APPENDIX 6B
BIOLOGICAL ASSESSMENT
SENTINEL QUARRY EXPANSION

BIOLOGICAL ASSESSMENT

OMYA (CALIFORNIA) INC.
PROPOSED SENTINEL QUARRY EXPANSION

May 2000

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BIOLOGICAL ASSESSMENT
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I. INTRODUCTION

Pursuant to Section 7(c) of the Endangered Species Act, this document serves as a Biological Assessment of impacts to Threatened, Endangered or Proposed plants and animals from the proposed Sentinel Quarry Expansion. This Biological Assessment has been prepared to review proposed expansion of the OMYA (California), Inc. Sentinel quarry and Butterfield overburden site, and to determine whether the project's potential impacts to federally listed threatened or endangered plants or animals will result in jeopardy to their long-term existence. The Mountaintop Ranger District of the San Bernardino National Forest is reviewing the proposed project as lead federal agency, pursuant to the National Environmental Policy Act.

The project site is in the northern San Bernardino Mountains, on public land administered by the San Bernardino National Forest (Figures 1 & 2). The "federal action area" includes the proposed expansion areas, existing Sentinel Quarry, existing Crystal Creek haul road with a 50-meter buffer to existing processing plant, the processing plant, the *Oxytheca* dust study location ¼ mile from B5 Overburden Pad Extension to the southern terminus of Forest Road 3N87 then to the eastern portion of Sentinel Quarry (Figure 3), and the access road to the processing plant, Meridian Road.

Threatened and endangered species considered in this Biological Assessment are listed in Appendix 1, with a brief description of habitat and range, agency status, and probability of occurring on the project site. Threatened and endangered species not affected and not addressed here are listed in Appendix 2, with an explanation for their exclusion.

Of the five listed carbonate endemic plants considered in this assessment, only indirect effects to *Oxytheca parishii* var. *goodmaniana* and *Eriogonum ovalifolium var. vineum* are expected. The USFWS Recovery Plan for the Carbonate Endemic Plants is in draft format. Critical habitat is not designated at this time.

On the San Bernardino National Forest, threatened and endangered wildlife species include bald eagle, peregrine falcon, unarmored three-spined stickleback, desert tortoise, California red-legged frog, Quino checkerspot, Mojave tui chub, California brown pelican, California condor, southwestern willow flycatcher, coastal California gnatcatcher, least Bell's vireo, peninsular bighorn sheep, San Bernardino kangaroo rat, and arroyo toad. Of these, only desert tortoise, willow flycatchter, and least Bell's vireo are known from the general vicinity of project site on the north slope of the San Bernarndino Mountains. No designated critical habitat occurs within the project area or the federal action area for this proposal.

This Biological Assessment addresses the proposed project's potential impacts to listed threatened, endangered or proposed species occurring in the general area, in compliance with the Forest Service Manual (FSM) 2672.42, Section 7 of the Federal Endangered Species Act (19 USC 1536 [c]), National Environmental Policy Act of 1969, and 50 CFR 402.12 (f).

II. CONSULTATION TO DATE

SBNF staff provided a list of threatened or endangered species occurring on SBNF lands to the Fish and Wildlife Service on 14 July 1998, 27 Jan, 23 April, 12 July, and 10 October 1999 with a request for any changes or additions. No reply was received regarding this project. Every species included on the list is included in this report, either in Appendix 1 or Appendix 2.

On March 12, 1998, a field meeting at the project site was held between the Forest Service, OMYA, Inc., their biologist and Scott Eliason of the U.S. Fish and Wildlife Service. Potential impacts and avoidance and minimization measures for *Oxytheca parishii* var. *goodmaniana* and carbonate substrates were discussed.

On July 13, 1998, September 17, 1998, and February 25, 1999, Scott Eliason of the USFWS provided input on the alternatives to date and the consultation process needed.

III. LEGAL REQUIREMENTS AND MANAGEMENT DIRECTION

Applicable requirements and direction may be found in the Endangered Species Act, National Forest Management Act, Department of Agriculture 9500-4 Regulations, Forest Service Manual, and the San Bernardino National Forest Land and Resource Management Plan (USDA Forest Service 1989).

National Forest Management Act

The National Forest Management Act of 1976 and its implementing regulations direct the Forest Service to maintain viable and well-distributed populations of all native species. In addition, the Secretary of Agriculture's policy on fish and wildlife (Department Regulation 9500-4) directs the Forest Service to avoid actions "which may cause a species to become threatened or endangered".

Forest Service Manual

Forest Service Manual 2670 further directs the Forest Service:

- to avoid or minimize impacts to species whose viability has been identified as a concern.
- that if impacts cannot be avoided, analyze the significance of potential adverse effects... line officer can allow or disallow the impact but the decision must not result in loss of species viability or create a significant trend towards Federal listing.
- to develop/implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions.

Endangered Species Act

The Endangered Species Act contains protection for all species federally-listed as endangered or threatened:

- Federal agencies shall seek to conserve endangered species and threatened species and shall, in consultation with U.S. Fish and Wildlife Service, utilize their authorities in furthering the purposes of the Endangered Species Act by carrying out programs for the conservation of endangered and threatened species.
- Federal agencies shall confer with U.S. Fish and Wildlife Service on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed.

San Bernardino National Forest Land Management Plan Direction

Carbonate Plants

Standard and Guidelines for carbonate plants direct the Forest to:

- Integrate management direction for sensitive plants endemic to limestone into mining operation and reclamation plans.
- Establish refugia to protect limestone plant habitat in areas such as: Blackhawk Mountain, Helendale Fault, Rattlesnake canyon, and habitat for *Lesquerella kingii* ssp. *bernardina* north of Big Bear Lake.
- Request mineral entry withdrawal for limestone plant refugia. Coordinate with mining companies and other appropriate agencies in the establishment of refugia.

Minerals

Standard and Guidelines for Minerals directs the Forest to:

- Investigate the need for mineral withdrawal or other suitable alternatives where mining significantly conflicts with unique resource values.
- Allow production of minerals and energy with the assurance of adequate protection of other surface resources and resource values.
- Permits, leases, and Plans of Operation are to assure that adverse environmental effects are minimized or mitigated and that mined lands are reclaimed in a timely manner to regain surface production and use.
- Determine validity of all mining claims which operate or propose to operate in areas of sensitive plant or animal habitat.

Forest Management Area Direction

The project area occurs within the Back Country Management Area and is mapped within a "watershed" management emphasis zone. According to the the SBNF Land and Resource Management Plan (USDA1988), the SBNF will administer mining operations, and "Plans of operation and appropriate mitigation and reclamation measures will be required for significant ground-disturbing activities. Viable populations of sensitive plants will be identified and protected through special measures." The LRMP prescribes management "to maintain habitat conditions for emphasis species," "to retain meadow and grassy openings," and "to maintain a mix of hardwoods and conifer[s] . . . consistent with the site potential to support hardwoods" in watershed emphasis zones.

Additional LRMP directives and their applicability to the proposed project are listed in Appendix 3.

SMARA

The California Surface Mining and Reclamation Act of 1975 (SMARA) is the State's response to society's need for a continuing supply of mineral resources, while preventing as much as possible, damage from mining activities to health, property and the environment (Zitney and Pompy 1997). SMARA serves as guidance to the BLM, USFS, State and local agencies and authorizes the BLM and USFS to work with the Lead Agency and State of California in coordinating surface mining and reclamation on Federal lands in California.

A memorandum of Understanding (MOU) was established between the State of California, the BLM and the USFS in 1992 with the purpose of 1) assuring the application of adequate and

appropriate reclamation throughout the state of California, 2) simplifying the administration of surface mining and reclamation practice requirements on Federal lands and on a combination of Federal and Private lands, 3) achieving coordination of activity governing reclamation and 4) eliminating duplication of activity among aforementioned agencies and counties serving as lead agencies in implementing State and Federal requirements (Memorandum Of Understanding 1992). USFS and BLM agree that mining operations need reclamation plans in compliance with SMARA.

The Legislative intent of the act is to assure reclamation of mined lands, encourage production and conservation of minerals and create and maintain surface mining and reclamation policy (regulations). SMARA applies to anyone, including government agencies, engaged in surface mining operations, which includes, but is not limited to prospecting and exploratory activities, dredging and quarrying, streambed skimming, borrow pitting, stockpiling of mined materials (and recovery of same). Exemptions that apply to USFS include mining of less than 1000 cubic yards on one acre or less, for the life of the project and activities required by federal law to protect a mining claim which includes annual assessment work. There are also some exemptions pertaining to road construction and maintenance for timber or forest operations that fall into certain categories.

Under the MOU, the USFS agrees to work cooperatively to insure that conditions required of operators (as defined by Federal law, and by SMARA and any other relevant regulations and ordinances) in minimizing adverse environmental impacts conform to all applicable local, State and Federal regulations.

Of the other 18 items agreed to by the USFS, the following are especially pertinent to this proposal:

- For mining operations requiring a Plan of Operations for projects solely on Federal land that are not exempt from SMARA, the USFS will provide the lead agencies notice and the opportunity for early participation, consultation, and submission of information and recommendations for the development of environmental documents and reclamation plans;
- USFS will forward the environmental and decision documentation, including reclamation plan requirements to the lead agency for appropriate consideration;
- Lead agencies and the USFS will review and coordinate environmental documents, operating plans, reclamation plans and permits of those mining operations that include both Forest Service and or BLM lands and private lands;
- The USFS will approve the Plan of Operations when the operator agrees to the conditions and stipulations, including the appropriate measure to mitigate adverse environmental impacts, incorporated into the plan or permit to meet applicable Federal, State, and local laws and regulations including those pertaining to hazardous substances; and,
- To the extent practicable, lead agencies and the USFS will coordinate their enforcement and monitoring responsibilities, and will cooperate in the correction and abatement of any violations of the conditions of operation imposed in accordance with the procedures described in this MOU.

The annual inspection by a certified examiner is another requirement that is beneficial to the USFS. SMARA requires the a lead agency (not BLM or USFS) to inspect a surface mining operation not less than once in any calendar year to determine whether the operation is in compliance with the Act. Permit conditions, the reclamation plan and the financial assurances

are of specific concern. If environmental documents are included in the reclamation plan by reference, the documents are also considered for inspection.
Prior to the inspection, the certified examiner reviews the mining files for information on the permit conditions, reclamation plan and any incorporated documents, financial assurance cost estimate, most recent annual report and previous inspection reports, photos, or enforcement actions. During the inspection, all areas of the site are visited, and all documents in the file are referred to. The examiner takes notes, and photos or videos to document the inspection. If deficiencies or violations are found, they are recorded in the notes.

The Surface Mining Inspection Report (form MRRC-1) is completed after the inspection and a copy is sent to the USFS or BLM if necessary. A follow-up letter is sent to the mine operator which details any verbal agreements, corrective actions needed and any important deadlines. Lead agencies (counties, cities, San Francisco Bay Conservation and Development Commission and State Mining and Geology board, and the State Dept. of Conservation) have the primary responsibility of SMARA enforcement. If the violation presents an imminent and substantial endangerment to the public health or the environment, a court order to stop operations may be pursued. For the violation of operating without an approved reclamation plan or financial assurance, the order will be to cease operations.

IV. DESCRIPTION OF THE PROPOSED PROJECT

The proposed project is described in detail in the Sentinel Quarry Expansion Proposed Plan of Operations (OMYA Inc. 1998) and Supplement (OMYA Inc. 2000). These documents contain the company's analysis and comments.

Several project designs have been proposed and analyzed over the past 2 years in conjunction with USFS and USFWS staff. This proposal was designed to avoid and minimize effects to the listed carbonate plants and their habitat. The following mitigation measures are incorporated into the project proposal: 1) relinquishment of 80 acres of mining claims (60 acres of carbonate substrates); 2) quantitative measurements of on site dust emissions; 3) quantitative measurements of dust deposition on non-sensitive plants; 4) growth measurements of a non-endangered species of buckwheat; and, 5) reduction of dust emissions through implementation of additional measures and controls. A summary of the proposed project is described below.

OMYA (California) Inc. proposes to expand the existing Sentinel limestone quarry and associated facilities. The project area is in Township 3 North, Range 1 West, Sections 24 and 25, San Bernardino Baseline and Meridian, on the USGS Fawnskin 7½' quadrangle. A general location map is shown in Figure 1.

The existing Sentinel Quarry has been in operation since 1971 and 6 mining phases have been previously approved. The proposed expansion includes 3 new additional phases (2 of which require permitting) or pushbacks for a total of 9 phases. This project includes expanding the existing quarry to the south and west of its present extent, and expanding the existing Butterfield 5 overburden site to accommodate new overburden material to be generated (Figure 2). Overburden material generated by the Sentinel Quarry is presently being used as fill in the mined out Butterfield 5 Quarry; which is expected to be filled by about 2003. Overburden material would also be placed as backfill into mined-out portions of the Sentinel Quarry, though logistics and volume necessitate an additional overburden site. The proposed additional site is expected

to provide for disposal of all overburden material (in excess of backfill into the quarry) to be generated by existing and proposed Omya operations on the SBNF. Omya estimates that from 1998-2035, (37 years) 18,000,000 tons of ore and waste rock would be removed (10,000,000 tons of ore grade limestone and 8,000,000 tons of overburden and waste rock).

The expansion would add an additional 15 years of mining in this quarry. Quarry operations would occur year round with mining of ore occurring for 8 months of the year and overburden and quarry development occurring during winter months. The proposed Sentinel Quarry expansion would begin by 2006 with final closure of the quarry occurring in 2035.

The quarry expansion project totals 32.2 acres of new development that is described below:

West Quarry Expansion (Phase 6): (T3N, R1W, SE1/4 of NW1/4 of Section 24, Fawnskin Quad). The existing northwest end of Sentinel Quarry would be expanded 1.25 acres to the west. The existing 3N88 Haul Road would be relocated within this acreage to the far west side of the quarry wall allowing the current location of the Haul Road to be mined. The West Quarry development would begin in 2006 and would continue through 2010.

South Quarry Expansion (Phase 7):
(T3N, R1W, NE1/4 of SW1/4 of Section 24, Fawnskin Quad).
The existing southern end of Sentinel quarry would be expanded 6.54 acres encompassing the existing crusher site and lands to the south and east of it. This phase would begin in 2011 and continue through 2015. Phase 9, already permitted, allows the pit to be mined to the 7,150' level which is the final footwall (bottom) limit of the pit.

Crusher Relocation to Black Hole (Phase 8):
(T3N, R1W, NE1/4 of SW1/4 of Section 24, Fawnskin Quad).
In 2015, the crusher would be moved from its present location to the existing Black Hole Overburden Site. Although this would delay reclamation of this 6.5 acre site, the relocation to an existing disturbed site would prevent new disturbance. The crusher would remain at this site from 2015 to 2035 with reclamation of this site beginning in 2035.

B5 Pad Overburden Expansion site:
(T3N, R1W, S1/2 of SW1/4 of Section 24, Fawnskin Quad).
(T3N, R1W, N1/2 of NW1/4 of Section 25, Fawnskin Quad)
An additional 24.4 acres would be developed to form a southern extension of the existing 3.5 acre pad, located on the east side of the 3N88 Haul Road. The configuration of the pad extension was designed entirely on non-carbonate material, avoiding any potential future affects to colonization of carbonate endemic plants onto nearby carbonate substrates.

There is an *Oxytheca parishii* var. *goodmaniana* occurrence (OP37) adjacent to the proposed B5 Pad Overburden Expansion area (T3N R1W SW1/4 of SW1/4 of Section 24, Fawnskin Quad). See Figure 4. The proposed Plan of Operations includes measures to protect this occurrence: (1) a 150-foot buffer zone would be maintained between the overburden area and the *Oxytheca* occurrence, (2) a barrier of boulders would be placed at the perimeter of the buffer zone to prevent rocks from rolling into the occupied *Oxytheca* habitat, and (3) OMYA would ensure compliance with these protection measures through regular monitoring of the plant occurrence.

Within the existing 3.5-acre pad, a reroute of the existing road with an excavated ramp would also ensure carbonate substrates are not disturbed. This would begin as soon as possible. In 2004, placement of overburden would begin and would continue incrementally as the pad is expanded. Final overburden placement would cease in 2035. Reclamation of the pad would also be done incrementally beginning in 2005 and would continue through 2037. Final monitoring would occur from 2037-2046.

OMYA proposes to implement the following actions to reduce dust emissions from the B-5 pad expansion:

1) Phased development of the overburden site to minimize exposure of newly disturbed ground.
2) Phased development of the overburden site so that portion closest to the *Oxytheca* occurrence is developed later to the degree possible.
3) Utilization of the B-5 Pad overburden site primarily during winter months when possible.
4) Minimize use of the B-5 Pad overburden site during *Oxytheca* flowering season when possible. Plants flower from June-August.
5) Retain existing revegetation on the top of the B-5 Pad as long as possible.
6) Minimizing the number of roads and exposed surfaces in the overburden site area.
7) Use of dust suppression on heavily utilized overburden roads.
8) Minimize exposure of active overburden dumping area.
9) Watering of the exposed active overburden dump site when possible while dumping is occurring.
10) Restricting dumping at the B-5 overburden site in dry weather, when possible, when the wind is blowing toward the *Oxytheca* occurrence.
11) Concurrent reclamation and revegetaion of the overburden site as possible.
12) Work on several aspects of reducing fines which would reduce dust.
    These include: eliminating or reducing amount of fines produced, marketing the fines, watering stored piles of fines, and incorporating fines with overburden as backfill into the overburden site.

Forest Road 3N87 Closure and Rehabilitation:

(T3N, R1W, S ½ of SW ¼ Section 24, Fawnskin Quad).
(T3N, R1W, NW ¼ of NW ¼ Section 25, Fawnskin Quad).
Expansion of the B5 Overburden Pad would cover 1,000 feet of the road with waste rock in 2014. Omya proposes to close and restore the upper and lower portions of this road (approximately ¾ mile) at the onset of the project (Figure 5). Drainages disrupted by the existing road would be re-established and the road bed would be ripped and revegetated by the company.

Continued Use of the Crystal Creek Haul Road:

T3N, R1W, 1/4 of 1/4 of Section 24, Fawnskin Quad
T3N, R1W, 1/4 of 1/4 of Section 24, Fawnskin Quad.
No new haul roads are proposed in this plan. Haul trucks and other equipment would continue to access the area using the existing Crystal Creek Haul Road (Figure 3). Use of the Forest Service portion of this road (3N88 Haul Road) for existing operations was permitted in a decision notice dated 1/11/88 under the EA of the Pleuss-Stauffer (California), Inc. and through modifications to original plans dated prior to 1988 (USDA Forest Service 1999). Use of the 3N88 Haul Road for activities covered in the 1988 Plan of Operations is included in the ongoing Formal Section 7 Consultation Package (Biological Assessment for the San Bernardino National Forest Carbonate Plant Species 1-6-99-F-26) submitted to the USFWS by the San Bernardino

National Forest (USDA Forest Service 1999). Although the Forest Service will work with OMYA to prevent further habitat impacts to habitat along the haul road during maintenance efforts, the baseline determination for that consultation will consider four of the six known occurrences along the Haul Road as lost and/or degraded through the effects of road maintenance and erosion (USDA Forest Service 2000).

The additional 15 years of use of the Haul Road is not a significant incremental effect over the existing conditions. Avoidance and minimization measures to reduce effects to listed plant occurrences and habitat along the 3N88 Haul Road are currently in effect. The following additional measures would be implemented to reduce potential effects to carbonate plant habitat from an additional 15 years of road use: 1) education of road maintenance equipment operators to the sensitivity of the area and the ESA and instructions to: a) eliminate future sidecasting of materials downslope from the road; and, b) ensure materials collected in sediment basins and check dams are not pushed over the sides but collected and moved off site to a pre-approved location; and, 2) monitoring of haul road conditions and implementation of maintenance needs in a timely manner.

Existing Operations and Reclamation

All other aspects of the OMYA (California) Inc. operation including other quarries, overburden sites and haul roads are covered in the existing approved plans and are not changed.

The proposed Plan of Operations includes measures to reclaim the expanded quarry and overburden sites, including revegetation with native species on quarry benches and overburden areas. Reclamation within the Sentinel quarry is to be concurrent with ongoing mining, beginning in the year 2009, and continuing beyond the completion of mining. Revegetation planning, implementation, and monitoring are designed to meet requirements of the California Surface Mining and Reclamation Act and the Mountaintop Ranger District.

Mining Claim Relinquishment (80 acres)

Rattler Claim 14: T2N R3W SE ¼ of SW ¼.of Section 7, Rattlesnake Quad.
Rattler Claim 15: T2N R3W NE ¼ of NW ¼ of Section 18, Rattlesnake Quad.
Rattler Claim 16: T2N R3W NE ¼ of NW ¼ of Section 18, Rattlesnake Quad.
Rattler Claim 17: T2N R3W NW ¼ of NE ¼ of Section 18, Rattlesnake Quad.

The proposed project includes relinquishment of mining claims controlled by OMYA on 80 acres northwest of Tip Top Mountain, about 15 miles east-southeast of the Sentinel Quarry in the Bighorn Wilderness (Figure 8). These claims include about 60 acres of carbonate rock. Known occurrences of *Eriogonum ovalifolium var. vineum* (Figure 10) are located adjacent to Claims 16 and 17 and the plants may occur on the claims themselves. *Oxytheca parishii* var. *goodmaniana* intermediates between *O. parishii* var. *cienagensis* are also known from the area south of claims 16 and 17 and may also be present (Figure 11). The University of Redlands GIS project indicates moderate or better habitat suitability for *Astragalus albens*. The easternmost occurrences of this species are located approximately one mile east of the claims.

