.5	9.8	1.7	10.7	2.0	18.9	19.4
21.0	0.043	17	0.05165	2.5	9.8	1.8	10.8	2.1	17.8	18.5
21.5	0.044	15	0.05165	2.5	10.1	1.9	11.0	2.2	16.8	17.0
22.0	0.044	14	0.05165	2.5	10.2	2.0	11.1	2.3	15.9	16.3
22.5	0.044	13	0.05165	2.5	10.2	2.0	11.1	2.4	15.0	15.6
23.0	0.044	11	0.05165	2.5	10.4	2.2	11.3	2.6	14.2	14.4
23.5	0.044	10	0.05165	2.5	10.5	2.3	11.3	2.7	13.5	13.9
24.0	0.044	10	0.05165	2.5	10.4	2.3	11.3	2.7	12.8	13.8

PIT AREA STORM WATER INFLOW

WATERSHED	10 yr 24 hr VOLUME (ac ft)
WET PLANT WATERSHED	44.02
MID-PIT WATERSHED	35.39
WEST DIVERSION PIT INFLOW WATERSHED	29.28
TOTAL PIT INFLOW VOLUME	108.69

PIT AREA STORM WATER IMPOUNDMENT
STAGE/STORAGE TABLE

ELEVATION	AREA	AVERAGE AREA	CHANGE IN ELEVATION	VOLUME	VOLUME	CUMULATIVE VOLUME
(ft)	(sq ft)	(sq ft)	(ft)	(cu ft)	(ac ft)	(ac ft)
7415.6	0					
		17086	24.4	416898.40	9.57	9.57
7440	34172					
		163305	40	6532200.00	149.96	159.53
7480	292438					
		609294	40	24371760.00	559.50	719.03
7520	926150					

POND OVERFLOW ELEVATION =	7495.00	ft.
POND VOLUME =	369.34	ac. ft.
10 yr - 24 hr Runoff Volume =	108.69	ac. ft.
10 yr - 24 hr Runoff Elevation =	7466.44	ft.
10 ac. ft. Maximum Volume Elevation	7440.11	ft.

HYDROLOGY DATA SHEET

C & E Concrete
Tinaja Pit

Prediction Point Wet Plant

Date 8/1/2003

Drainage Area	A=	454	acres
Runoff Curve Number	CN=	91	
Watershed Length	L=	11340	feet
Elevation Difference	d=	762	feet
Tc	Tc=	0.49	hours
cfs/ac/in		0.96	cfs/ac/in
(REFERANCE SCS 1985)			
2-year 24-hour rainfall	p2=	1.40	inches
2-year 24-hour direct runoff	q2=	0.66	inches
2-year 24-hour volume	V2=	24.95	ac-ft
2-year 24-hour discharge	Q2=	286.36	cfs
5-year 24-hour rainfall	p5=	1.80	inches
5-year 24-hour direct runoff	q5=	0.99	inches
5-year 24-hour volume	V5=	37.48	ac-ft
5-year 24-hour discharge	Q5=	430.11	cfs
10-year 24-hour rainfall	p10=	2.00	inches
10-year 24-hour direct runoff	q10=	1.16	inches
10-year 24-hour volume	V10=	44.02	ac-ft
10-year 24-hour discharge	Q10=	505.20	cfs
25-year 24-hour rainfall	p25=	2.40	inches
25-year 24-hour direct runoff	q25=	1.52	inches
25-year 24-hour volume	V25=	57.50	ac-ft
25-year 24-hour discharge	Q25=	659.79	cfs
50-year 24-hour rainfall	p50=	2.60	inches
50-year 24-hour direct runoff	q50=	1.70	inches
50-year 24-hour volume	V50=	64.38	ac-ft
50-year 24-hour discharge	Q50=	738.77	cfs
100-year 24-hour rainfall	p100=	3.00	inches
100-year 24-hour direct runoff	q100=	2.07	inches
100-year 24-hour volume	V100=	78.36	ac-ft
100-year 24-hour discharge	Q100=	899.22	cfs