The procedure for claim relinquishment is addressed in Appendix 12 of the proposed Plan of Operations. The ratio of mitigation acres to project acres is about 2.3:1, and the ratio of mitigation to project acres of limestone is about 7.8:1.

OMYA Dust Monitoring Project

The proposed dust studies are centered around the B5 Overburden Expansion Site (OMYA inc. 2000). See Appendices 5 and 6 for details of the proposed studies. The following changes to the company's proposal would further reduce impacts and improve the dust study:

- Recognize that moving the crusher from its existing location to the Black Hole site be recognized as a potential increased source of dust of since it will be located closer to the *Oxytheca* occurrences (even though this is not proposed to occur until the year 2015);
- Include provisions for reporting study results to the SBNF in the study protocol for the High Volumn Air Sampling; and,
- Change the sampling protocol for the Dust Deposition Effect on Plants Study to **exclude** sampling dry weight of *Oxytheca parishii* var. *goodmaniana* plants. Instead, sample *Eriogonum microthecum* var. *corymbosoides* with the *Chrysothamanus* (rabbitbrush) in the shoot growth study.
- Sample for *Eriogonum microthecum* var. *corymbosoides* within the *Oxytheca* occurrence along a linear transect to the west. Extend the sampling area for ¼ mile beginning at the east end of the *Oxytheca* 37 occurrence on the east side of the 3N88 Haul road. See Figure 12 for extent of known *Oxytheca* occurrences. Avoid individual *Oxytheca* plants while sampling in this location.

V. EXISTING ENVIRONMENT

A. Threatened/Endangered Plants

Species Accounts

Five plant species occurring on carbonate substrates of the northern San Bernardino Mountains are federally listed as threatened or endangered. No listed plant species occur within the project construction zone. Two endangered plant species, *Oxytheca parishii* var. *goodmaniana* and *Eriogonum ovalifolium* var. *vineum*, occur within the project vicinity and within the reach of indirect effects. Carbonate habitat on the project site may be unsuitable or only marginally suitable for *Erigeron parishii*, *Astragalus albens* and *Lesquerella kingii* var. *bernardinus* due to geographic and elevational ranges and habitat requirements as presently understood (White 1999). The five federally listed carbonate endemic plants are discussed below.

Oxytheca parishii* var. *goodmaniana is a locally endemic annual plant of the buckwheat family. All occurrences except one are found on carbonate derived substrates; one is found on dolomite and the others occur on limestone or a mixed lithology of limestone and dolomite (USDA 1999). Large-scale industrial mining is the major threat to this species. There are 90 extant occurrences known at this time (USDA Forest Service 2000). All occur within a 21 x 9 mile area on the north slope of the San Bernardino Mountains. There are approximately 432 acres of occupied habitat on USFS, BLM and private lands known at this time. In 1996, mining claims were known on 374 acres of occurrences. Since that time, additional acres have been claimed.

Within the footprint of the proposed project subject to ground disturbance, there are no occurrences of *Oxytheca parishii* var. *goodmaniana*. However, several large occurrences are known west of the B5 Overburden Expansion Site (OP 37, OP87,OP15) within the action area (Figure 12). Another *Oxytheca* occurrence (OP88) located in the vicinity of the project area is along the 3N88 Haul Road (Figure 7).

Numbers of individuals fluctuate from year to year depending on winter and spring rainfall and temperatures. If conditions favorable to seed germination are not present, seeds remain dormant

and the occurrence may not be seen that year. Two or more years of survey may be necessary to prove absence during drought cycles if the previous years skeletons are not present. Plants flower from June to August. The elevational range of known occurrences is from 4600 to 7880 feet (1402-2402 m) (USDA Forest Service 2000).

Eriogonum parishii is a similar looking annual species with basal rosettes similar to *Oxytheca parishii.* Plants cannot be easily detected from one another until the plants are in flower. *Oxytheca* can be then differentiated from the *Eriogonum* by the involucral bract with 4 (or more in intermediates) awns which are not present on the *Eriogonum* flower.

Plants at the northeastern portion of the range intergrade with another locally rare endemic variety, *Oxytheca parishii* var. *cienagensis.* The locations of intergrades are protected on the San Bernardino National Forest under the Endangered Species Act.

Eriogonum ovalifolium* var. *vineum is a locally endemic perennial plant also of the buckwheat family. Most occurrences are found on carbonate-derived substrates of limestone or dolomite. Large-scale industrial mining is the major threat to this species. There are 220 occurrences known at this time. All occur within a 22 x 11 mile area on the north slope of the San Bernardino Mountains. There are approximately 1,138 acres of occupied habitat on USFS, BLM and private lands known at this time (USDA Forest Service 2000). In 1996, mining claims were known on 836 acres of occurrences. Since that time, additional acres have been claimed.

Within the footprint of the proposed project subject to ground disturbance, there are no occurrences of *Eriogonum ovalifolium* var. *vineum.* However, two extant occurrences (EO90, EO91, EO) are known in the vicinity of the project area by the 3N88 Haul Road (Figure 6).

The University of Redlands habitat suitability analysis indicates "low" to "none" for Cushenbury buckwheat at the proposed expansion sites. Occurrences are known along the Haul Road within 1/2 a mile of the East Quarry expansion Site. There may be some possibility that it could naturally colonize carbonate soils in the proposed quarry expansion area in the future, though this would necessitate relatively long-distance upslope dispersal (White 1999).

Plants flower from May through June. Vegetative plants can be seen year round. The elevational range of known occurrences is from 4360 to 8120 feet (1329-2475 m).

Erigeron parishii is a locally endemic perennial plant of the aster family. Most occurrences are found on carbonate derived substrates of limestone or dolomite; two are reported to occur on limestone alluvium above monzonite substrates (USFS 1998). Large-scale industrial mining is the major threat to this species. There are 83 occurrences known at this time excluding the eastern most occurrences that are located off SNBF lands (USDA Forest Service 2000). With a range of approximately 35 miles long from Tip Top Mountain westward to Furnace Canyon, this plant is the most widely ranging of the five listed carbonate endemics. Off the Forest, there are two outlying occurrences at the eastern edge of its range near Pioneertown. There are approximately 786 acres of occupied habitat on USFS, BLM and private lands known at this time. In 1996, mining claims were known on 630 acres of occurrences. Since that time, additional acres have been claimed.

Plants flower from May through June. Vegetative plants can be seen year round. The elevational range of known occurrences is from 3800 to 6600 feet (1158-2012 m).

Astragalus albens is a locally endemic perennial herb of the pea family. Occurrences are only found on soils derived from decomposing limestone bedrock. Large-scale industrial mining is the major threat to this species. There are 102 occurrences known at this time. Plants are known from the east side of Dry Canyon southeast to the head of Lone Valley; a range of approximately 15 miles. There are approximately 1143 acres of occupied habitat on USFS, BLM and private lands known at this time (USDA Forest Service 2000). In 1996, mining claims were known on 920 acres of occurrences. Since that time, additional acres have been claimed.

Plants flower from March to May. Vegetative plants can usually be seen year round but tend to dry and shrivel after fruiting. The elevational range of known occurrences is from 4000 to 6380 feet (1220-1944m).

The project expansion site is about 1000 ft. above reported elevational ranges of both the *Erigeron* and the *Astragalus species*. The nearest known locations of these species are about 1.25 miles north, at about 2000 feet lower elevation. Habitat suitability is mapped as "none" for Cushenbury milk-vetch and Parish's daisy by the SBNF/University of Redlands GIS project. Neither plant was seen during surveys reported here and neither has been recorded within the OMYA operations area during past biological surveys. Likelihood that either species could eventually colonize carbonate soils in the proposed quarry expansion area is probably negligible (White 1999).

Lesquerella kingii* var. *bernardina is a short lived perennial of the mustard family. All known occurrences are found on dolomite (USFS 1998). Large-scale industrial mining is the major threat to this species. There are 23 occurrences known at this time. Plants are known from only two populations and this taxon occupies the smallest area of all the listed carbonate endemic species. There are approximately 212 acres of occupied habitat on NFS lands known at this time (USDA Forest Service 2000). In 1996, mining claims were known on 22 acres of occurrences. Since that time, additional acres have been claimed.

Plants flower from May to July depending on the elevation. Vegetative plants can be seen year round and the basal rosettes could be confused with *Abronia nana* spp. *covillei* and *Caulanthus major*. The elevational range of known occurrences is from 6840 to 8800 feet (2085-2682).

The project expansion site is within its known elevational range, reported as above 2150 m (7052 ft.; Hickman 1993) or below 8800 ft. (FWS 1994). The nearest known occurrences are on the south side of Holcomb Valley, nearly five miles distant. All known occurrences are on dolomite-derived soils, while soils at the Sentinel site are derived from limestone (Miller et al. 1998). The habitat suitability analysis in the University of Redlands GIS project show habitat suitability as "low" for San Bernardino Mountains bladderpod. Likelihood that it could eventually colonize limestone soils in the proposed quarry expansion area is probably negligible.

Survey Methods—Plants and Wildlife

Scott D. White reviewed reports of previous botanical surveys covering OMYA mining claims (in total, or in part) of the proposed expansion areas. These include: Barrows (1988 a-c), Biotech

Environmental consultants (1984), Krantz (1979 a and b), Neel (1987), SBNF (1988), and Tierra Madre Consultants (1992). He also reviewed the California Department of Fish and Game Natural Heritage Division's Rarefind data base (1998) and the California Native Plant Society's Electronic Inventory (1998) for records of threatened and endangered plants and animals reported from the USGS Big Bear City, Butler Peak, and Fawnskin 7½-minute topographic maps.

To predict carbonate habitat suitability, White used data from a cooperative SBNF/University of Redlands project which used Geographic Information System (GIS) software to analyze known occurrences of the five listed plants, carbonate soils and other habitat elements, and likely future mining conflicts. The project's intent was to support future long-term conservation planning for the five plants. The project included an analysis of habitat suitability for each of the five listed plants, considering a variety of factors including slope aspect, mapped soil types, elevation, and vegetation types. These data were also used extensively by Howard Brown to reduce effects to listed plants in the proposed project. It should be noted, however, that while these data were useful in this project design, methods for prediction of habitat suitability have since been modified by the USFS and may not be accurately reflected in the Redlands study.

Based on these literature reviews, a list of threatened and endangered plant and animal species potentially occurring in the general area of the project site was compiled. This list is included here, as Appendix1, describing the habitat and range of each species, its activity season, conservation status, and likelihood of occurring on the project site. Threatened and endangered plants and animals occurring on the SBNF but not addressed in this report due to their geographic range or clear absence of suitable habitat are listed in Appendix 2, along with the reason for their exclusion. All threatened or endangered species occurring on the SBNF are included in either Appendix 1 or Appendix 2.

White visited the project site on June 2 and 3, 1997 and July 3, 1997 to map and describe plant communities and to survey the site for listed species (Psomas and Associates 1997). Surveys were done by covering the entire proposed expansion areas for both the West and South Quarries and the B5 Overburden Pad Extension as thoroughly as practical during the field visits, by walking along roughly parallel transect routes spaced about 30 feet apart. The 3N88 Haul Road was not included in the survey effort. Special attention was given to carbonate soils and outcrops, which may provide suitable habitat for listed threatened or endangered species or other special status plants.

White revisited the proposed B5 Overburden Pad Expansion Site on 3 June 1998 to confirm the earlier conclusion that federally listed carbonate-endemic species were absent (White 1998). White was asked to perform this additional survey because *Oxytheca parishii* var. *goodmaniana* is an annual species known to remain dormant in the soil if moisture requirements are not met.

A total of about 20 person-hours were spent carefully surveying the two proposed South and West Quarry expansion areas and the proposed B5 Overburden Pad Expansion Site. All species recognized during the survey were recorded in field notes; plants not recognized in the field were collected and subsequently identified from keys, descriptions, and illustrations in Abrams (1923, 1944, 1951), Abrams and Ferris (1960), Hickman (1993), Munz (1974) and Sanders *et al.* (1995). Many of these identifications were made or confirmed by Andrew C. Sanders (Herbarium Botanist, Department of Botany and Plant Sciences, University of California

Riverside). This thorough coverage exceeds the California Native Plant Society's recommended guidelines for rare plant surveys (Nelson 1995) and meets USFS survey protocol. Vegetation was described in the terms used by Sawyer and Keeler-Wolf (1995), with comparisons to earlier descriptions by other authors. A list of all plant species noted on the project site is included in Appendix 4.

Additional plant surveys were conducted by USFS botanists within the project area to comply with direction in the ongoing consultation with USFWS in the Carbonate Plant Biological Assessment. These surveys were performed at known threatened and endangered plant locations that were in or adjacent to active mining operations and assessment sites on NFS lands to determine if any on-site avoidance mitigation/minimization measure would be effective or if those occurrences should be included in the baseline of destroyed/lost occurrences/habitat.

On April 20, 1999, USFS botanists Redar and Volgarino visited the *Oxytheca parishii* var. *goodmaniana* occurrences (OP 37) that were discovered, recorded and mapped by White in his 1997 surveys. Additional survey was conducted for OP 87 and OP15; two previously known *Oxytheca* occurrences west of OP37 (Figure 12). Numerous skeletons from the previous years plants and basal rosettes smaller than 1-inch diameter were observed in a previously unmapped location between these two occurrences and the occurrence footprint was redrawn to connect the occurrences. (Note: Basal rosettes of *Oxytheca* were observed under skeletons of last years plants at this time but mapped locations were based on skeletons only. This was to not confuse the rosettes with *Eriogonum parishii*, a species that looks like *Oxytheca* before maturity.)

In November 1999, Stearns and Volgarino surveyed this area for lands affected by fire suppression activities after the Willow Fire. Several unauthorized roads that had grown over and were reopened by fire suppression activities on the north side of 3N16 were bermed and disguised. The survey area included lands west of OP37, where more *Oxytheca* was found. At this time the OP37 occurrence footprint was extended to the west to connect with OP87.

White performed additional survey of Forest Road 3N87 from its junction with 3N16 to 3N54 on February 8, 2000. This entire area was not previously surveyed but it was necessary to get an idea of potential effects to listed species due to the proposed closure of 3N87. White was asked by the USFS to survey the area for this proposal even though the timing of the survey was not optimum.

Volgarino and Butler compiled existing data of known occurrences along the 3N88 Haul Road to determine potential effects to known *Eriogonum ovalifolium* var. *vineum* and *Oxytheca parishii* var. *goodmaniana* occurrences for this project. No new surveys were conducted along the northern portion of the 3N88 Haul Road specifically for this project.

Volgarino and Eliason conducted botanical surveys within Rattler claims 14,15,16 and 17 proposed for relinquishment by Omya for this project. Surveys were conducted on May 5, 2000 for *Eriogonum ovalifolium* var. *vineum*, *Astragalus albens*, *Erigeron parishii* and *Oxytheca parishii* var. *goodmaniana*. These surveys were intuitive and were not conducted to protocol due to timing of survey and lack of complete survey coverage over all the claims. The survey area is mapped in Figure 9. Plants observed on the survey are shown in Appendix 7. Known locations of listed plants found near the claims are shown in Figures 10 and 11.

Survey Results--Plants

The proposed West and South Quarry, and the B5 Overburden Pad Extension range in elevation from about 7450 to 7650 feet. Dominant vegetation on the three sites matches the Singleleaf pinyon (*Pinus monophylla*) series described by Sawyer and Keeler-Wolf (1995), with western juniper (*Juniperus occidentalis*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), and rabbitbrush (*Chrysothamnus viscidiflorus; C. parryi*) as common associates. The vegetation also matches Holland's (1986) description of Mojavean pinyon woodland (coded by the California Dept. of Fish and Game as 87.040.01, 1997), and as Yellow pine forest - pinyon woodland transition by Gonella (1994).

1. West Quarry Expansion Site

Thin carbonate-derived soil overlays carbonate bedrock, and scattered carbonate outcrops occur. No federally listed plant species were observed on the site.

2. South Quarry Expansion Site

The proposed South Quarry expansion is, in the headwaters of the Furnace Canyon watershed. Thin carbonate-derived soil overlays carbonate bedrock, and scattered carbonate outcrops occur. No federally listed plant species were observed on the site.

3. Crusher to Black Hole Site:

No federally listed plant species were observed on the site.

4. B5 Pad Overburden Expansion Site:

The proposed B5 Overburden Pad Expansion site is on a gently sloping minor canyon which ultimately drains into the headwaters of Holcomb Creek. Soils are deeper, largely alluvial in origin, and are composed mostly of igneous material. The proposed overburden area generally supports the Singleleaf pinyon series (described above) and Jeffrey pine (*Pinus jeffreyi*) series (Sawyer and Keeler-Wolf 1995) with white fir (*Abies concolor*), serviceberry (*Amelanchier utahensis*), and Great Basin sagebrush (*Artemisia tridentata*) as common associates. On carbonate substrates adjacent to the site, pinyon pine and western juniper are the only dominant trees in this area.

Just west of the proposed B5 Overburden Pad Extension site, the alluvial material is composed partly of carbonate material and reflects a geologic contact from igneous rock beneath the proposed overburden site to carbonate rock to the west. It is in this area west of the proposed B5 Overburden Pad Expansion site that the *Oxytheca parishii* var. *goodmaniana* occurrence (OP37) is located (Figure 4).

There are several large occurrences to the west of the B5 Overburden Extension Site. Prior to recent survey and mapping efforts, these occurrences were mapped separately and are known in the USFS records as OP37,OP87 and OP15 (Figure 12). For record keeping, these occurrences retain their individual record numbers but are in actuality, one large continuous occurrence west of the proposed project area. Even mapped as individual occurrences, population numbers at each site has been very high and if mapped as one occurrence, would contain the highest number of individuals across the range of the plant. In 1998, White estimated individual numbers of *Oxytheca* at Occurrence 37 to be around 3,000 individuals. In 1999, Volgarino and Redar estimated individual numbers of *Oxytheca* at Occurrence 87 to be around 100. In 1995, Henderson estimated around 5,000 individuals present at *Oxytheca* Occurrence 15.

5. Forest Road 3N87 Road Closure and Rehabilitation

Upon survey of the area, White observed that some of the carbonate substrate along the road appears suitable for *Oxytheca parishii* var. *goodmaniana* but no remains of plants from the previous year were observed. Timing of the survey and below normal rainfall may have contributed to the difficulty of observing this annual species even if it was present (White 2000). Survey results indicate that *Eriogonum ovalifolium* var. *vineum* is probably absent from the site. White suggests that due to elevational ranges of *Astragalus albens* and *Erigeron parishii*, it is unlikely that they would occur along the road also.

6. Continued use of 3N88 Haul Road

Approval of this plan of operations will increase use of the 3N88 Haul Road for an additional 15 years. Use of the road for existing operations was permitted in a decision notice dated 1/11/88 under the EA of the Pleuss-Stauffer (California), Inc. and through modifications to original plans dated prior to 1988 (USDA Forest Service 1999). Use of the 3N88 Haul Road for activities covered in the 1988 Plan of Operations is included in the ongoing Formal Section 7 Consultation Package (Biological Assessment for the San Bernardino National Forest Carbonate Plant Species 1-6-99-F-26) submitted to the USFWS by the San Bernardino National Forest. Therefore only the additional 15 years of use of the Haul Road will be addressed here.

Approximately 6 miles of the Crystal Creek Haul Road occur on Forest lands within the project area. These 6 miles are referred to as the 3N88 Haul Road in this document. The road was constructed in 1958 prior to recognition of the carbonate endemic plant species and has been expanded several times since then for access to additional quarries or facilities. From the project area to the processing plant, the 3N88 Haul Road bisects or runs adjacent to 2 occurrences of federally listed plant species known to be extant (EO90, OP88) and 4 other occurrences which are considered to be disturbed, declining and difficult to protect (EO91) or believed to have been extirpated due to previous sidecasting from the 3N88 Haul Road (EO 88,EO89,EO92). See Figures 6 and 7. There are two unnumbered occurrences (EO,AA) that were previously mapped along the Haul Road. Neither of these occurrences have ever been relocated and are now considered erroneous.

Eriogonum ovalifolium var. *vineum* occurrence EO90 occurs on approximately 17.4 acres in T3N, R1E, W ½ of SW ¼ of Section 13 on the Fawnskin quadrangle. Approximately 200-300 plants were observed here by Volgarino and Redar in 1999. Plants were also located in 1998 during Vegetation Plot surveys. This occurrence is surrounded by the Haul Road on its north, east and west sides. *Oxytheca parishii* var. *goodmaniana* (OP88) occurs within this location also.

Oxytheca parishii var. *goodmaniana* occurrence OP88 occurs on approximately 2.39 acres in T3N, R1E, W1/2 of SW1/4 of Section 13 on the Fawnskin quadrangle. Plants were observed here in 1999 by Volgarino and Redar. *Eriogonum ovalifolium* var. *vineum* (EO90) is also present. The 3N88 Haul Road is located adjacent to the west side of the *Oxytheca* occurrence. The Haul Road also surrounds the occurrence farther to the north and east.

Lands adjacent to the existing Haul Road may be potential habitat for the listed carbonate listed species. Not all of these lands have been surveyed recently.

Eriogonum ovalifolium var. *vineum* occurrence EO91 occurs on approximately 3.46 acres in T3N, R1E, NE1/4 of SW1/4 of Section 13 on the Fawnskin quadrangle. An incomplete survey of the site in 1999 by Volgarino and Redar located 25 plants and 21 plants were recorded within a 0.10 acre plot during 1998 SBNF Vegetation Plot surveys. Due to encroachment of erosion caused by the Haul Road, this occurrence is considered disturbed, declining and difficult to protect.

Eriogonum ovalifolium var. *vineum* occurrence EO88 was extant here in 1979 and 1988. It has not been observed on 2 recent surveys in 1998 and 1999. It was known from approximately 0.55 acres in T3N, R1E, NW1/4 of SW1/4 of Section 13 on the Fawnskin quadrangle. The Haul Road is present on the north and east side of this location. At this time only a small island of undisturbed habitat occurs between the Haul Road above and a previously used road below it.

Eriogonum ovalifolium var. *vineum* occurrence EO89 was extant here in 1979 and 1988. It has not been observed on 2 recent surveys in 1998 and 1999. It was known from approximately 0.8 acres in T3N, R1E, NW1/4 of SW1/4 of Section 13 on the Fawnskin quadrangle. This occurrence was located on a steep slope in between 2 locations of the Haul Road. Much of the slope is covered in sidecasting of overburden. While some vegetation is still present on the slope, most of the understory appears to be covered with overburden.

Eriogonum ovalifolium var. *vineum* occurrence EO92 has not been observed on 2 recent surveys in 1998 and 1999. It was known from approximately 1.29 acres in T3N, R1E, NE1/4 of SW1/4 of Section 13 on the Fawnskin quadrangle. The mapped occurrence appears to be covered with overburden dumped 50 feet below the Haul Road.

7. Existing Operations and Reclamation

These areas were not surveyed or analyzed due their inclusion in pre-existing approved Plans of Operation.

8. Mining Claim Relinquishment (80 acres)

Botanical surveys were inconclusive because all lands within the claims were not covered in the survey. Focused surveys for *Eriogonum ovalifolium* var. *vineum*, *Oxytheca parishii* var. *goodmaniana*, *Erigeron parishii* and *Astragalus albens* did not locate any occurrences on the portions of claims surveyed May 5, 2000 by Volgarino and Eliason. More survey is needed on Rattler Claim 16 to document occurrences if they are present. A large mapped occurrence of *Eriogonum ovalifolium* var. *vineum* is located just south of the claim. *Oxytheca parishii* var. *goodmaniana* X *cienagensis* is also mapped nearby and has the potential to occur.

B. Threatened/Endangered Animals

No listed wildlife species are known to occur at the project site, except perhaps as incidental overflights by bald eagle or peregrine falcon. See Appendix 3. Desert tortoise habitat occurs north of the processing plant, including areas along Meridian Road (over 3 miles from the project site). This area is designated as Category 3 Desert Tortoise habitat, meeting criteria such as "not essential to maintenance of viable populations and having low to medium population density not contiguous with medium or high population density areas". Southwestern willow flycatcher and least Bell's vireo are known to nest approximately 5 miles to the east of Omya's processing plant (at Cushenbury Springs) but are not known from the project area. No suitable habitat for these bird species is known from the project site.

VI. EFFECTS OF THE PROPOSED ACTION

A. Direct and Indirect Effects--Plants:

West Quarry Expansion Site: No federally listed plant species were observed on the site, therefore no direct or indirect effectsto carbonate plants are expected to result from the proposed action. Quarry expansion would result in grading and removal of 1.25 acres of undisturbed woodland on carbonate substrate. The proposed quarry expansion may reduce the long-term probability of natural colonization by these plants.

South Quarry Expansion Site: No federally listed plant species were observed on the site, therefore no direct or indirect effects to carbonate plants are expected to result from the proposed action. The proposed South Quarry expansion is located in the headwaters of the Furnace Canyon watershed. While the proposed expansion would not directly contribute to loss of listed carbonate-endemic plants; it would contribute to ongoing loss of undisturbed natural vegetation on carbonate soils in the region, by converting 6.54 acres to quarry. The proposed quarry expansion may reduce the long-term probability of natural colonization by these plants. Revegetation of the proposed mine and overburden expansion areas would eventually restore native vegetation cover to the extent practical. There is some possibility that one or more of the listed plant species might eventually colonize naturally onto the disturbed / reclaimed sites, though this must be considered low due to elevation, geographic ranges, and present and future habitat conditions. Expanding the existing operation would prevent or delay the need for construction of new quarries and haul roads elsewhere.

There is an *Oxytheca parishii* var. *goodmaniana* occurrence (OP35) on private land east of the Sentinel Quarry (Figure 12). In 1995, it was noted that overburden piles were encroaching on the occurrence. Effects to the occurrence from the Sentinel East Side Expansion phase are already permitted and were addressed in the ongoing 1999 Carbonate Plant Consultation Package. Recently it has been noted that continued operation of Sentinel Quarry is unlikely to impact the occurrence since the 80-foot tall vertical wall separates the operation from the occurrence (USDA Forest Service 2000). Effects of dust on this occurrence are expected to be reduced from current levels when the crusher is moved farther south to the Black Hole site.

Crusher to Black Hole Site: No federally listed plant species were observed on the site, therefore there would be no direct effects to carbonate plants from this action. Moving the crusher to this previously mined site prevents undisturbed lands being selected for the crusher location although it would delay reclamation of the site.

Movement of the crusher to this site is not expected to have significant adverse effects as wind patterns are expected to carry dust away from the *Oxytheca* (OP37) occurrence. The crusher would be located ¼ mile northeast of the occurrence. Currently fog and foam sprays are used at the crusher for dust control. Purchase orders and permit applications have been submitted for a baghouse installation at this screening location for a total of 94% reduction of emissions at this point compared to waterspray. Total emissions before the screen baghouse installation for TSP (total suspended particulate=total dust) is estimated at 22.98 tons/year. Total emissions after the screen baghouse installation for TSP are 15.97 tons/year (OMYA, Inc. 2000).

B5 Pad Overburden Expansion Site: The *Oxytheca parishii* var. *goodmaniana* (OP37) occurrence is located 150 feet west of the proposed overburden pad extension (Figure 4). The pad footprint was designed to avoid covering this occurrence. Additional avoidance and

minimization measures incorporated into the proposed action to protect the occurrence during dumping of materials would also prevent direct impacts to the occurrence.

The estimated amounts of dust expected to reach the *Oxytheca* occurrence were studied by OMYA as a part of this proposal (Appendix 9). Dust emissions calculated from .25 miles of unpaved road, handling, dumping of load at the overburden site, wind erosion from active overburden dumping area and vehicle emissions while at the overburden site are estimated at 414.5lb/year (OMYA, Inc. 2000). Crusher dust was not included in this estimate as they assumed that was an ongoing activity. OMYA determined the prevailing wind direction, and seasonality of wind velocity and direction and calculated that total emissions blown in the direction of the *Oxytheca* occurrence would be 6.9/lbs/year. They then modeled where the dust emissions from the overburden site would be dispersed and the amount that would be deposited in a specific area. At a distance of 0.25 mile (1320 feet) from the source, the plume would be 200 feet wide. The proportion of time the wind would blow dust from the overburden site in the specific direction of the *Oxytheca* occurrence would be variable ranging from 1% to 4.5% of the time per year and averaging about 3% over the life of the project. Dispersion modeling showed that at a distance of 0.25 miles from the source (the overburden pad), the area of plume deposition is 4.05 acres and that 0.94 lbs/acre/year or 0.00006 lb/ft2/year would be deposited. See Appendix 9 for estimates of deposition at further distances from the source.

The overburden site expansion would result in grading or burying about 24 acres of undisturbed woodland on granitic alluvium. Proposed expansion of the existing overburden site would increase disturbance by noise and equipment in an area about ¼ mile south-southeast of the presently active overburden area.

Forest Road 3N87 Road Closure and Rehabilitation: No federally listed plant species were observed in the middle section of the road; (the portion of road which would eventually be covered in overburden) during surveys conducted to protocol by White in 1998 (White 1999). No direct or indirect effects to carbonate plants are expected to result from the proposed action at this location.

The north and south ends of the road were surveyed in February 2000 for closure and rehabilitation. This was an out of season survey so it cannot be said with certainty that listed plants are not present here. Closure and rehabilitation of this road immediately is recommended by USFS biologists as we expect effects of restoring the carbonate habitat within the existing roadbed to be beneficial.

At this time, two road closure timelines are proposed. In the first alternative, the road could remain open for use until 2014 when the overburden would cover a portion of road and then the remaining upper and lower sections of the road would be decommissioned and rehabilitated. The second alternative is to decommission and rehabilitate the road as soon as possible. To restore carbonate habitat within the existing roadbed, USFS biologists recommend the second alternative. OMYA also prefers Alternative 2. An in season survey is needed prior to road ripping/subsoiling to ensure listed plants are not present.
If plants are present, the following actions are mandatory:

1) If *Oxytheca* is present, consider the following: a) not ripping/subsoiling that stretch of road (preferred) or b) perform road ripping after plants have gone to seed.

2) If other perennial listed plants are present, avoid individual plants with machinery and lift the rippers.
3) A monitor on site, prefield meeting with equipment operator or botanist flags for avoidance are additional mandatory measures to be taken if listed plants are found to occur in or adjacent to the road.
4) These measures and an in-season survey are to be performed prior to any road work. If plants were in the roadbed, these avoidance and minimization measures would ensure adverse affects do not occur.
5) Waterbars should also be constructed to direct water off the road using the previously described methods to avoid individual plants.
6) The road would need to be barricaded at both ends prior to rehabilitation.

Continued use of 3N88 Haul Road: These effects are covered in the ongoing 1999 Carbonate Plant Consultation Package with the USFWS (USFS 1999). They are listed here to document that effects to these plants were considered in this proposal for the extended use of the Haul Road (Figures 6 and 7). This extended use is not a significant incremental effect over existing conditions. Expanding the existing operation would prevent or delay the need for construction of new quarries and haul roads elsewhere.

Eriogonum ovalifolium var. *vineum* occurrence EO90: This occurrence is surrounded by the Haul Road on its north, east and west sides. Sidecasting of road material or berm overburden could affect the west side only as the north and east sides of the occurrence are located above the road. Sidecasting has been previously prohibited and remains so. All of the occurrence could be affected by road generated dust. Other indirect effects of the Haul Road may include habitat fragmentation and increased possibilities for exotic plant invasions along disturbed corridors. *Oxytheca parishii* var. *goodmaniana* (OP88) occurs within this location also.

Oxytheca parishii var. *goodmaniana* occurrence OP88: The 3N88 Haul Road is located below the west side of the *Oxytheca* occurrence. The Haul Road also surrounds the occurrence farther to the north and east. Some of the occurrence could be affected by road generated dust. Other effects of the Haul Road may include habitat fragmentation and increased possibilities for exotic plant invasions along disturbed corridors.

Lands adjacent to the existing Haul Road are potential habitat for the listed carbonate listed species. Not all of these lands have been surveyed recently. Potential effects to this habitat include those listed above for the known occurrences. Compliance to existing avoidance and minimization measures are expected to prevent direct effects to this habitat.

Eriogonum ovalifolium var. *vineum* occurrence EO91: Sidecasting of road materials from the Haul Road was observed 40 feet below the road and may have covered the uppermost portion of this occurrence. Sidecasting has been previously prohibited and remains so. Most of the occurrence could be affected by road generated dust. Other effects of the Haul Road may include habitat fragmentation and increased possibilities for exotic plant invasions along disturbed corridors. This occurrence has been included in the environmental baseline in the ongoing Formal consultation with the USFWS for the Carbonate Endemic Plants (USDA Forest Service 2000).

Eriogonum ovalifolium var. *vineum* occurrence EO88: Occurrence was extant here in 1979 and 1988. It has not been observed on 2 recent surveys in 1998 and 1999. The Haul Road is present on the north and east side of this location. At this time only a small island of undisturbed habitat occurs between the Haul Road above and a previously used road below it. Although plants have not been relocated since the 1988 surveys, there is potential for them to become re-established on site if current policy prohibiting sidecasting is adhered to. Other effects of the Haul Road may include habitat fragmentation and increased possibilities for exotic plant invasions along disturbed corridors. This occurrence has been included in the environmental baseline in the ongoing Formal consultation with the USFWS for the Carbonate Endemic Plants (USDA Forest Service 2000).

Eriogonum ovalifolium var. *vineum* occurrence EO89 was extant here in 1979 and 1988. It has not been observed on 2 recent surveys in 1998 and 1999. This occurrence has been included in the environmental baseline in the ongoing Formal consultation with the USFWS for the Carbonate Endemic Plants (USDA Forest Service 2000).

Eriogonum ovalifolium var. *vineum* occurrence EO92 has not been observed on 2 recent surveys in 1998 and 1999. This occurrence has been included in the environmental baseline in the ongoing Formal consultation with the USFWS for the Carbonate Endemic Plants (USDA Forest Service 2000).

The two unnumbered occurrences (EO,AA) that were previously mapped along the Haul Road have never been relocated and are now considered erroneous.

Existing Operations and Reclamation: Existing operations were included in the ongoing consultation with USFWS for the Carbonate Endemic Plants (USDA Forest Service 1999) and effects are not discussed here. Avoidance and minimization measures pertaining to salvage of listed plant species prior to reclamation activities will occur as a result of that consultation and will become a standard in the Forest Reclamation Policy. This is expected to decrease direct loss of individual plants through salvage, seed collection and avoidance and to increase the knowledge base for use of these species in future reclamation efforts (USDA Forest Service 2000).

Rattler Claim Relinquishment: Relinquishment of these mining claims on carbonate substrate may provide a beneficial effect. If they occur on site, protection of occurrences of *Eriogonum ovalifolium* var. *vineum* and possibly *Astragalus albens* and intermediates of *Oxytheca parishii* var. *goodmaniana* X *Oxytheca parishii* var. *cienengensis* would result in permanent preservation of these occurrences.

The likelihood of eventual colonization by other carbonate-endemic plants onto the claims is presumably comparable or greater as it is onto the proposed quarry expansion areas because *Eriogonum ovalifolium* var. *vineum* and *Oxytheca parishii* var. *goodmaniana* X *Oxytheca parishii* var. *cienengensis* occur adjacent to the claims and may be present. Habitat suitability is ranked as "moderate" for *Astragalus albens* (White 1999).

Discussion of Potential Indirect Effects: A series of potentially adverse indirect effects of mining or other land uses on listed carbonate-endemic species has been considered by the Fish and Wildlife Service (1997) and the San Bernardino National Forest (1998). These include edge

effects, habitat fragmentation windblown dust, lighting, soil moisture, and hydrology and will be addressed individually (White 1999).

Edge effects occur when differing habitat types occur adjacent to one another. In the case of disturbed or degraded habitats, there is a tendency for invasive plant species to spread into adjacent undisturbed land and perhaps adversely affect native species. The proposed expansion would have the effect of expanding edge effects beyond the presently affected areas. Note, however, that the *Oxytheca parishii* var. *goodmaniana* (OP37) population adjacent to the proposed overburden expansion area is already adjacent to an existing overburden site and the southern portion of 3N88 Haul Road. While edge effects to the listed carbonate-endemic species have not been well studied, there is no documentation that adjacent mining activities are incompatible with habitat suitability, and there are several plant occurrences immediately adjacent to other active mining areas.

Habitat fragmentation is widely implicated in reducing population viability by subdividing formerly large populations into several small and increasingly isolated populations. There is no data available on the effects of fragmentation or on population viability for the listed carbonate-endemic species. The proposed expansion sites, however, are outside the ranges of three listed plants and near the upper elevational range of two others. The proposed quarry expansion would only marginally increase the size of the existing quarry and would not disrupt potential dispersal routes between populations. The proposed overburden expansion area could interrupt hypothetical *Oxytheca parishii* var. *goodmaniana* dispersal between the adjacent location and the unoccupied carbonate outcrop to the east, though this effect is only speculative without knowledge of the plant's dispersal mechanism.

Windblown dust can significantly affect gas exchange and photosynthesis rates in plants immediately adjacent to and upwind from major dust sources (e.g., an unpaved tank road at Fort Irwin: Sharifi et. al. 1997). Fugitive "klinker" (a slag-like intermediate product in cement production, made up of limestone and other ingredients after firing in kilns, that is crushed to produce finished cement) dust from the formerly uncovered milling areas of the Kaiser Cement plant (now Mitsubishi) at Cushenbury Springs has visibly affected soil surface and vegetation in the surrounding area, where a hardened crust covers soil surface and very little herbaceous vegetation occurs with the established shrub cover. There are no klinker dust crusts adjacent to the other mining facilities, though fugitive dust is often visible on plant surfaces around crushers, loading areas, roadsides, and other major points of origin. These effects visibly diminish over distances on the order of 50 to 100 feet. The *Oxytheca parishii* var. *goodmaniana* (OP37) occurrence adjacent to the proposed overburden expansion area would be protected by a 150-foot buffer area and prevailing winds would generally carry dust away from the population. The probability of significant adverse effects to these plants from windborne dust is negligible.

The Fish and Wildlife Service (1997) speculated on potential adverse effects of altered lighting regime, from both lighted operations at night and from reflected light from barren limestone slopes. Any alterations to existing light regime within the proposed quarry expansion area would be negligible because (1) the quarry site is already subject to the effects considered, and (2) most of the quarry is below grade, so that reflected light and work lights do not reach adjacent undisturbed areas. At the proposed overburden expansion area, no night lighting would be directed toward the adjacent *Oxytheca parishii* var. *goodmaniana* population; the plants are partly shielded from lighting impacts by existing overstory vegetation; and the overburden

material would be comparable to existing adjacent overburden which presumably does not adversely affect the plant population.

The proposed quarry expansion will not affect soil moisture and hydrology outside the quarry itself. The proposed overburden expansion is downslope from the adjacent *Oxytheca* (OP37) occurrence and cannot affect upstream hydrology. The overburden site has been designed with a wide buffer area to prevent indirect effects to the adjacent plants. The overburden material is porous and would not tend to impede downstream drainage or percolation. Further, the plan of operations includes regular monitoring of the *Oxytheca* population to confirm that no impacts occur.

B. Direct and Indirect Effects—Wildlife Species:
No direct or indirect effects to southwestern willow flycatcher, and least Bell's vireo are expected at the project site or within the federal action area. No direct effects to desert tortoise are expected at the project site. However, within the federal action area, there is a very low likelihood of indirect effects associated with vehicles using the access road to the processing plant (Meridian Road). The proposal will allow Omya to operate the Sentinel quarry an additional 15 years. Injury or death of desert tortoises from vehicles accessing the processing plant through low quality Category 3 desert tortoise habitat is possible though vanishingly small.

C. Cumulative Effects:
Under NEPA, cumulative effects are those impacts caused by past, present, and future federal state and private activities. Please refer to the Cumulative Impacts Analysis in the 1999 Biological Assessment for carbonate endemic Plants (USDA Forest Service 1999).

Under the Endangered Species Act, only state and private activities are considered under the cumulative effect analysis. Future federal activities or activities permitted by federal agencies are not included under cumulative effects because any proposed future federal activities or federally permitted activities must undergo Section 7 consultation with the USFWS. Activities unauthorized by the Forest are also addressed here. The Cumulative Effects Analysis under the Endangered Species Act is completed for the "federal action area" of the proposed project. See Figure 3 for this location. Please refer to the Cumulative Impacts Analysis in the 1999 Biological Assessment for carbonate endemic Plants (USDA Forest Service 1999).

Cumulative effects within the federal action area are limited to unauthorized use of Forest System lands and adjacent private lands. These activities include unauthorized woodcutting and off road vehicle use. Prospecting for claim establishment is expected to be ongoing within the action area and does not trigger a federal nexus. These three actions may result in small scale loss or degradation of carbonate plant habitat.

VII. AVOIDANCE/MINIMIZATION MEASURES

Plants:. The following measures would further reduce impacts to listed plants:

- Conduct complete surveys for botanical and wildlife resources in the Rattler claims should in the year 2000. Surveys should be conducted at the end of May for *Eriogonum ovalifolium* var. *vineum* and in June or July for *Oxytheca* when plants are in flower.
- Relinquishment of claims should occur prior to start of the expansion project.

- Close and rehabilitate Forest Road 3N87 as soon as possible after NEPA is completed, and after performing in season plant survey prior to ground disturbance. Coordinate with USFS botanist on survey results and rehabilitation timelines.
- Implement dust monitoring study (as modified in the Proposed Action section).

Wildlife: In order to further reduce the low likelihood of desert tortoise/vehicle interactions, Omya's personnel should be trained annually on desert tortoise identification and regulations. A reporting process should be established to monitor vehicle/desert tortoise impacts along Meridian Road so that future remedial actions can be taken if any desert tortoise losses are noted.

VIII. DETERMINATIONS

Listed Plant Species

It is my determination that the Sentinel Expansion Project may affect but is not likely to adversely affect *Oxytheca parishii* var. *goodmaniana and Eriogonum ovalifolium var. vineum.* No critical habitat has been designated for this species, therefore, none will be affected.

This conclusion was reached in recognition of:

1) project planning which avoided direct affects to the *Oxytheca* occurrence by the B5 pad;
2) estimations of low dust levels covering the plants due to project distance from known plant occurrences and wind pattern;
3) existing road maintenance policy for the Haul Road with required annual surveys of plant occurrences along the road (USDA Forest Service 1999);
4) additional avoidance and minimization measures to protect occurrences along the Haul Road which are included in the proposed action;
5) reduction of dust emissions through implementation of additional measures and controls; and,
6) closure and rehabilitation of Forest road 3N87 is expected to provide a beneficial effect to potential *Oxytheca* habitat.

Listed Wildlife Species

It is my determination that the Sentinel Expansion Project may affect but is not likely to adversely affect Desert Tortoise. Indirect effects within the federal action area (vehicle access along Meridian Road) account for a discountable chance of impacts to desert tortoises. No critical habitat is within the project area; therefore, none will be affected. No other listed wildlife species are known from the project area. There are no effects to southwestern willow flycatcher and least Bell's vireo expected.