HYDROLOGY DATA SHEET

C & E Concrete
Tinaja Pit

Prediction Point Pit Inflow

Date 8/1/2003

Drainage Area	A=	365	acres
Runoff Curve Number	CN=	91	
Watershed Length	L=	8625	feet
Elevation Difference	d=	750	feet
Tc	Tc=	0.36	hours
cfs/ac/in		1.20	cfs/ac/in
(REFERANCE SCS 1985)			
2-year 24-hour rainfall	p2=	1.40	inches
2-year 24-hour direct runoff	q2=	0.66	inches
2-year 24-hour volume	V2=	20.06	ac-ft
2-year 24-hour discharge	Q2=	288.54	cfs
5-year 24-hour rainfall	p5=	1.80	inches
5-year 24-hour direct runoff	q5=	0.99	inches
5-year 24-hour volume	V5=	30.13	ac-ft
5-year 24-hour discharge	Q5=	433.37	cfs
10-year 24-hour rainfall	p10=	2.00	inches
10-year 24-hour direct runoff	q10=	1.16	inches
10-year 24-hour volume	V10=	35.39	ac-ft
10-year 24-hour discharge	Q10=	509.03	cfs
25-year 24-hour rainfall	p25=	2.40	inches
25-year 24-hour direct runoff	q25=	1.52	inches
25-year 24-hour volume	V25=	46.22	ac-ft
25-year 24-hour discharge	Q25=	664.80	cfs
50-year 24-hour rainfall	p50=	2.60	inches
50-year 24-hour direct runoff	q50=	1.70	inches
50-year 24-hour volume	V50=	51.76	ac-ft
50-year 24-hour discharge	Q50=	744.38	cfs
100-year 24-hour rainfall	p100=	3.00	inches
100-year 24-hour direct runoff	q100=	2.07	inches
100-year 24-hour volume	V100=	63.00	ac-ft
100-year 24-hour discharge	Q100=	906.05	cfs

HYDROLOGY DATA SHEET

C & E Concrete
Tinaja Pit

Prediction Point West Diversion - Pit Inflow Date 9/29/03

Drainage Area	A=	302	acres
Runoff Curve Number	CN=	91	
Watershed Length	L=	7672	feet
Elevation Difference	d=	666	feet
Tc	Tc=	0.33	hours
cfs/ac/in		1.28	cfs/ac/in
(REFERANCE SCS 1985)			

2-year 24-hour rainfall	p2=	1.40	inches
2-year 24-hour direct runoff	q2=	0.66	inches
2-year 24-hour volume	V2=	16.60	ac-ft
2-year 24-hour discharge	Q2=	254.60	cfs
5-year 24-hour rainfall	p5=	1.80	inches
5-year 24-hour direct runoff	q5=	0.99	inches
5-year 24-hour volume	V5=	24.93	ac-ft
5-year 24-hour discharge	Q5=	382.39	cfs
10-year 24-hour rainfall	p10=	2.00	inches
10-year 24-hour direct runoff	q10=	1.16	inches
10-year 24-hour volume	V10=	29.28	ac-ft
10-year 24-hour discharge	Q10=	449.15	cfs
25-year 24-hour rainfall	p25=	2.40	inches
25-year 24-hour direct runoff	q25=	1.52	inches
25-year 24-hour volume	V25=	38.25	ac-ft
25-year 24-hour discharge	Q25=	586.60	cfs
50-year 24-hour rainfall	p50=	2.60	inches
50-year 24-hour direct runoff	q50=	1.70	inches
50-year 24-hour volume	V50=	42.82	ac-ft
50-year 24-hour discharge	Q50=	656.82	cfs
100-year 24-hour rainfall	p100=	3.00	inches
100-year 24-hour direct runoff	q100=	2.07	inches
100-year 24-hour volume	V100=	52.12	ac-ft
100-year 24-hour discharge	Q100=	799.47	cfs