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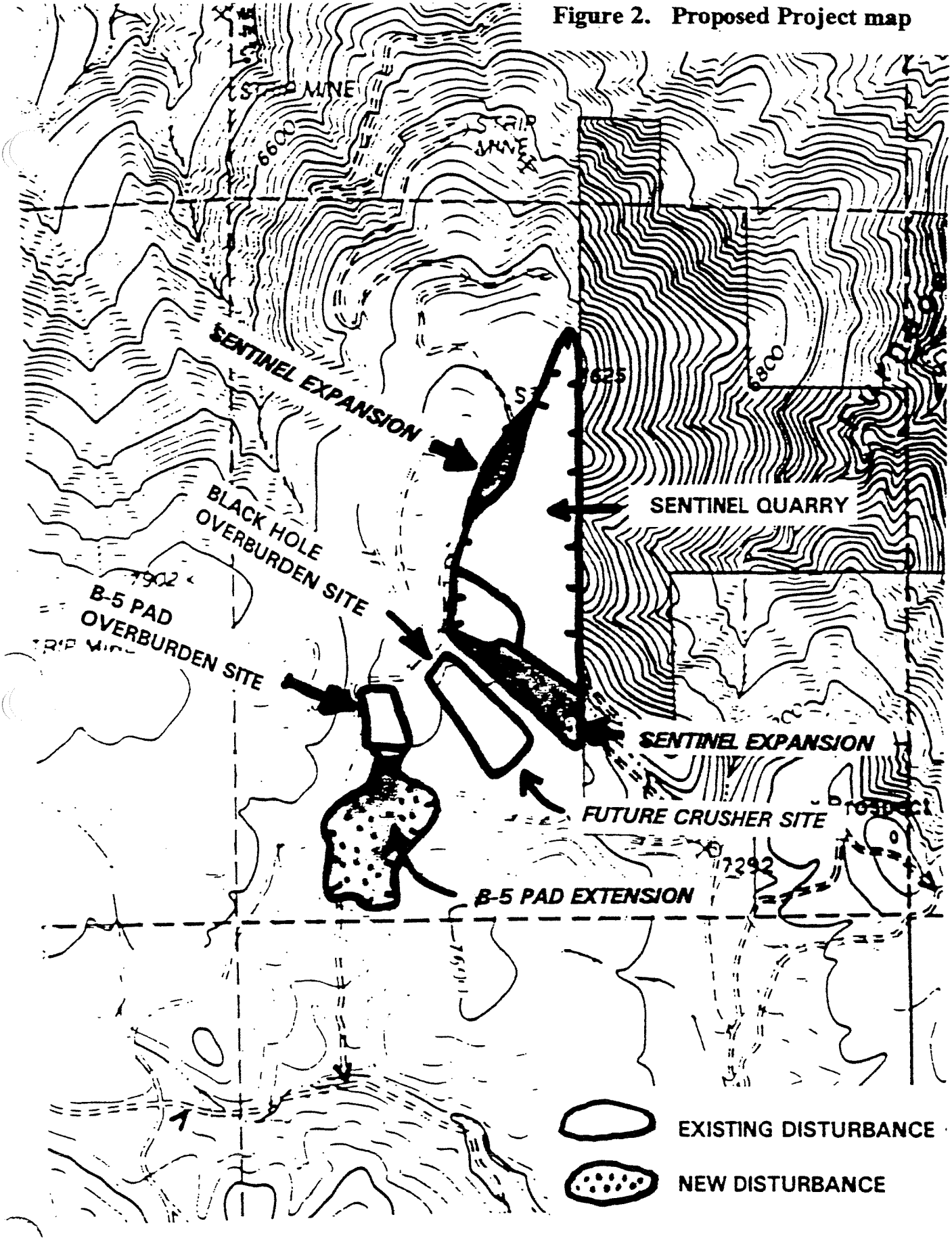
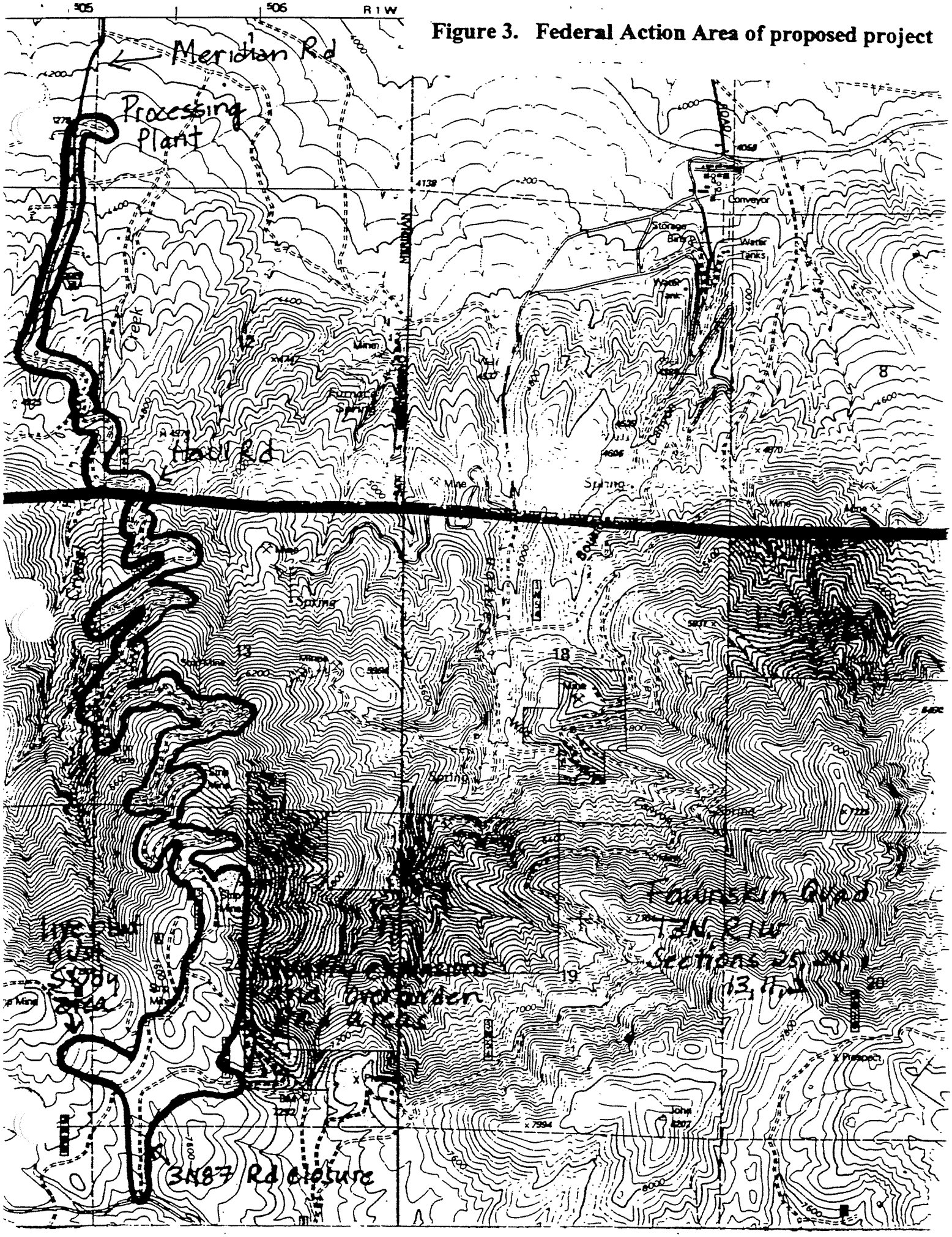
Figure 1. Project Location map

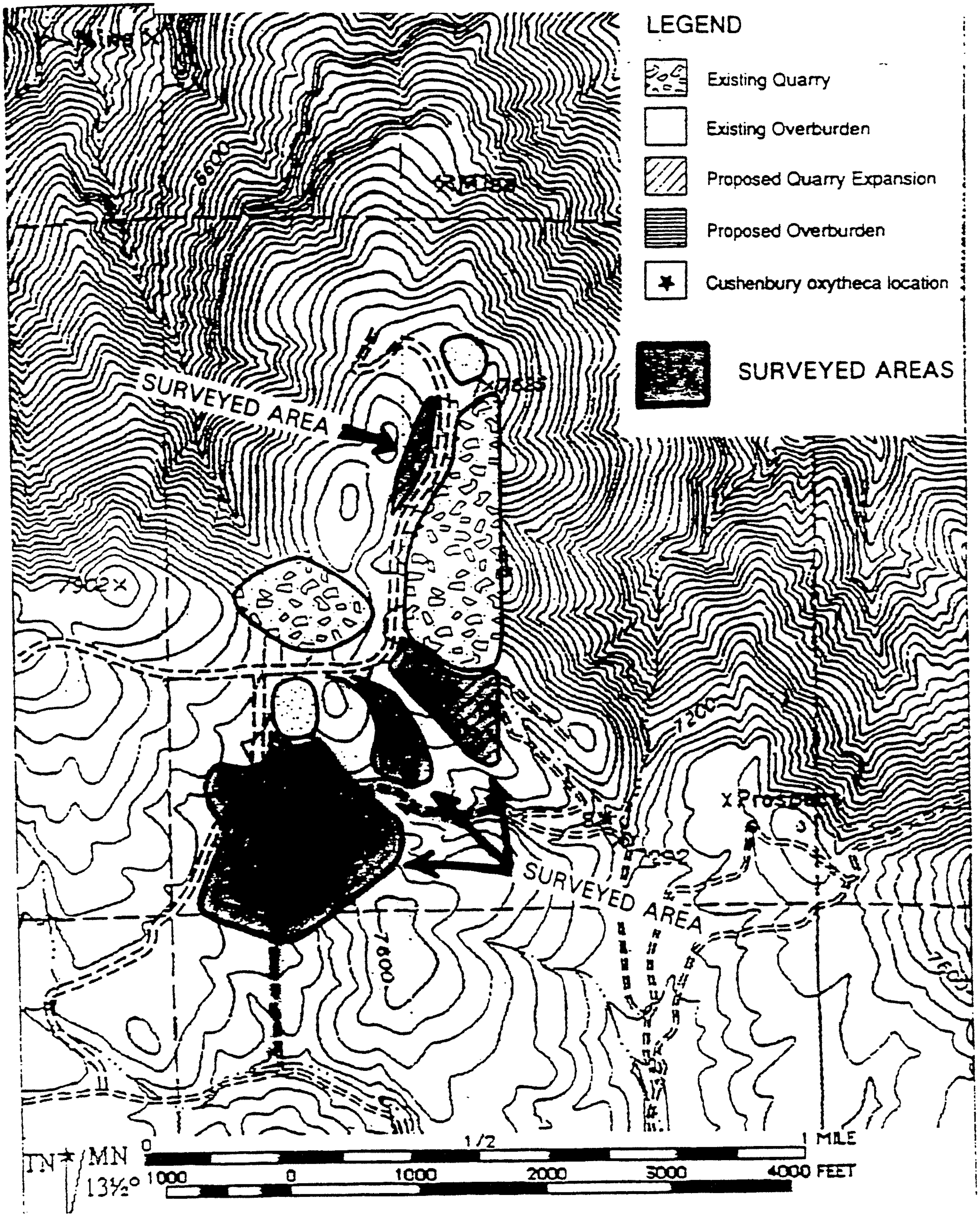
Figure 2. Proposed Project map



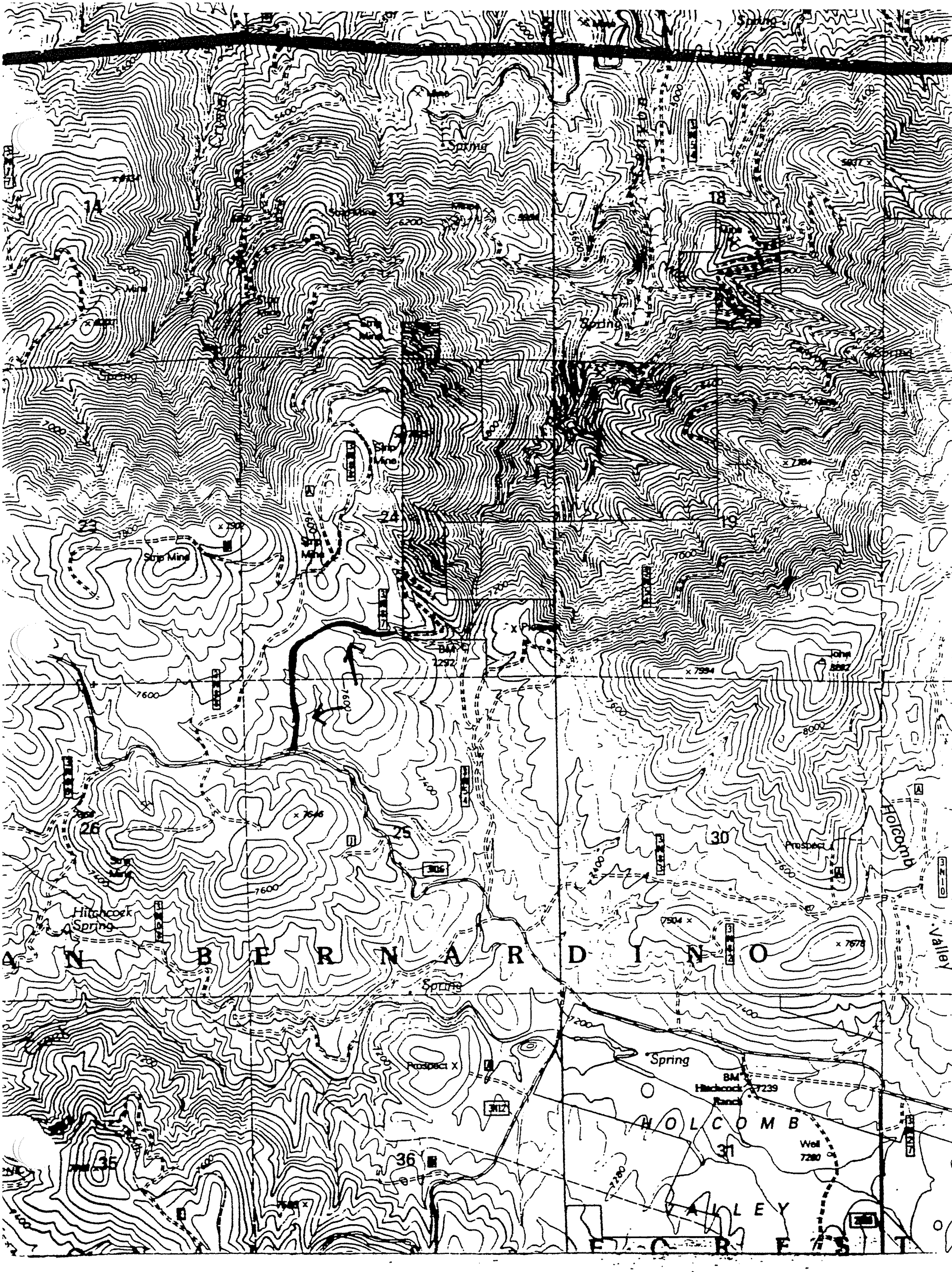
SENTINEL QUARRY SITE AREA MAP

Figure 3. Federal Action Area of proposed project





Botanical surveys and *Oxytheca parishii* var. *goodmaniana* locations



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Valley
Spring
Spring
Prospect
BM
Hitchcock 7239
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Well
7280
35
36
V A L L E Y

Figure 6. Plant occurrences EROVV along 3N88 Haul Road

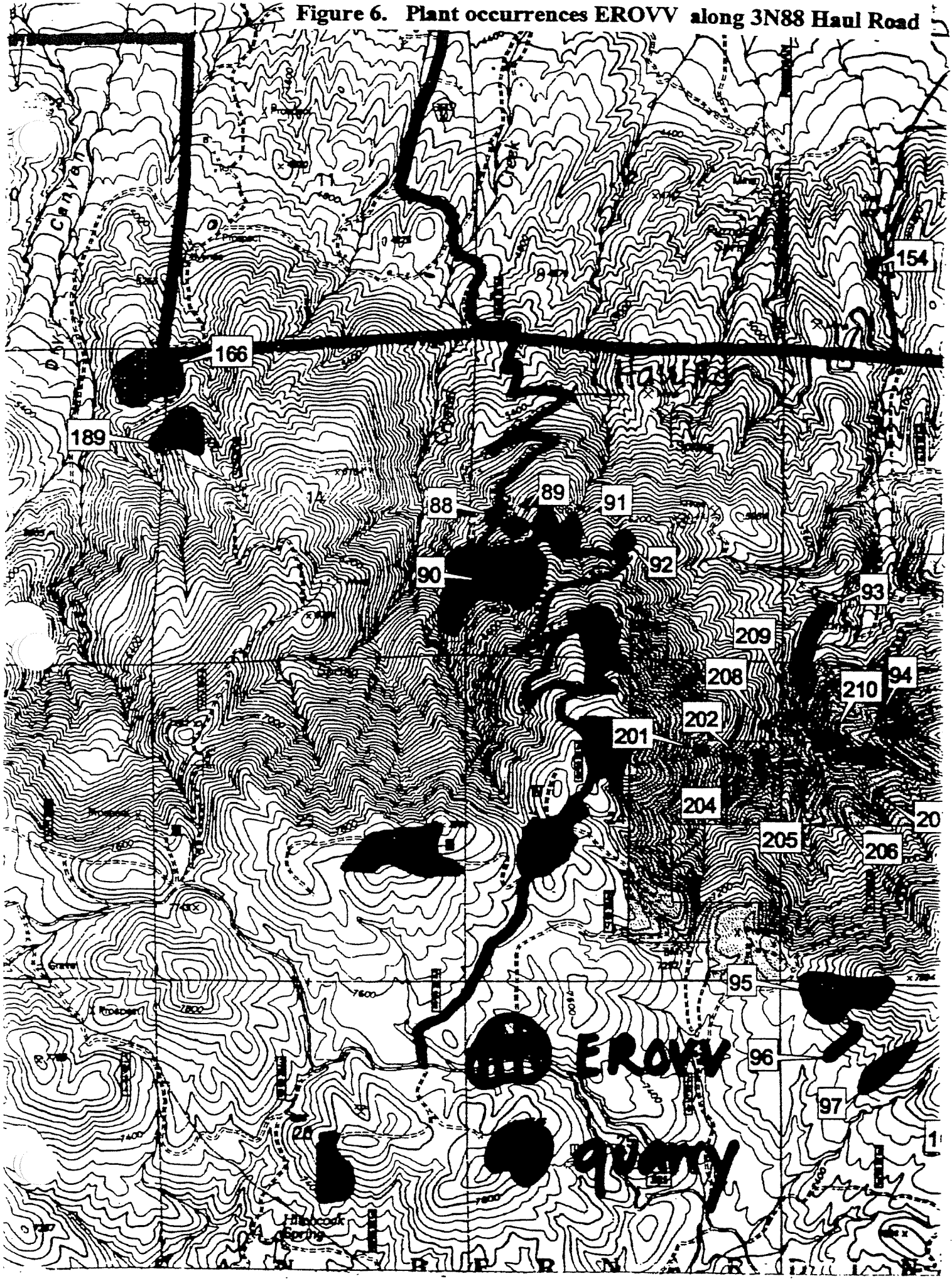


Figure 7. Plant occurrences OXPAG along 3N88 Haul Road

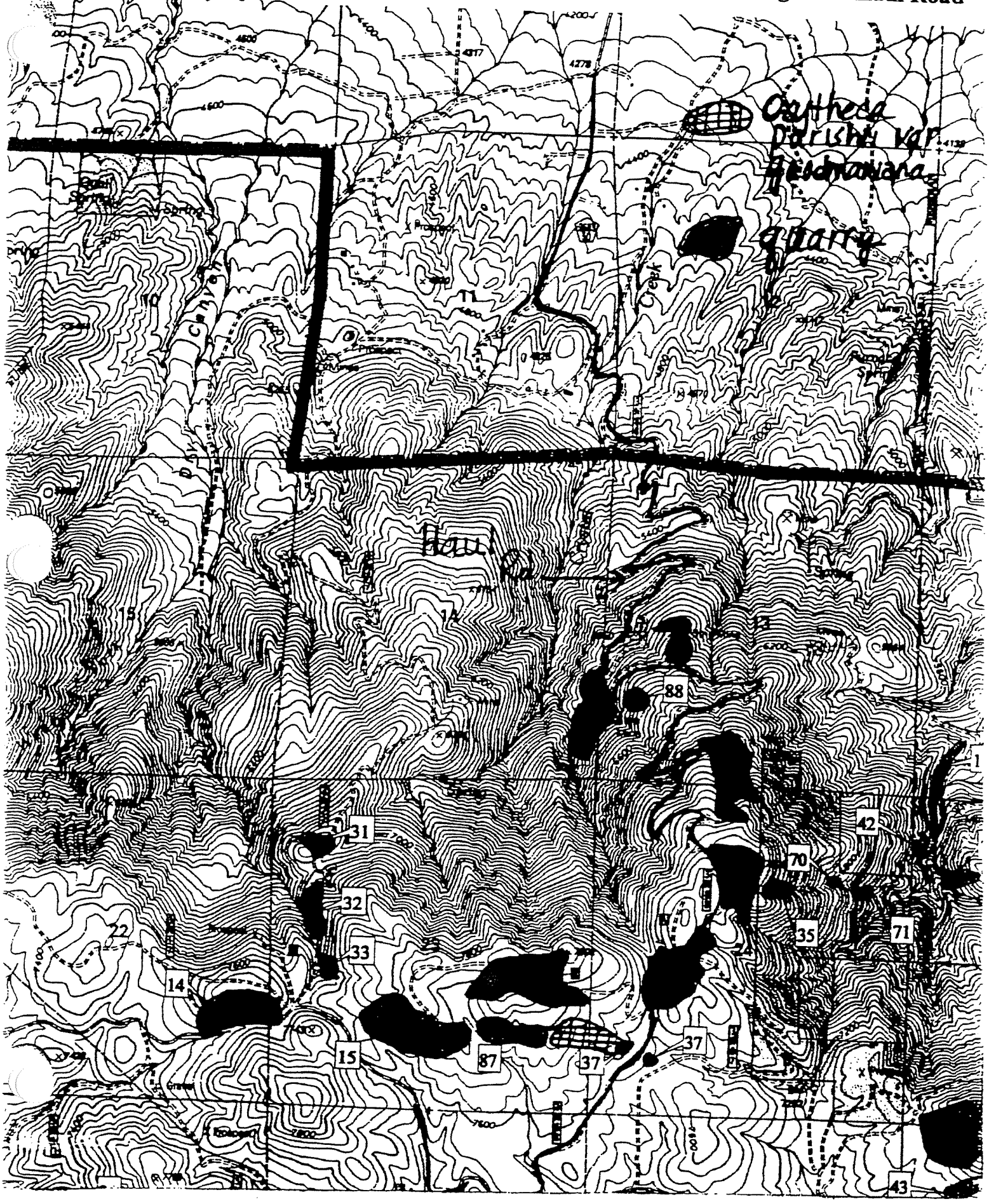
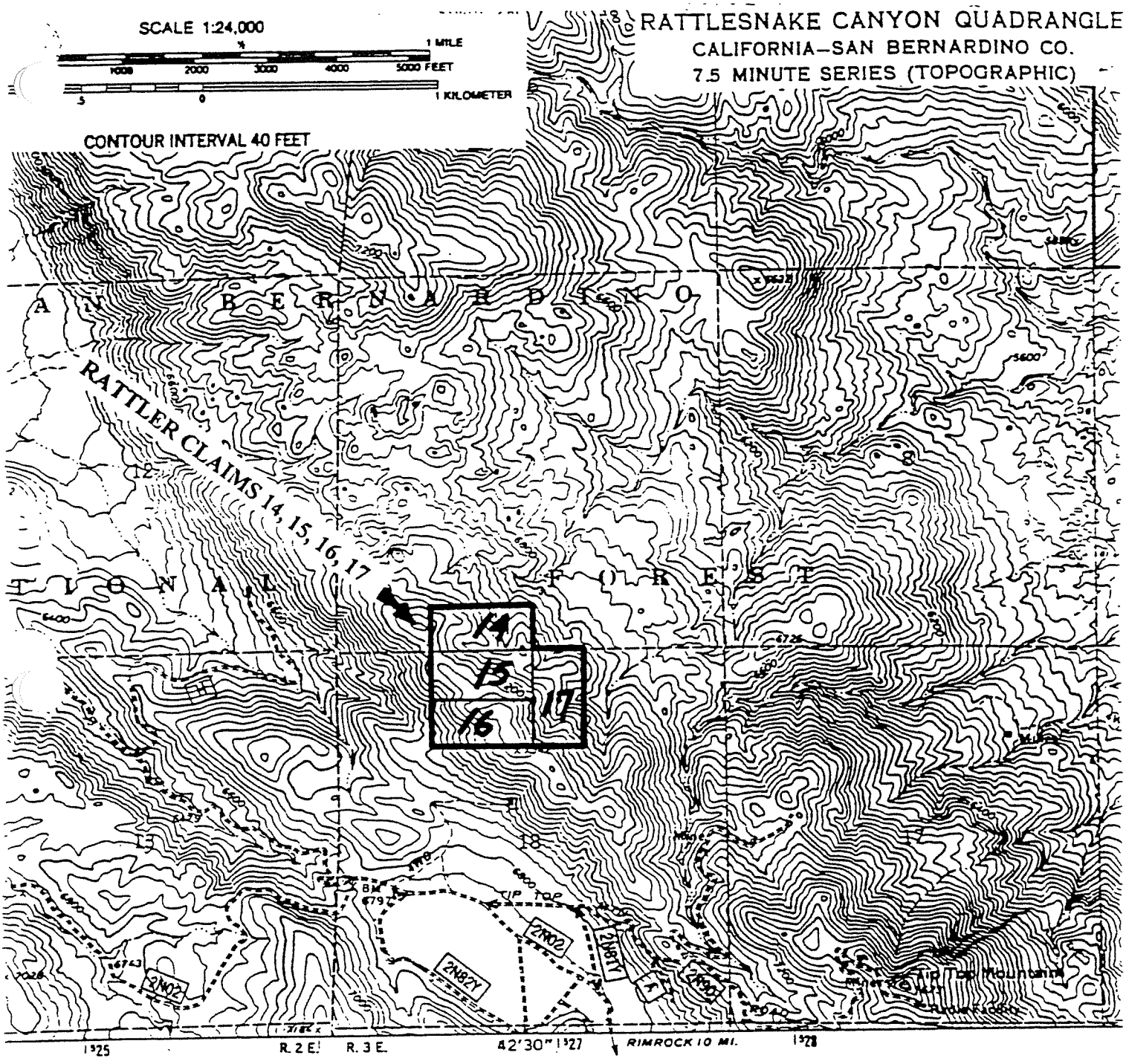
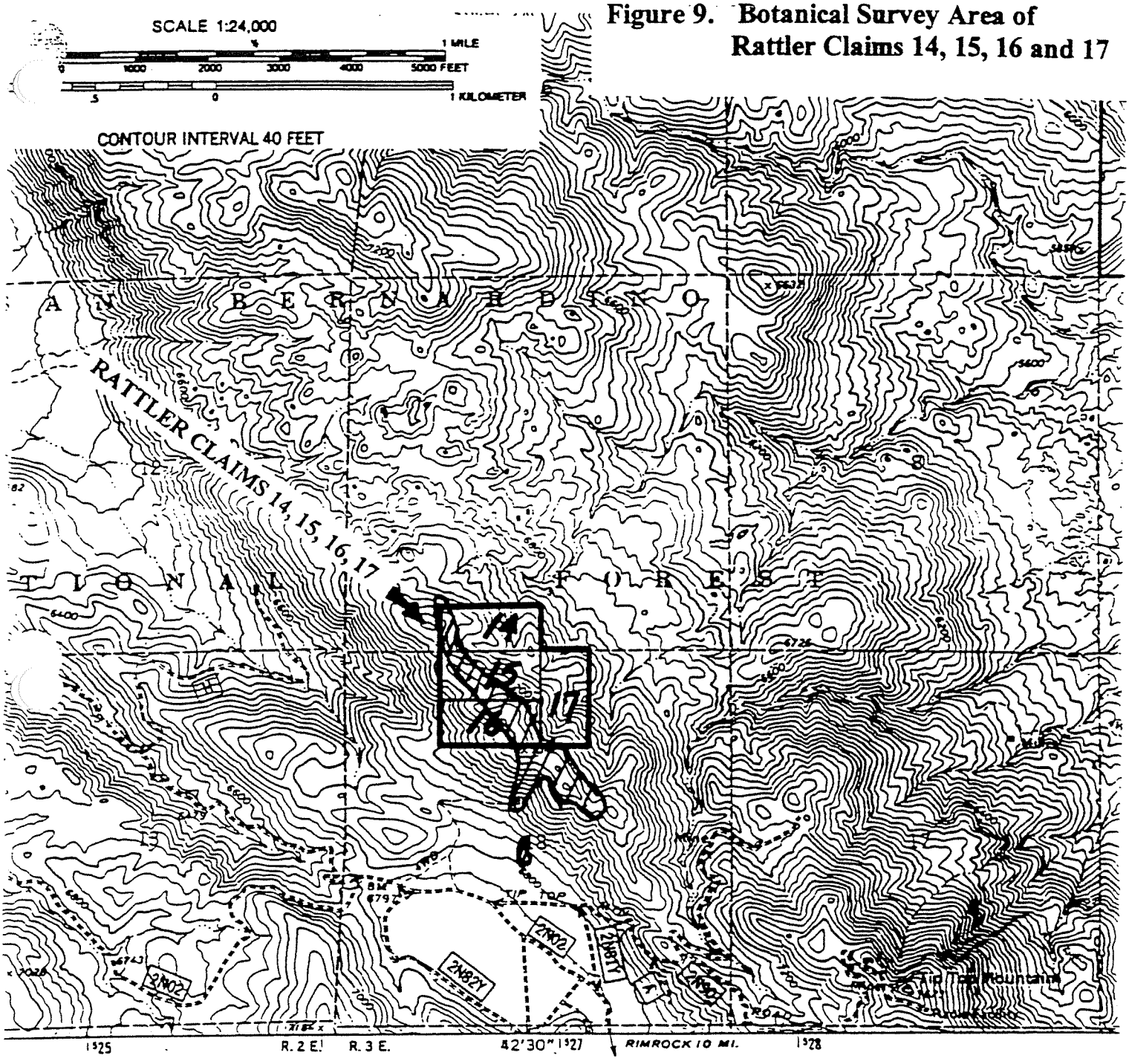


Figure 8. Claim Relinguishment Locations
Rattler Claims 14, 15, 16, and 17



PORTION OF RATTLESNAKE CANYON QUADRANGLE (71/2') MAP SHOWING LOCATION OF THE RATTLER 14-17 CLAIMS.

Figure 9. Botanical Survey Area of Rattler Claims 14, 15, 16 and 17



PORTION OF RATTLESNAKE CANYON QUADRANGLE (71/2') MAP SHOWING LOCATION OF THE RATTLER 14-17 CLAIMS.

area surveyed for plants 5/5/00. Elasont Volgarino.

Figure 10. Endangered Plant EROVV Locations
near Rattler Claims 14, 15, 16 and 17

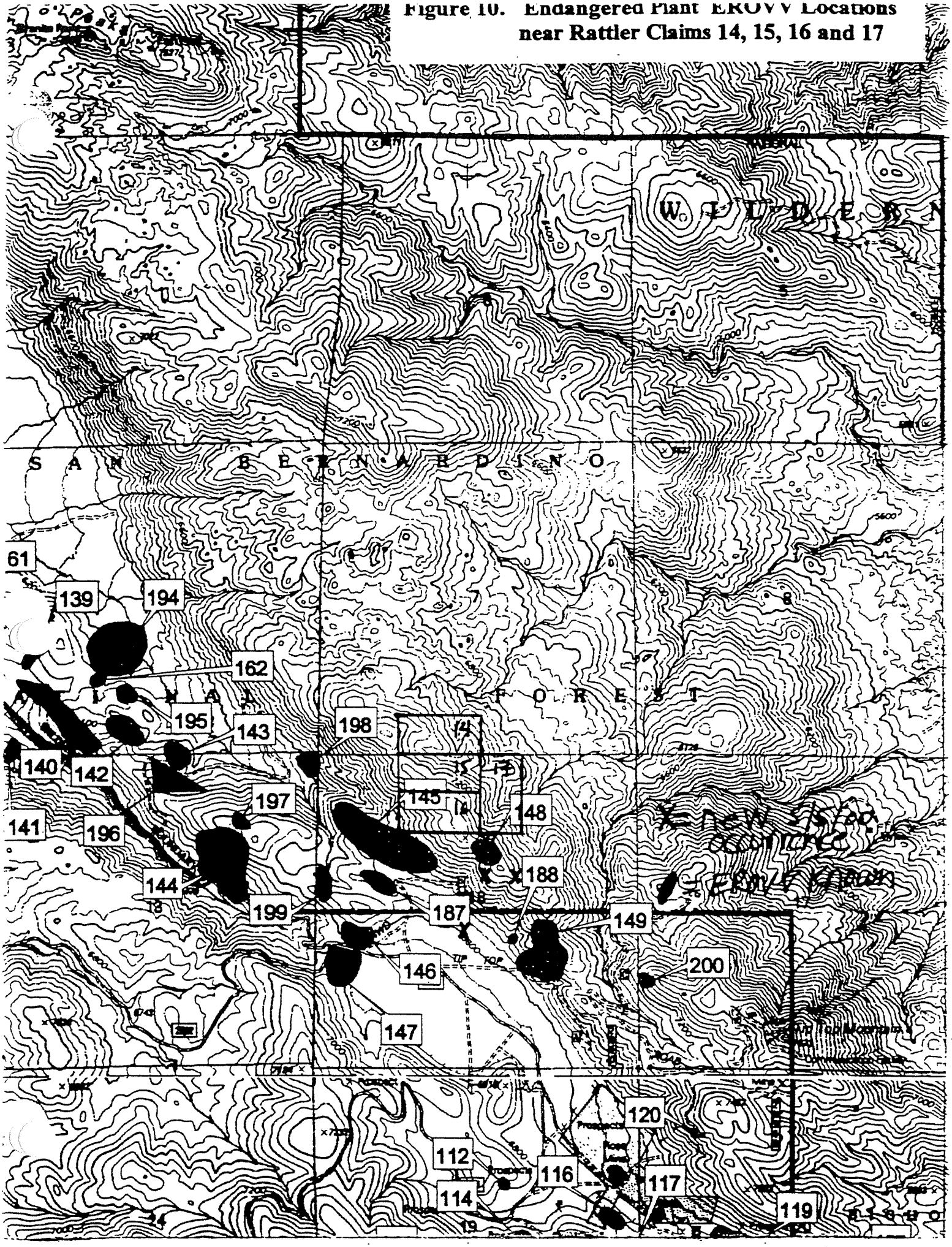
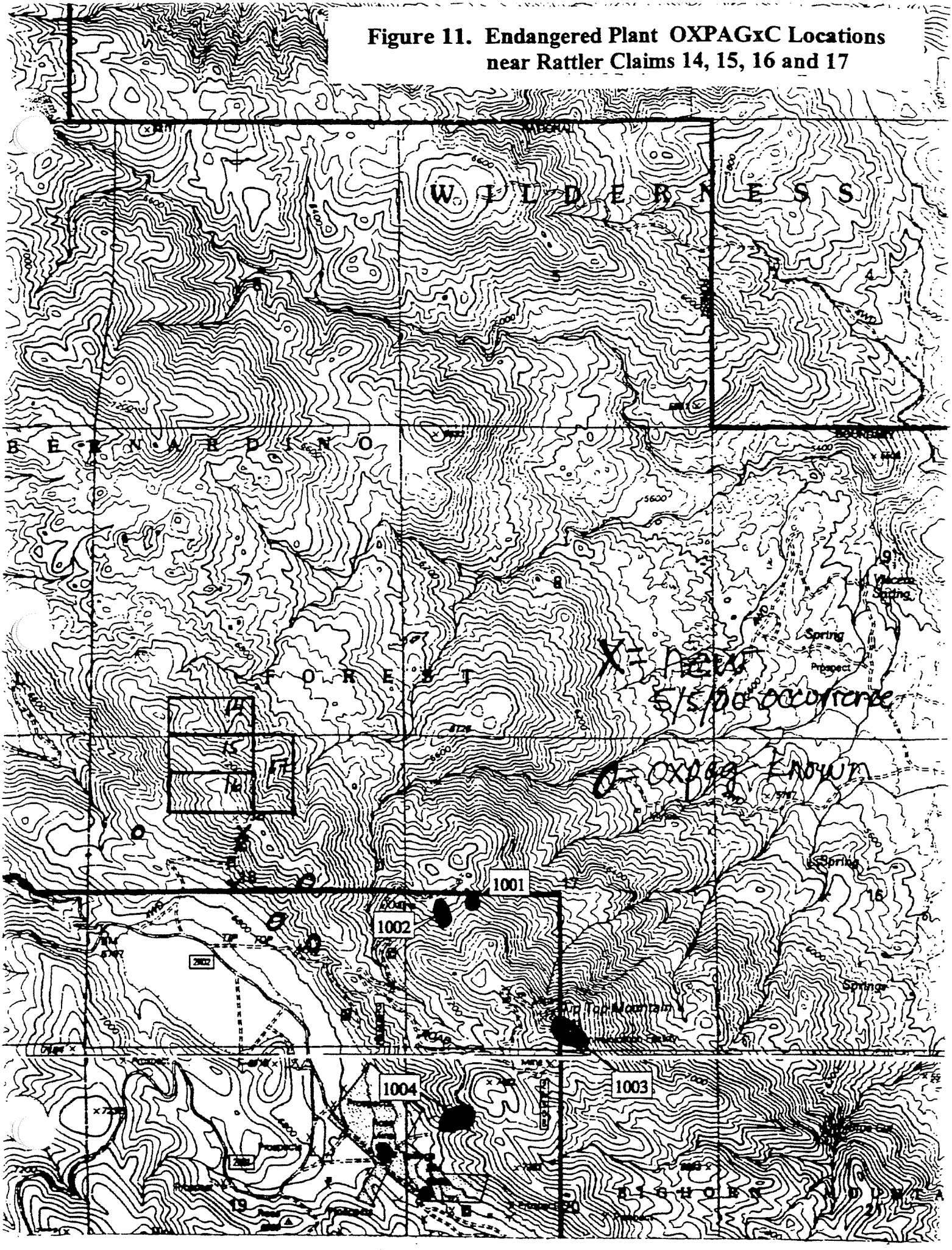
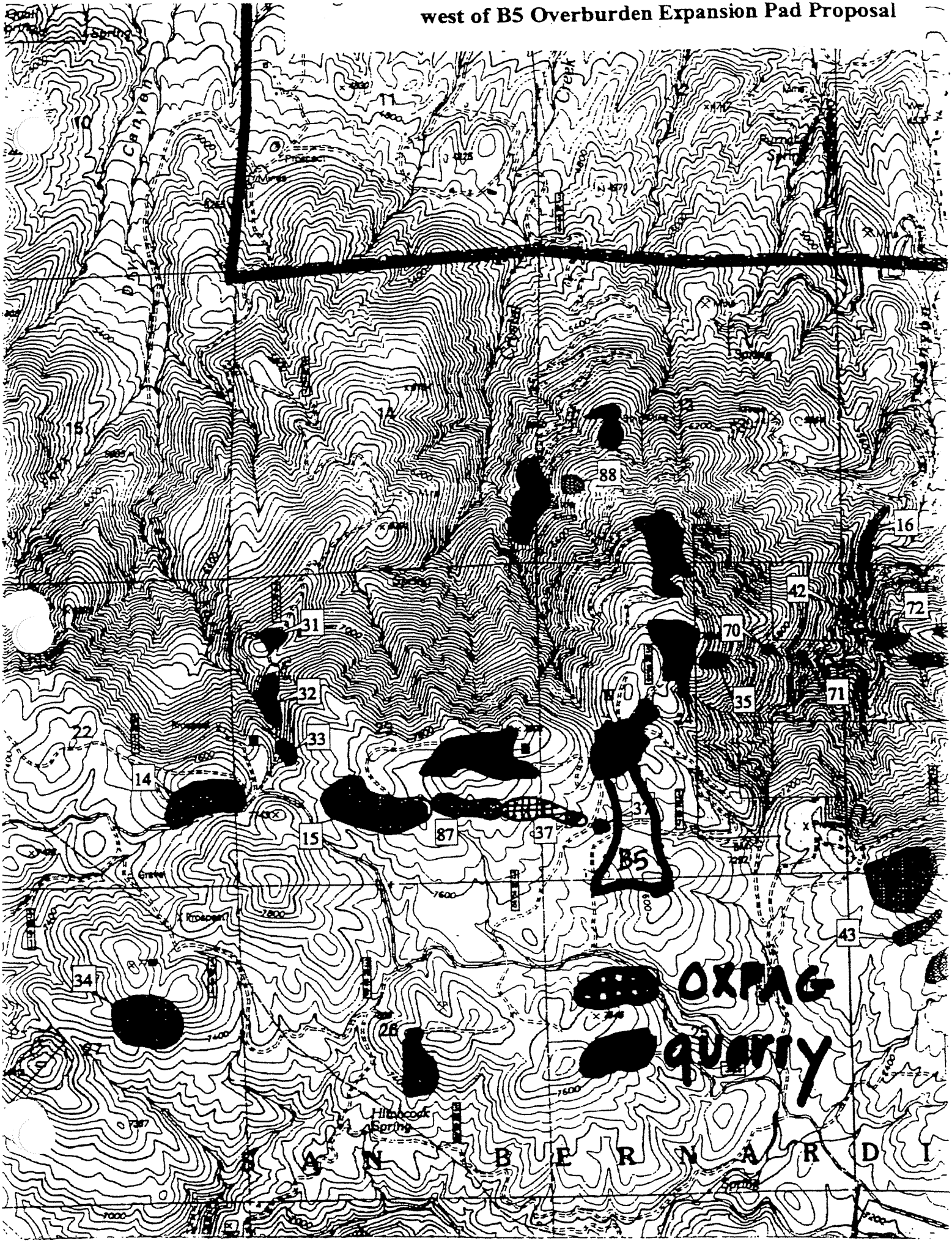


Figure 11. Endangered Plant OXPAGxC Locations near Rattler Claims 14, 15, 16 and 17




west of B5 Overburden Expansion Pad Proposal
B5
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quarry
SAN BERNARDINO

APPENDIX 1: Federally listed threatened or endangered plant and wildlife species potentially occurring on proposed project site.

Listed Species	Habitat and Distribution[1]	Flower season 1	Status Designation[2]	Occurrence Probability[3]
Astragalus albens **Cushenbury milk vetch**	Carbonate outcrops and alluvial / colluvial deposits to about 6000 ft. elev.; San Bernardino Mts endemic	Mar - May	**Fed: END** USFS: sensitive Calif: S1.1 CNPS: List 1B R-E-D:3-3-3	**Absent**
Erigeron parishii **Parish's daisy**	Carbonate soils to 6400 feet elev., San Bernardino Mountains endemic	May - June	**Fed: THR** USFS: sensitive Calif: 2.1 CNPS: 1B R-E-D:2-3-3	**Absent**
Eriogonum ovalifolium **var. *vineum*** **Cushenbury buckwheat**	Carbonate soils, outcrops, and talus; about 3900 to 7000 ft. elev.; San Bernardino Mountains endemic	May - June	Fed: **END** USFS: sensitive Calif: 1.1 CNPS: List 1B R-E-D:3-3-3	**Absent**
Lesquerella kingii **var. *bernardina*** **San Bernardino Mtns.** bladderpod	Carbonate soils above about 6800 ft. elev.; San Bernardino Mts. endemic	May - June	Fed: **END** USFS: sensitive Calif: S1.1 CNPS: List 1B R-E-D:3-3-3	**Absent**
Oxytheca parishii var. ***goodmaniana*** **Cushenbury oxytheca**	Carbonate soils, about 4200 to 7700 ft. elev.; San Bernardino Mts. endemic; populations fluctuate widely year to year	May - Sept.	Fed: **END** USFS: sensitive Calif: S1.1 CNPS: List 1B R-E-D:3-3-3	**Absent** (occurs adjacent to proposed overburden site)
Gopherus agassizii Desert tortoise	Desert shrubland	N/A	**Fed: THR** USFS: sensitive	**Absent** (occurs along Meridian Road)

1. Hickman (ed.) 1993; Munz 1974; Sanders et. al. 1995; Skinner and Pavlik 1994.
2. Calif. Dept. of Fish and Game 1996; Skinner and Pavlik 1994; San Bernardino National Forest 1995; US Fish and Wildlife Service 1993.
3. Occurrences based on field survey and reference to Rarefind 1998; Sanders et. al. 1995.

Federal designations: (federal Endangered Species Act, US Fish and Wildlife Service):

END: Federally listed, endangered.
THR: Federally listed, threatened.

CDF&G Natural Diversity Data Base Designations: Applied to special status plants and sensitive plant communities; where correct category is uncertain, CDF&G uses two categories or question marks.

S1: Fewer than 6 occurrences or fewer than 1000 individuals or less than 2000 acres.
S1.1: Very threatened
S1.2: Threatened
S1.3: No current threats known
S2: 6-20 occurrences or 1000-3000 individuals or 2000-10,000 acres (decimel suffixes same as above).
S3: 21-100 occurrences or 3000-10,000 individuals or 10,000-50,000 acres (decimel suffixes same as above).
S4: Apparently secure in California; this rank is clearly lower than S3 but factors exist to cause some concern, i.e., there is some threat or somewhat narrow habitat. No threat rank.
S5: Demonstrably secure or ineradicable in California. No threat rank.

APPENDIX 1: Federally listed threatened or endangered plant and wildlife species potentially occurring on proposed project site.

California Native Plant Society (CNPS) designations: (Note: According to CNPS (Smith and Berg 1988), plants on Lists 1B and 2 meet definitions for listing as threatened or endangered under Section 1901, Chapter 10 of the California Fish and Game Code.)

List 1A: Plants presumed extinct in California.
List IB: Plants rare and endangered in California and throughout their range.
List 2: Plants rare, threatened or endangered in California but more common elsewhere in their range.
List 3: Plants about which we need more information; a review list.
List 4: Plants of limited distribution; a watch list.

CNPS R-E-D Code:

Rarity 1: Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is low at this time.
2: Occurrence confined to several populations or one extended population.
3: Occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported.

Endangerment 1: Not endangered.
2: Endangered in a portion of its range.
3: Endangered throughout its range.

Distribution 1: More or less widespread outside California.
2: Rare outside California.
3: Endemic to California (i.e., does not occur outside California).

Definitions of occurrence probability:

Occurs: Observed on the site during surveys described here, or recorded on-site by other qualified biologists.
High: Observed in similar habitat in region by qualified biologists, or habitat on the site is a type often utilized by the species and the site is within the known range of the species.
Moderate: Reported sightings in surrounding region, or site is within the known range of the species and habitat on the site is a type occasionally used by the species.
Low: Site is within the known range of the species but habitat on the site is rarely used by the species.
Absent: A focused study failed to detect the species, or, no suitable habitat is present.
Unknown: No focused surveys have been performed in the region, and the species' distribution and habitat are poorly known.

Appendix 2. Plants and animals listed, proposed for listing, or candidates for listing, under federal Endangered Species Act occurring on SBNF but not addressed in this report.

Species	Common name	ESA status	Reason for exclusion
PLANTS			
Arenaria ursina	Bear Valley sandwort	THR	No suitable habitat (pebble plains)
Astragalus lentiginosus var. coachellae	Coachella Valley milk vetch	END	No San Bernardino Mtn. occurrences; well above elev. range (below about 1200 ft.); no suitable habitat (windblown dunes)
Astragalus tricarinatus	Triple-ribbed milk vetch	END	No northern San Bernardino Mtn. occurrences; above elevational range (below about 4000 ft.); no suitable habitat (desert shrublands)
Berberis nevinii	Nevin's barberry	END	Only San Bernardino Mtn. occurrence evidently an ornamental
Brodiaea filifolia	Thread-leaved brodiaea	THR	Only San Bernardino Mtn. occurrences in thermal-influenced soils at Arrowhead Hot Springs; no suitable habitat (gen. valley clay soils); above elev. range (below about 2000 ft.)
Castilleja cinera	Ash-gray Indian paintbrush	THR	No suitable habitat
Dodecahema leptoceras	Slender-horned spineflower	END	Above elev. range (below about 2300 ft.); no suitable habitat (cismontane alluvial fans and benches)
Eriastrum densifolium ssp. sanctorum	Santa Ana River woollystar	END	Above elev. range (below about 2000 ft.); no suitable habitat (alluvial fans and benches)
Eriogonum kennedyi var. austromontanum	Southern mountanin buckwheat	THR	No suitable habitat (pebble plains)
Poa atropurpurea	San Bernardino bluegrass	END	No suitable habitat (wet meadows)
Sidalcea hickmanii ssp. parishii	Parish's checkerbloom	Candi-date	No suitable habitat (chaparral, oak & yellow pine forest) on cismontane slopes
Sidalcea pedata	Bird's foot checkerbloom	END	No suitable habitat (wet meadows)
Taraxacum californicum	California dandelion	END	No suitable habitat (wet meadows)
Thelypodium stenopetalum	Slender-petaled thelypodium	END	No suitable habitat (alkaline meadows)
Trichostema austro-montanum ssp. compactum	Hidden Lake bluecurls	THR	No San Bernardino Mtn. occurrences; no suitable habitat (margins of Hidden Lake, San Jacinto Mts.)

Appendix 2. Plants and animals listed, proposed for listing, or candidates for listing, under federal Endangered Species Act occurring on SBNF but not addressed in this report.

FISH & INVERTEBRATES			
Euphadydras editha quino	Quino checkerspot	END	Above elev. range (below about 2500 ft.)
Gasterosteus aculeatus williamsoni	Unarmored threespine stickleback	END	No suitable habitat (streams or ponds)
Catostomus santannae	Santa Ana sucker	prop. THR	No suitable habitat (streams or ponds)
Gila bicolor mohavensis	Mojave chub	END	No suitable habitat (streams or ponds)
AMPHIBIANS & REPTILES			
Rana aurora draytonii	California red-legged frog	THR	Only reported San Bernardino Mtn. occurrence in City Creek on cismontane slope; no suitable habitat (streams or ponds)
Bufo microscaphus californicus	Arroyo southwestern toad	END	No suitable habitat (rivers and washes)
BIRDS			
Pelecanus occidentalis californicus	California brown pelican	END	Only potential occurrences accidental flyover; no suitable habitat (ocean & Salton Sea)
Gymnogyps californianus	California condor	END	Locally extinct & outside reintroduction area
Falco peregrinus anatum	American peregrine falcon	END	Only occurrences incidental; no suitable nesting habitat (cliffs) or foraging habitat (generally open water)
Haliaeetus leucocephalus	Bald eagle	THR	Only occurrences incidental; no suitable nesting habitat (large forest trees) or foraging habitat (generally open water)
Empidonax traillii extimus	Southwestern willow flycatcher	END	No suitable habitat (riparian)
Polioptila californica californica	California gnatcatcher	THR	No extant San Bernardino Mtn. occurrences; no suitable habitat (coastal sage scrub); above elev. range (below about 2000 ft.)
Vireo bellii pusillus	Least Bell's vireo	END	No suitable habitat (riparian)
Charadrius montanus	Mountain plover	Candidate	No suitable habitat (winters on open valley playas and flatlands)
MAMMALS			
Dipodomys merriami parvus	San Bernardino kangaroo rat	END	No suitable habitat (cismontane alluvial fans and washes); well above elev. range
Ovis canadensis cremnobates	Peninsular bighorn sheep	END	No San Bernardino Mtn. occurrences

APPENDIX 3: Forest Plan direction pertinent to the proposed project.

Plan direction	Applicability	Project consistant w/ direction?
WATERSHED MANAGEMENT EMPHASIS ZONE (MEZ) DIRECTION		
Plans of operation and appropriate mitigation and reclamation measures will be required for significant ground-disturbing activities.	Plan of operation has been prepared and includes appropriate mitigation (design to avoid or minimize impacts; claim transfer)	Yes
Viable populations of sensitive plants will be identified and protected through special measures.	Note design measures and additional recommendations to protect *Oxytheca parishii* var. *goodmaniana* population near overburden site	Yes
Maintain habitat conditions for emphasis species	Net loss of 7.7 acres during operation; eventual recovery of partial habitat value following reclamation. Claim relinquishment of about 60 acres of carbonate habitat.	Yes
Retain meadow and grassy openings	Not applicable	N/A
Maintain a mix of hardwoods and conifer[s] . . . consistent with the site potential to support hardwoods	Addressed in reclamation plan	Yes
GENERAL VEGETATION, HABITAT, AND SENSITIVE SPECIES DIRECTION		
Management of sensitive species habitat is to "maintain population viability (health) and to avoid future listing as threatened or endangered"	2 sensitive plants occur: *Arabis parishii* and *Swertia neglecta*; several sensitive animals may occur. All are common and/or widespread enough that habitat loss will be negligible. Future reclamation will replace some habitat value for species able to disperse and/or establish on site. Other sensitive plants determined absent based on surveys.	Yes
General direction regarding vegetation and watershed conditions are to "maintain long-term health and vigor, species diversity, and watershed stability, based on reproductive and regenerative potential of vegetation."	Project size insignificant in terms of watershed; soil and slope stability to be maintained by quarry and overburden design; eventual reclamation will partially replace elements of vegetation cover, health, and vigor.	Yes

APPENDIX 3: Forest Plan direction pertinent to the proposed project.

SENSITIVE PLANT DIRECTION		
Manage sensitive plant species to avoid future listing as threatened or endangered. Ensure maintenance of genetic and geographic diversity and viable populations. Inventory and monitor TE&S plant species. Protect as needed to maintain viability.	Impacts will not cause any trend toward eventual listing of sensitive species. Small numbers of plants to be lost are unlikely to be meaningful to species viability, genetic diversity, or geographic distribution.	Yes
Develop species management guides to identify population goals and compatible management activities that will maintain viability. Species management guides will function as recovery plans defining activity constraints in essential habitat and the need for monitoring land allocation and habitat management.	Not applicable. Project will have no effect of species management guide preparation.	N/A
Emphasize sensitive plant species habitat protec-tion and improvement in all forest management activities. Restrict uses and activities to protect sensitive plants where needed. Prepare a bio-logical evaluation on every Forest project with the potential to impacts TE&S plants.	Some loss of plants and habitat; note inclusion of overburden site design to avoid carbonate soils and nearby *Oxytheca parishii* v. *goodmaniana* occurrence. Further restrictions unneeded for proposed project; biological evaluation has been prepared	Yes
Encourage land ownership adjustments to acquire lands with important habitat for TE&S plant species.	Not applicable	N/A
Attempt to re-establish TE&S plants species in historic or suitable habitat.	No T&E species on site. Expanded quarry or overburden sites may become suitable habitat after reclamation	Potential
Provide information and education for TE&S plants to optimize public enjoyment while providing adequate protection to the resource habitat enhancement.	Not applicable	N/A

APPENDIX 3: Forest Plan direction pertinent to the proposed project.

FISH AND WILDLIFE DIRECTION		
Coordinate with California Department of Fish and Game and U.S. Fish and Wildlife Service during preparation of environmental assessments and plans having significant effects on fish and/or wildlife habitat.	Not applicable; no siginficant effects identified for project	N/A
Coordinate with other agencies, southern California Forests, PSW, local universities and conservation groups developing management guides for TE&S species and emphasis species.	Not applicable. Project does not affect management guide preparation.	N/A
Actively pursue land acquisitions for TE&S species.	Not applicable	N/A
Manage habitat for TE&S species to enhance populations and to permit their timely removal from designated lists. Manage for genetic and geographic diversity and long-term viability of the species on the Forest. Conduct all management activities and regulate uses to support the needs of TE&S species.	Loss of 32 acres of pinyon - juniper woodland occupied by two sensitive plants and suitable for several sensitive animals. Small area and numbers of individuals to be lost are unlikely to be meaningful to species viability, genetic diversity, or geographic distribution. Quarry reclamation and operation (subject to FS regulation and oversight) to minimize or mitigate losses. Relinquishment of claims off-site contributes to long-term conservation management.	Yes
Strive to maintain at least the current distribution of all TE&S species.	Minimal loss of habitat not meaningful in terms of species distributions.	Yes
Prepare a biological evaluation on every Forest project with the potential to impact TE&S species.	Biological evaluation has been prepared	Yes
Attempt to re-establish species in unoccupied suitable habitat.	Not applicable.	N/A
Fully mitigate for unavoidable impacts to TE&S species and riparian habitat.	Claim transfer and future reclamation provide substantial mitigation.	Yes
Develop species management guides to identify population goals and compatible management activities that will maintain viability.	Not applicable. Project has no effect on management guide preparation.	N/A

APPENDIX 3: Forest Plan direction pertinent to the proposed project.

MINING-RELATED DIRECTION		
Investigate the need for mineral withdrawal or other suitable alternatives where mining significantly conflicts with unique resource values.	Claim transfer and concurrent mineral withdrawal included as part of project.	Yes
Allow the production of minerals and energy with the assurance of adequate protection of other surface resources and resource values. Permits, leases, and Plans of Operation are to assure that adverse environmental effects are minimized or mitigated and that mined lands are reclaimed in a timely manner to regain surface production and use.	See Plan of Operations	Yes
Determine validity of all mining claims which operate or propose to operate in areas of sensitive plant or animal habitat.	OMYA claims in the Sentinel area have been in continuous production for >25 years; drilling samples indicate availability of 35 years of proven economically viable reserves	Yes
Review all lease applications submitted by the Bureau of Land Management and make recommendations necessary to protect surface resources.	Not applicable	N/A
Authorize extraction of other mineral materials (non-locatable, or non-leaseable minerals) only if the on-site or downstream damage to lands and resources can be mitigated and the extraction does not interfere with other uses already occurring on the lands.	Not applicable	N/A

APPENDIX 3: Forest Plan direction pertinent to the proposed project.

MINING-RELATED DIRECTION		
Investigate the need for mineral withdrawal or other suitable alternatives where mining significantly conflicts with unique resource values.	Claim transfer and concurrent mineral withdrawal included as part of project.	Yes
Allow the production of minerals and energy with the assurance of adequate protection of other surface resources and resource values. Permits, leases, and Plans of Operation are to assure that adverse environmental effects are minimized or mitigated and that mined lands are reclaimed in a timely manner to regain surface production and use.	See Plan of Operations	Yes
Determine validity of all mining claims which operate or propose to operate in areas of sensitive plant or animal habitat.	OMYA claims in the Sentinel area have been in continuous production for >25 years; drilling samples indicate availability of 35 years of proven economically viable reserves	Yes
Review all lease applications submitted by the Bureau of Land Management and make recommendations necessary to protect surface resources.	Not applicable	N/A
Authorize extraction of other mineral materials (non-locatable, or non-leaseable minerals) only if the on-site or downstream damage to lands and resources can be mitigated and the extraction does not interfere with other uses already occurring on the lands.	Not applicable	N/A

Appendix 4: Species list.

This list reports only the species observed on the site during this study. Other species may have been overlooked due to their growing season. Plants were identified from keys, descriptions, and drawings in Abrams (1923, 1944, 1951); Abrams and Ferris (1960); Hickman (1993); Mason (1957); Munz (1974), and Sanders et. al. (1995). Some specimens were identified or confirmed by A.C. Sanders (U.C. Riverside). Nomenclature and systematics follow Hickman (1993). Identifications supported by voucher specimens are identified by collection number (S. White); the specimens have been donated to the U.C. Riverside Herbarium.

Latin name	Common name	Note	Turn 16	S. Quarry	Overburden	Voucher
CONIFERALES						
CUPRESSACEAE	CYPRESS FAMILY					
Juniperus occidentalis	Western juniper		Comm.	Comm.	Comm.	5276
PINACEAE	PINE FAMILY					
Abies concolor	White fir			Uncom.	Occas.-comm.	
Pinus jeffreyi	Jeffrey pine				Comm.	
Pinus monophylla	Single-needle pinyon		Comm.	Comm.	Comm.	
EPHEDRALES						
EPHEDRACEAE	EPHEDRA FAMILY					
Ephedra viridis (?)	Green ephedra		Scarce			
DICOTYLEDONES						
ASTERACEAE	ASTER FAMILY					
Agoseris sp.	Unid. wild dandelion				Scarce	
Artemisia dracunculus	Tarragon			Uncomm.	Uncomm.	
Artemisia tridentata	Great Basin sagebrush			Comm.	Comm.	5274
Chrysothamnus nauseosus	Common rabbitbrush			Uncomm.	Occas.	
Chrysothamnus parryi	Parry rabbitbrush		Comm.	Comm.	Comm.	5296
Chrysothamnus viscidiflorus ssp. viscidiflorus	Yellow rabbitbrush		Comm.	Comm.	Comm.	
Ericameria linearifolia	Goldenbush				Scarce	5285
Gutierrezia microcephala	Small-flowered matchweed		Uncomm.	Uncomm.	Occas.	
BORAGINACEAE	BORAGE FAMILY					
Cryptantha sp.	Unid. annual cryptantha				uncomm.	5272
BRASSICACEAE	MUSTARD FAMILY					
Arabis sp.	Unid. rock-cress			Uncomm.		5301
Arabis holboellii	Holboell rock-cress			Uncomm.	Uncomm.	5302, 5304
Arabis parishii	Parish rock cress	2	Scarce			
Arabis perennans (?)	Rock-cress				Uncomm.	5300, 5303

Appendix 4: Species list.

BRASSICACEAE, cont.						
Caulanthus major	Grand jewelflower		Occas.			
Descurainia pinnata	Tansy mustard		Occas.	Occas.	Occas.	5292
Erysimum capitatum	Western wallflower		Occas.	Occas.	Occas.	
Sisymbrium altissimum	Tumble-mustard	1		Uncomm.	Roadside	
CACTACEAE	CACTUS FAMILY					
Opuntia basilaris var. basilaris	Beavertail cactus			Occas.	Occas.	
CARYOPHYLLACEAE	CARNATION FAMILY					
Arenaria macradenia (?)	Desert sandwort		Scarce			5294
Silene verucunda	Campion		Occas.			5297
CHENOPODIACEAE	GOOSEFOOT FAMILY					
Salsola tragus	Russian thistle	1	Roadside	Roadside	Roadside	
ERICACEAE	HEATH FAMILY					
Arctostaphylos glauca	Bigberry manzanita			Scarce		
Arctostaphylos patula	Greenleaf manzanita			Occas.	Occas.	
EUPHORBIACEAE	SPURGE FAMILY					
Chamaesyce albomarginata	Rattlesnake weed			Scarce		5287
FABACEAE	LEGUME FAMILY					
Astragalus douglasii	Douglas rattleweed			Occas.	Occas.	
Lupinus excubitis (?)	Bush lupine				Scarce	
FAGACEAE	OAK FAMILY					
Quercus chrysolepis	Canyon live oak			Occas.	Uncomm.	
GENTIANACEAE	GENTIAN FAMILY					
Swertia neglecta	Pine green gentian	2			Uncomm.-occas.	5277
GROSSULARIACEAE	CURRANT FAMILY					
Ribes cereum	Wax current			Scarce	Occas.	5275
HYDROPHYLLACEAE	HELIOTROPE FAMILY					
Eriodictyon trichocalyx	Yerba santa			Occas.		
Nama rothrockii	Purple mat			Occas.	Occas.	5286
Phacelia exilis (P. mohavensis ssp. exilis)	Transverse Range phacelia	2			Uncomm.	5271
Phacelia hastata (?)	Arrowleaf phacelia				Occas.	5270
LAMIACEAE	MINT FAMILY					
Salvia pachyphylla	Thick-leaf sage		Comm.	Comm.	Comm.	
LOASACEAE	STICK-LEAF FAMILY					
Mentzelia laevicaulis	Giant blazing star		Roadside		Roadside	
PAPAVERACEAE	POPPY FAMILY					
Argemone munita	Chicalote, prickly poppy			Uncomm.		

Appendix 4: Species list.

POLEMONIACEAE	PHLOX FAMILY					
Gilia sp.	Unid. annual gilia				Uncomm.	5279
Phlox austromontana	Southern mountain phlox		Comm.	Comm.	Comm.	5298
POLYGONACEAE	BUCKWHEAT FAMILY					
Eriogonum microthecum var. corymbosoides	San Bernardino buckwheat	2	Comm.	Occas.	occurs adj.	5293
Eriogonum nidularium	Nidulate buckwheat			Uncomm.	Occas.	5280
Eriogonum parishii	Parish buckwheat			Uncomm.	Uncomm.	
Eriogonum umbellatum var. minus	Alpine buckwheat		Occas.			5289
Eriogonum wrightii var. subscaposum	Matted Wright's buckwheat				Occas.	
Oxytheca parishii var. goodmaniana	Cushenbury oxytheca	2			See text	
PORTULACACEAE						
Lewisia rediviva	Lewisia				Uncomm. adj.	
RANUNCULACEAE	BUTTERCUP FAMILY					
Delphinium parishii	Desert larkspur				Scarce	5269
RHAMNACEAE	BUCKTHORN FAMILY					
Ceanothus greggii	Cupleaf ceanothus			Occas.	Uncomm.	5284
ROSACEAE	ROSE FAMILY					
Amelanchier utahensis	Serviceberry			Scarce	Occas.	
Cercocarpus ledifolius	Curl-leaf mountain mahogany		Comm.	Comm.	Comm.	
SCROPHULARIACEAE	FIGWORT FAMILY					
Castilleja montigena (C. applegatei x C. angustifolia)	Heckard's paintbrush	2	Occas.	Uncomm.	Uncomm.	5299
Cordylanthus nevinii	Nevin's bird beak				Occas.	
Pedicularis semibarbata	Lousewort		Occas.		Occas.	5290
Penstemon eatonii (?)	Eaton's penstemon				Uncomm.-occas.	
Penstemon grinnellii	Grinnell's penstemon		Occas.	Occas.	Occas.	
SOLANACEAE	NIGHTSHADE FAMILY					
Nicotiana sp.	Unid. wild tobacco			Uncomm.		
Solanum xanti var. montanum	Mountain nightshade			Occas.	Occas.	5273
STERCULIACEAE	CACAO FAMILY					
Fremontodendron californicum	Fremontia		Occas.	Comm.	Occas.	5283
VISCACEAE	MISTLETOE FAMILY					
Phoradendron juniperinum	Juniper mistletoe				Occas.	5278

Appendix 4: Species list.

MONOCOTYLEDONES						
POACEAE	GRASS FAMILY					
Achnatherum hymenoides	Indian ricegrass		Occas.	Occas.	Occas.	
Achnatherum parishii	Parish's needlegrass		Uncomm.	Uncomm.	Uncomm.	5295
Bromus tectorum	Cheatgrass	1	Uncomm.	Comm.	Comm.	
Elymus elymoides	Bottlebrush squirreltail		Occas.	Occas.	Occas.	
Melica stricta	Spike melic			Occas.		5288
Poa fendleriana	Fendler bluebrass		Comm.	Comm.	Comm.	

Appendix 5. Proposed High Volumn Air Sampling for Butterfield 5 Overburden Pad

PROPOSED HIGH VOLUME AIR SAMPLING BUTTERFIELD 5 OVERBURDEN SITE

Prepared by:
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PROPOSED HIGH VOLUME AIR SAMPLING

During the evaluation of emissions sources for the Sentinel Quarry expansion, it is suggested to establish an area emissions baseline around the Butterfield 5 overburden site expansion area.

This can be established by the use of a total of three high volume air samplers, each strategically located. One within the Sentinel Crusher area, the second near the location of the Threatened and endangered plant population of Cushenbury Oxytheca, and the third located in an upwind ambient location.

DESCRIPTION OF SAMPLE LOCATIONS

1). Number 1 sampler located at the existing crusher area to determine the maximum amount of emissions exposure possible.

2). Number 2 sampler located in the northwest edge of the Butterfield 5 overburden expansion area. This location is close to the endangered plant population just to the west of the proposed overburden site expansion. This sampler would measure baseline emissions prior to beginning overburden activities at the site, and would later sample emissions at the overburden site after overburden dumping begins.

3). Number 3 sampler location near turnout # 26 of the Claudia haul road. This location is about ½ mile up wind from the Butterfield 5 overburden expansion area, and would measure ambient conditions prior to the overburden site expansion and after the expansion is underway.

SAMPLING PROTOCOL

It is required per EPA Method IP 10, using this sampling method to sample 33 to 55 cubic feet of air per minute thru each of the high volume samplers. This is accomplished either a twelve or twenty four hour period with the sample being distributed through a preweighed filter, and carefully weighed after sampling to determine Total Suspended Particulate (TSP).

This is then carefully calculated in reference to the total amount of sample gathered during the total sampling time for the filter, and documented.

It is suggested to sample over a period of seven days (one week) both before and after overburden site expansion begins to determine the total changes which can occur during the coarse of the weeks operations.

DATA COLLECTION AND ANALYSIS

As noted sampling is accomplished prior to the overburden site expansion to determine actual baseline conditions. Sampling is also accomplished after the overburden site expansion starts to determine actual emissions, and to allow comparison with the baseline data.

The crusher site sampler # 1 will determine the most contaminated area of particulate exposure. This location at the crusher is more than 0.25 mile northeast and down wind from the Endangered plant species population. Since it is some distance from and down wind from the endangered species, activities at the crusher will not likely impact samples collected at the endangered species location.

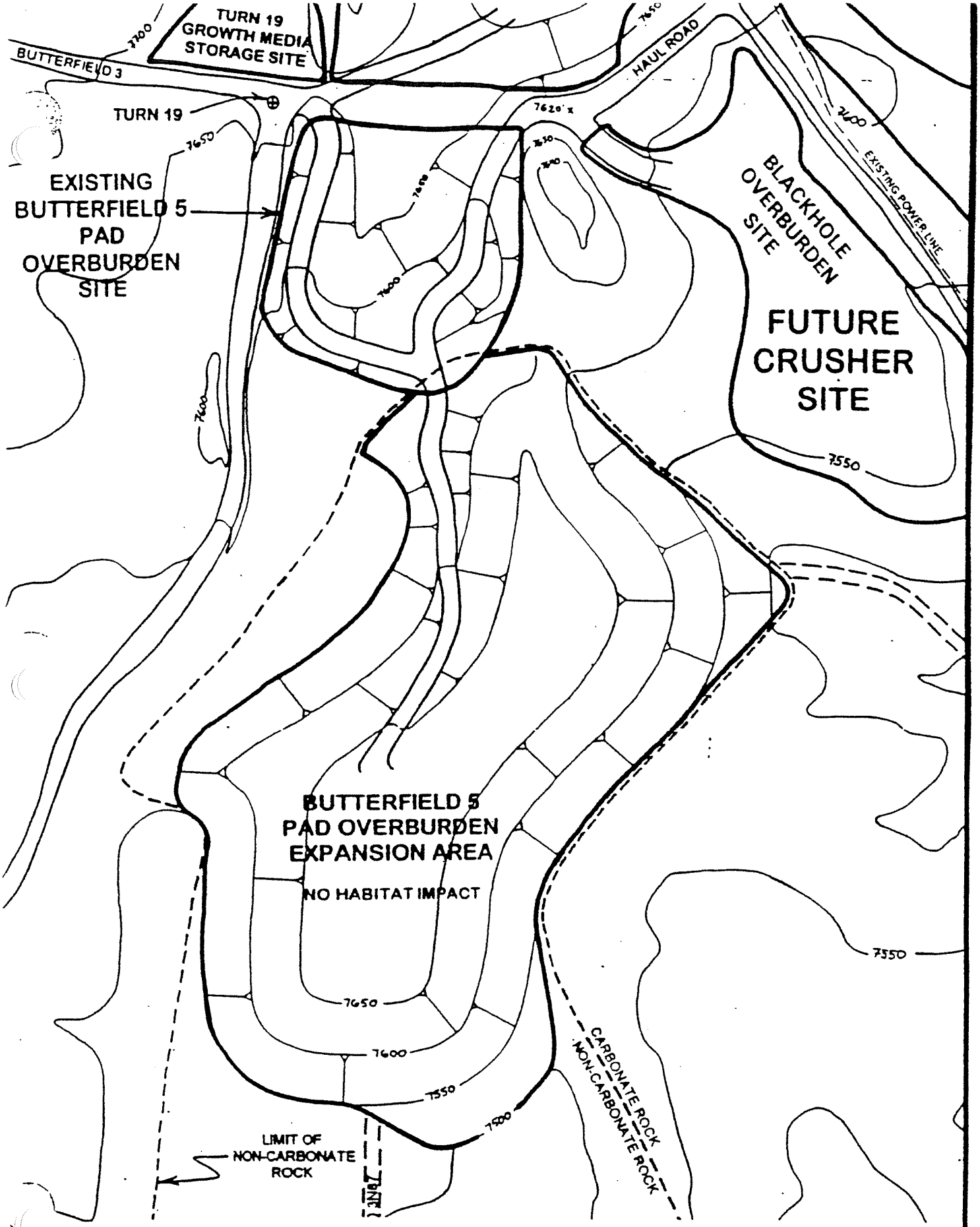
The sampler # 2 located near the endangered species population will not disturb the plant population site, but will be close enough to the plants to accumulate good accurate sampling data, both prior to the overburden site expansion and during overburden activities, and thus before and after data can be compared.

The ambient background will be established at Sampler # 3 to determine the most clean uncontaminated air in the general area. This site is more than 0.5 mile upwind of the overburden site and south of the endangered species plant population.

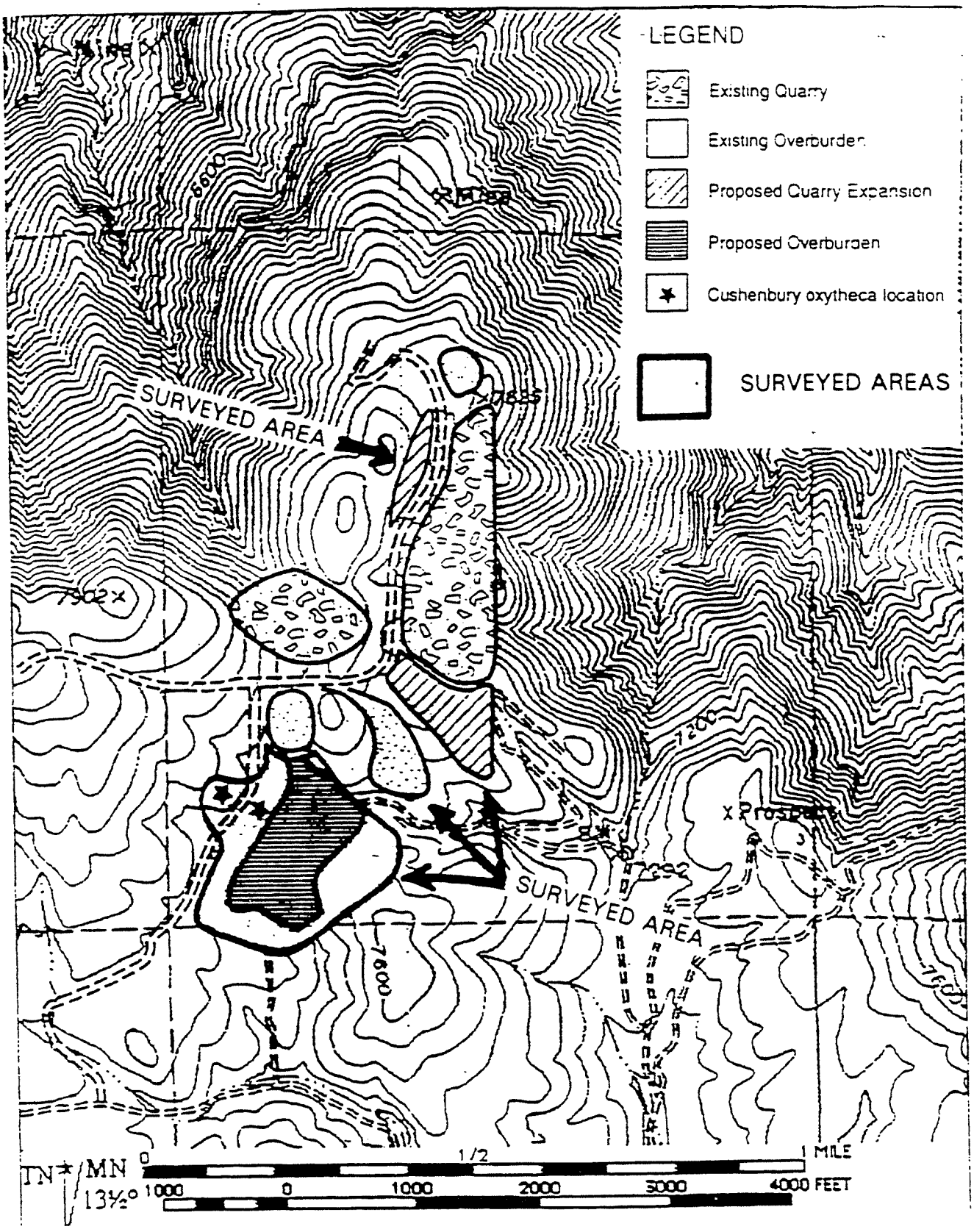
The results of the sampling can be compared to before and after with respect to individual sites and compared to the ambient air sampling both before and after the expansion begins. Thus, the sampling will determine actual emissions at various sites including the endangered species site, both before the expansion and after the expansion begins and allow comparisons of real emissions data. In addition, comparisons can be made with modeled data and adequacy of the various attributes which are considered in the calculations can be determined.

In addition, the real emissions data which generated, can then be applied to the EPA approved dispersion modeling program and calculated dust deposition patterns and volumes per unit area over time can be calculated and compared with the modeling data generated prior to starting the overburden activity.

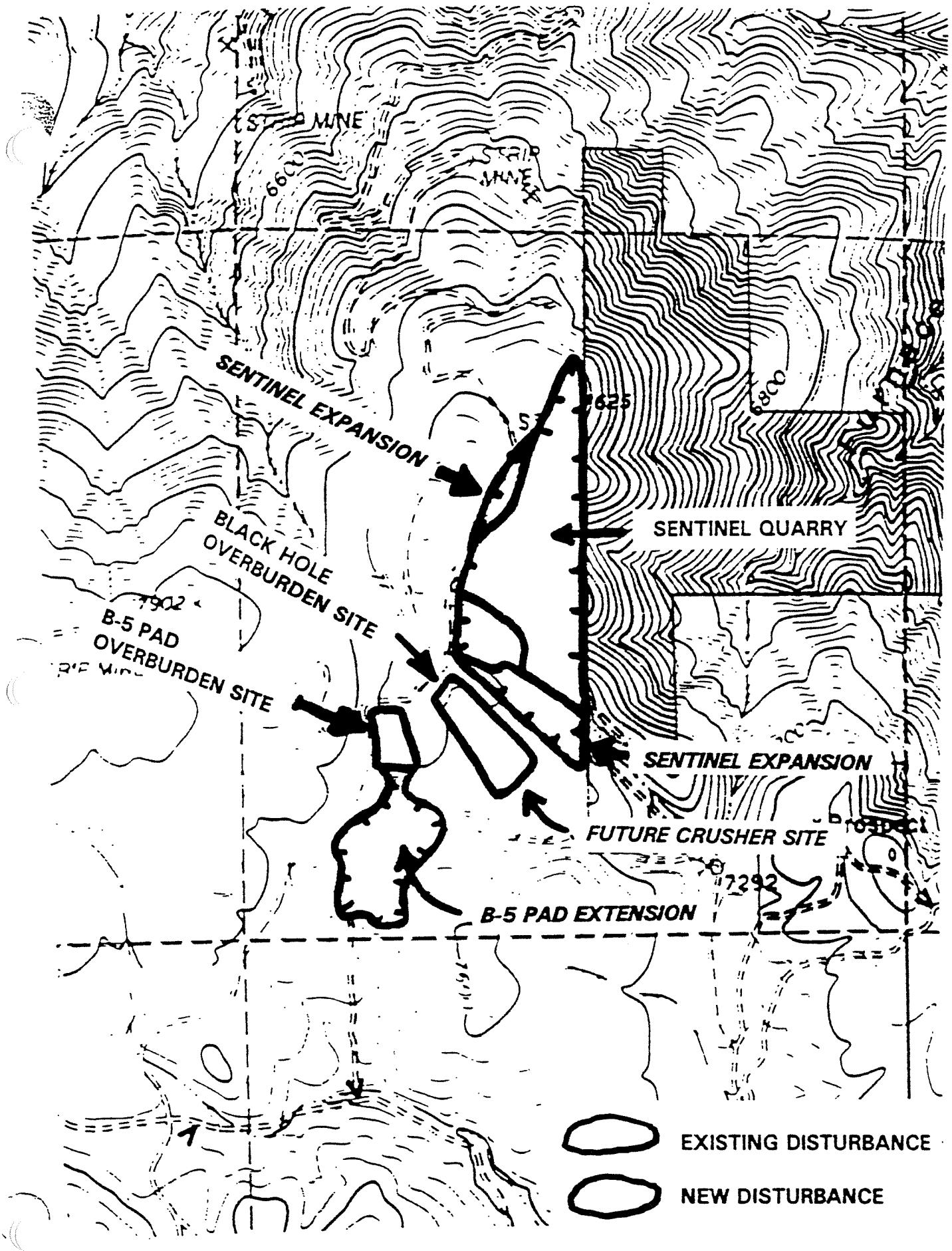
This high volume air sampling program will generate valid real emissions data from the Butterfield 5 overburden site expansion.



BUTTERFIELD 5 OVERBURDEN SITE DEVELOPMENT PLAN



Botanical surveys and *Oxytheca parishii* var. *goodmaniana* locations



SENTINEL QUARRY SITE AREA MAP

Study Proposal: Dust Deposition and its Effects on Plants at the Proposed Omya B5 Overburden Expansion Site

29 March 2000

Prepared for:
Howard Brown, Omya (California), Inc., PO Box 825, Lucerne Valley, CA 92356

Prepared by:
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Introduction and Overview:

The San Bernardino National Forest and other agencies have expressed concern about potential adverse effects of dust originating from limestone operations on the Forest on native vegetation, particularly on listed threatened or endangered species. One recent Forest Service document noted heavily dusted plants near Omya's Sentinel crusher and quarry site and extrapolated from this that significant dust effects were expected within ¼ mile (400 m) of any mine-related dust source, including crushers, processing plants, haul roads, quarries, and waste sites.

There is meaningful scientific evidence of dust affecting plants. Researchers at the Army's Fort Irwin site found dust levels as high as 40 g / m^2 of leaf surface on shrubs alongside a heavily used dirt road. Dust clearly affected the plants. Physiological studies showed reduced photosynthesis rates and other adverse effects. Measures of shoot production showed little or no growth of dusted plants, while control plants located just across the road (upwind from the dust source) showed steady shoot production through the growing season.

I am unaware of quantitative measures of dispersal distance from dust sources, or of relative importance of various dust sources and their likely effects on listed plants in the San Bernardino Mountains. The Forest Service has asked Omya to monitor dust effects at the proposed B5 overburden expansion site as a condition of approval for proposed quarry and waste dump expansions. This proposal is intended to (1) directly address the Forest Service's request, and (2) provide a basis for more widespread monitoring of dust and its effects throughout the area.

Four aspects of the Omya operations area and the B5 site force a more complex study design than the one used at Fort Irwin:

1. The B5 expansion site is within about ¼ mile of Omya's Sentinel crusher site and the old B5 pit, now in use for waste disposal. Thus, even without new dust originating from on-site waste disposal, the site presumably experiences some dust deposition from these other sources. This study is intended to distinguish increased dust deposition from existing ambient dust levels by collecting data through at least one growing season before beginning to operate the expansion area.

2. The San Bernardino Mountains receive significant summer thundershowers which are likely to wash accumulated dust from vegetation. At the Fort Irwin site, researchers collected dust samples only once, at the end of the growing season. In the San Bernardino Mountain study, I propose to collect dust samples monthly throughout the season (May - Oct.) to avoid distortions of results that might result from rainfall.

3. The dust source at Omya's proposed overburden expansion site will shift in space as the waste area expands to the south. The primary source of dust will be the active face of the overburden site, which will progress southward as the site expands. Depending on the rate of expansion, it may be necessary to either shift locations of data source points during the course of the study, or to plan in advance for overburden site expansion by sampling from a wider array of points.

4. The Omya project involves an endangered annual plant, *Oxytheca parishii* var. *goodmaniana*, which occurs just west of the proposed overburden expansion site. At Fort Irwin, researchers collected samples from common shrubs and used destructive techniques to quantify dust deposition and physiological response. I propose here to sample common shrubs to quantify dust deposition and shoot growth, and to sample endangered plants only after completion of their reproductive cycle.

Study plan:

I propose to collect the following 3 data sets. If scheduling permits, each data set should be collected prior to the beginning of overburden site operation for comparison to post-project data. Dust deposition and shoot growth data should be collected during 2 years of overburden site operation. *Oxytheca* biomass production should be collected in more years due to anticipated high variance.

- Dust deposition, expressed as grams of dust per square meter of leaf surface area, at points of varying distance from the new dust source
- Shoot growth of common shrubs, expressed in centimeters, from the same points
- Dry weight biomass production by *Oxytheca parishii* var. *goodmaniana* from a series of quadrats along a linear transect from the base of the proposed overburden expansion site toward the southwest.

Dust deposition: I propose to mark and monitor individual shrubs at the overburden site, the endangered plant location and, for control data, at a more more distant location to the south or west. At each point, shoot samples will be collected from common shrub species (probably rabbitbrush), all dust removed and weighed, and total leaf area measured, to determine amount of dust accumulated (g / m^2 of leaf surface area). Methods for measuring dust collection and leaf surface area will be modified slightly from Sharifi and coauthors (1997: Surface dust impacts on gas exchange in Mojave Desert shrubs; *Journal of Applied Ecology* 34:837-846).

Shrub shoot growth: I propose to mark a series of stems at each data collection point and compare total shoot length at the beginning and end of each growing season, following methods of Sharifi et al. (op cit.). A point about 2 dm from the end of each selected stem will be marked with a plastic or metal ring. Lengths of all shoots above the point will be counted, measured, and summed. Measurements from the same point will be repeated at the middle and end of the growing season. Sharifi and coworkers found little or no growth among the most severely dusted plants in their study, while shoot length and number in control plants increased throughout the season (Fig. 9, p. 844). I would expect to find significant correlations of dust to growth inhibition only on plants very near a significant dust source.

Effects to Cushenbury oxytheca: A Cushenbury oxytheca population lies just west of the proposed expansion site and extends to the west. Due to the plant's legal status, I do not propose destructive sampling to monitor potential dust effects. After the growing season, I propose to sample a series of 1 square meter quadrats within the adjacent population and along a linear

transect to the west; to count and weigh all Cushenbury oxytheca plants within each quadrat, and to plot population density and biomass as functions of distance from the proposed overburden expansion site. I will collect these data in as many years as possible prior to the beginning of operations at the overburden expansion site. I would expect to find high variance in biomass and density in the baseline data and little or no correlation with distance from the overburden site. Hypothetical results are shown below.

Limitations of the study plan:

The study plan described above was designed specifically to monitor dust deposition at the proposed overburden expansion site. Total dust deposition will be a sum of dust resulting from new expansion operation on-site and ambient dust produced by surrounding operations (particularly the Sentinel quarry and crusher and nearby roads).

Dust deposition: I anticipate that dust effects from the overburden expansion site will be minor by comparison with other sources and that the proposal outlined here may yield inconclusive results.

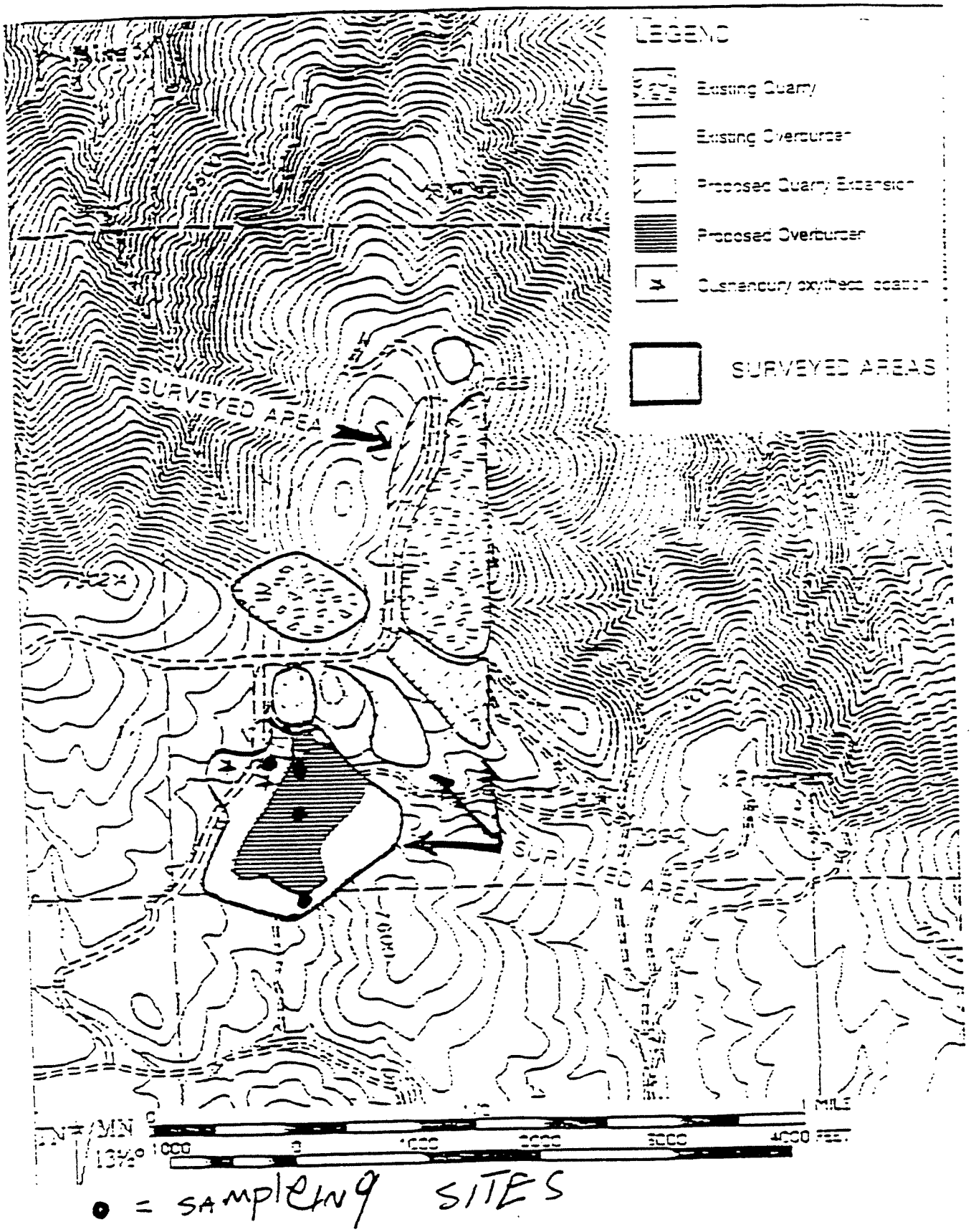
Shoot growth: The methodology does not account for potential loss of shoot length by browsing herbivores. Rabbitbrush is unpalatable to most animals, and is likely to show little if any herbivory. More important, significant impacts to shoot growth are likely to be seen only in the most heavily dusted plants (those nearest major dust sources). Again, the study proposed here may yield inconclusive results.

Effects to Cushenbury oxytheca: Annual variation in population density seems to be high, probably fluctuating with precipitation. Ideally, data should be collected through an entire "cycle" of El Nino / La Nina years before and after beginning operation at the overburden site. This would provide robust baseline and post-project data, so that comparisons could be made with high confidence.

Tentative Work Plan and Budget:

If scheduling permits, I propose to carry out the full study program outlined here for 1-2 two years prior to beginning operations at the overburden expansion site and for 2 years after beginning operations. I propose to carry out the Cushenbury oxytheca monitoring over as many years as possible before and after beginning operations to minimize the influence of statistical variance.

The cost estimates shown below are intended only as rough guidelines and do not represent a formal proposal.



Map 2: Botanical surveys and *Oxytheca parishii* var. *goodmaniana* locations

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...nants

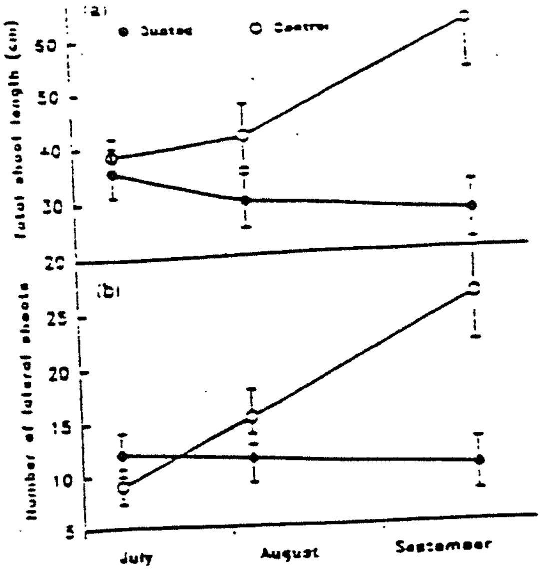

Fig. 9. Phenological data for individuals of *Larrea tridentata* sampled on 7 July, 3 August and 16 September 1984 at the study site at Goldstone Tracking Station. Bar indicates standard error

... and 3 C increase in photosynthetic stems of ... At high ambient summer temperatures of 40–45 C in the central Mojave Desert, these relatively small absolute changes in leaf temperature may significantly reduce rates of net photosynthesis. *Larrea* has a summer optimum temperature for photosynthesis near 40 C (Mooney *et al.* 1978). Any decrease in PAR would be expected to yield a lowered rate of net photosynthesis of dusted organs. In addition, leaf temperatures approaching or exceeding 45 C have the potential to cause significant heat stress and permanent tissue damage.

Another potential physical effect of dust on photosynthetic surfaces could be a change in boundary layer conditions due to increased surface roughness. A thick coating of dust particles on a leaf surface theoretically would produce a small decrease in boundary layer conductance across the leaf air transition that would lower transpiration rate, thus leading to lower evaporative cooling and consequently increased leaf temperatures and reduced growth (Darley 1966; Eveling 1969; Borka 1980). At the same time, irregular accumulation of dust would produce changes in turbulence for air flow over the plant organ. Probably more important, heavy dust on a leaf could also cover a significant percentage of the stomatal pores, thereby lowering leaf conductance and causing elevated leaf temperatures. The methods employed in the current study were not capable of determining to what extent stomata were blocked by dust.

Where dust particles are very fine, individual grains have been reported to occlude stomata, presumably lowering leaf conductance during daylight and increasing water loss at night or under conditions of ...75). While our results for nocturnal conductance do not support this mechanism in *Larrea*, there are numerous studies (Ricks & Williams 1974; Eller & Brunner 1975; Eveling & Bataille 1984) that have reported that fine dust particles occlude stomata, presumably by lowering leaf conductance to water vapour during the daytime and increasing water loss at night. Incomplete closure of stomata would cause a decrease in WUE, make impacted plants more susceptible to drought, and expose interiors of organs to increased oxidant air pollutants, which in turn may have direct and indirect effects on plant performance. The potential for small particulates to wedge open stomatal pores certainly exists for desert plants, but direct observations did not confirm that this occurred, because closure was virtually complete at night, and thus particulates wedged into stomatal pores are unlikely to have any significant effect on plant water loss.

The minimum midday plant water potentials reported here are comparable to values previously reported. Midday summer plant water potentials of −6·5 MPa were found for *Larrea* growing in the Sonoran Desert (Nilsen, Sharifi & Rundel 1984), while values of −5·5 MPa (Bamberg *et al.* 1975) and [illegible] MPa (M. R. Sharifi, A. C. Gibson & P. W. Rundel, unpublished data) have been reported for *Larrea* in the Mojave Desert. While higher water potentials were noted in control plants than in dusted plants of *Larrea* and *Hymenoclea*, the opposite effect was noted in the C_4 plant *Atriplex*. Pre-dawn water potential, an indicator of the equilibrium between soil water potential and plants, was not measured at our site. However, in a companion study of *Larrea* alone at the same site and during the same month and year, no significant differences were found between dusted and control individuals with regard to pre-dawn water potentials ([illegible] and −5·0 MPa for dusted and control plants, respectively) (M. R. Sharifi, A. C. Gibson & P. W. Rundel, unpublished data).

The phenological development of *Larrea* control plants showed a steady increase in the total shoot length and the total number of lateral shoots. However, dusted individuals showed no growth or even a slight decrease (due to branch senescence) in total shoot length. In most C_3 shrubs in the Mojave Desert, peak growth activity continues until mid-summer, while even C_4 plants such as *Atriplex* reach peak biomass production at midsummer (Ackerman, Romney & Kinnear 1980). However, peak growth and phenological activity may shift by weeks, or even months, towards spring or summer, depending on temperature and precipitation (Ackerman *et al.* 1980). *Hymenoclea* showed a similar phenological pattern to *Larrea*. *Atriplex*, on the other hand, had higher growth rates than the two C_3 plants towards the end of July.

The physiological impacts of dust on Mojave Desert

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APPENDIX 7.

PLANT LIST FOR
OMYA RATTLER CLAIMS 14, 15, 16 AND 17
Note: all areas not covered in survey
5/5/2000
Volgarino and Eliason

Abronia nana spp. covillei
Arabis shocklei
Arabis dispar
Eriogonum microthecum var. cormybosoides
Astragalus leucolobis
Unknown Arabis
Draba sp.
Gilia cana
Ephedra sp.
Purshia tridentata
Chrysothamnus nauseosus
Juniperus osteosperma
Phlox sp.
Arenaria macradenia var. macradenia
Pinus monophylla
Descurania sp.
Yucca brevifolia
Opuntia basalaris
Echinocerus triglochinatus
Eriogonum saxatale
Bromus tectorum
Cercocarpus ledifolius
Eryisimum capitatum
Castilleja chromosa
Stipa coronata
Mirabalis sp.
Opuntia littoralis
Echinocerus engelmannii
Chrysothamnus vicidiflorus
Galium sp.
Salvia pachyphyllus
Caulanthus major
Poa incurva

APPENDIX 8: SPECIES ACCOUNTS FOR CURRENTLY-LISTED ANIMALS ON THE SAN BERNARDINO NATIONAL FOREST

Quino Checkerspot (*Euphydryas editha quino*): Found in open coastal sage and chaparral, and grasslands. Host plants are *Plantago erecta*, *P. insularis*, and *Castilleja exerta*. Known from Vail Lake, east of Anza (SJ). Status: FE (1/16/97).

Shay Creek Unarmored Three-spined Stickleback (*Gasterosteus sp.*): Shay Creek and Baldwin Lake (BB) are the only naturally occurring populations. Sugarloaf Pond supports a transplanted population.

Morphologically, the species resembles other populations of *G. aculeatus* that have a greatly reduced number of lateral plates. Dorsal and ventral spines are short and slender and the body is rounded. Collections from Shay Creek in 1981 and 1985 had 80-90% of fish without any plates. The species shows a striking male nuptial coloration. In most G. aculeatus populations, males exhibit distinctive breeding colors with a blue eye, a dark or blackish dorsum, and a red or orange chin. The extent of the reddish pigment is variable ranging from zero in certain melanic forms to extensive red markings extending in some fish to the anal fin. The red of male individuals in Shay Creek is more developed than in any other sticklebacks in Southern California. Almost all males have red coloration to the anal fin and in many it extends beyond and is visible on the caudal peduncle and onto the tail itself. The red color is combined with a shiny black over most of the rest of the body.

This species of stickleback is found at high elevations and possibly evolved there. This population lies at 6700 feet and is higher than any other Unarmored three-spined stickleback population. The species survives today in only two ponds that both have a covering of ice for long periods in the winter. It is not known if the fish possess unique physiological adaptations to these severe conditions. The fish have also been seen living in Baldwin Lake during 1985. This lake lacks any external drainage, and accumulates mineral salts. It has been speculated that this fish historically inhabited the tributaries to Baldwin Lake and during seasons of wet years, the lake itself. It is believed that the ground water has been dropping and many streams have become intermittent. During wet years, fish can be seen in Baldwin Lake and Shay Creek but during normal or dry years are confined to Shay Pond. Requires quiet water and pools with a lot of aquatic vegetation. (Sections taken from CDFG Petition - James Malcolm.) Status: FE (USFWS treats it the same as *G. aculeatus williamsoni*)

Unarmored Three-spined Stickleback (*Gasterosteus aculeatus williamsoni*): Young stickelbacks hatch in a nest from eggs which have been brooded for several days by the adult male, which fans the eggs and guards the nest and surrounding territory from possible predators. This parental care is essential for successful reproduction. The exact amount of time the young stay in the nest is not known but the smallest specimens captured outside a nest were about 10 mm standard length. In small artificial pond situations, the stickelbacks tend to be concentrated at the upstream end of the pond where the water is flowing in. In larger ponds they are only found in such places, not in the areas of standing water. None have been found to be living permanently in ponds

isolated from the main stream. Population size estimates indicate that the best habitat is a small clean pond in the stream with a constant flow of water through it. A pond such as this, at Soledad Sands Park in Soledad Canyon, supports between 3.4 and 2.0 fish per square meter.

This particular stickleback feeds mostly on aquatic insects and snails. The stickleback population tends to decline due to natural mortality and low recruitment during winter; fish apparently live for only one year. Examination of gonads, size-frequency studies and field observations of young and nesting adults show that there is some reproduction during almost every month. A large increase occurs in the spring, about March, and continues at a lower level through the summer and fall.

The number of suitable nesting sites may be a limiting factor on the population while predation could play a major role. Other threats include urbanization resulting in changes in water quantity or quality. Pollution from lowered water quality has caused deformities. Introduction of exotic predators and competitors could affect populations of this fish. (Taken from UTS Recovery Plan - Natural History and Habitat Requirements.) Status: FE SE R5 SBNF

Mojave Tui Chub (*Gila bicolor mohavensis*): Habitat is quiet, vegetated, sand or mud bottomed pools of headwaters, creeks, and small to large rivers; lakes (Page and Burr, 1991). Historic occurrences in Deep Creek (AH, BB) and Mojave River (AH). Status: FE SE SFP

California Red-legged Frog (*Rana aurora draytoni*): Historically, red-legged frogs were found through southern California in freshwater streams, marshes, and lakes. It was once located in the San Bernardino mountains at elevations less than 5100' (in the Mojave River Forks area of Cedar Springs and Deep Creek prior to construction of Lake Silverwood and Mojave River Forks Flood Control Dam).

More recent surveys of the Forest have failed to locate red-legged frogs. However suitable habitat does exist. Deep (<.7m deep) plunge pools within streams with emergent and overhanging vegetation provide preferred habitat. Willow root masses provide hiding cover and egg-laying sites. This species is primarily nocturnal (Zeiner et al, 1988). Only known extant population in southern California occurs at Santa Rosa Plateau (off-Forest). Status: FT

Mountain Yellow-legged Frog (*Rana muscosa*): In Southern California, mountain yellow-legged frogs live in streams in ponderosa pine, montane hardwood conifer, and montane riparian habitats at elevations ranging from 1200 to 7500'. Populations in the Sierra Nevada are declining, and isolated populations are all that remain of the species in the mountains of Southern California. Adult frogs prey on a variety of invertebrates and terrestrial insects are a preferred food. Tadpoles feed on algae and diatoms found on rocky stream, lake and pond bottoms.

Males defend a territory around themselves during the breeding season. Home ranges are thought to be less than 10 m in length. These frogs breed and lay eggs from March to May in Southern California, depending on local conditions. Clusters of up to 500 eggs

(typically 200-300) are laid in shallow places on rocks or gravel. Tadpoles typically overwinter before transforming to adult frogs. Adults hibernate in iced-over streams. Predators include garter snakes and introduced trout (Zeiner et al. 1988). Known from Black Mnt (SJ) and possibly from Day Canyon (recent unconfirmed sighting) (CA). Historic occurrences: Keen Camp, Schain's Ranch, Fuller Mill Creek, Tahquitz Creek, South Fork San Jacinto River, Strawberry Valley, Cabazon, Snow Creek, Andreas Canyon (SJ); Cucamonga, Day, and Etiwanda Canyons, Lytle Creek (CA); possibly Jenks Lake (SG). Status: CSC CP SBNF *

Arroyo Southwestern Toad (*Bufo microscaphus californicus*): This toad is endemic to the coastal portions of Southern California and Baja California, south of San Luis Obispo. It has been found in semi-arid habitats such as valley foothill and desert riparian areas, Joshua tree woodland, desert wash, palm oasis, mixed chaparral and sagebrush, near washes and intermittent streams. Adult toads prey on a variety of invertebrates including snails, ants, caterpillars, moths and Jerusalem crickets. No information on the feeding habits of tadpoles is available. No information is available on territoriality or home range size. Arroyo toads breed principally in March to July. Thousands of eggs are laid in strings on the bottom of clear streams or quiet ponds among leaves, gravel and sticks. Adults are primarily nocturnal, although newly transformed toads are more diurnal (Zeiner et al. 1988). Known from: West Fork Mojave River (AH), Deep Creek (AH/BB), Whitewater Cyn (SG). Possible: South Fork San Jacinto River, Bautista Cyn, Indian Creek (SJ), San Gorgonio and Lower Santa Ana Rivers, Plunge, Mill, and Little San Gorgonio Creeks (SG); Holcomb Creek (BB), Lytle, East Twin, and Horsethief Creeks, Crowder Canyon, Cajon Wash (CA). Status: FE CSC CP R5

Desert Tortoise (*Gopherus agassizii*): Desert tortoises occur in a wide variety of habitats in arid and semiarid regions. They are most common in desert scrub, desert wash, and Joshua tree habitats, but occur in almost every desert habitat except on the most precipitous slopes. Tortoises are herbivorous, eating a variety of annual forbs and grasses. They prefer forbs and green vegetation over grasses and drier vegetation for the moisture content. Water is not required, but tortoises will drink if water is available. They are most active between March and June. They require friable, sandy, well-drained soils for excavation of burrows to escape the sun and for nesting. Copulation occurs in early spring (late March or early April). Clutches average 5 eggs (range 2-9) and take 3-4 months to hatch. Lack of rain and annual plants contributes to reproductive failure. Home range sizes depend on the quality of the habitat. There is no evidence that tortoises defend territories, although they can be aggressive. When young, tortoises are vulnerable to predation but have few enemies as adults (Zeiner, et al. 1988). Found on north slope of San Bernardino Mountains (BB/AH), Whitewater/Cabazon (SG), possibly Cajon RD. Status: FT ST

Brown Pelican (*Pelecanus occidentalis*): Rare inland. Wanderers are seen at any time of year but especially in summer (Blom et al. 1987). Need large open bodies if water; lakes, reservoirs and their margins. Known as an accidental visitor to Big Bear Lake (BB). Habitat code: L. Occ in SB Mtns: x. Status: FE SE CFP.

California Condor (*Gymnogyps californianus*): California condors are large, scavenging birds of open grasslands, savannah, and chaparral habitats. Cliffs, large trees,

and snags for roosting are important habitat components. Their range is now extremely restricted. This species was extinct in the wild from 1987 to 1992, and they are now being reintroduced to areas of Santa Barbara and Ventura counties. Condors nest on high cliffs, on large ledges, in caves or crevices, or behind rock slabs. Nests are on bare rock, but are often surrounded by heavy brush. Condors are strictly scavengers, eating carcasses of cattle, sheep, deer, and ground squirrels. They forage over large areas (up to 30 km2 or greater) and do not appear to be territorial. A single egg is laid annually, or less often. Incubation lasts approximately 59 days, and the young leave the nest after about 5 months. Pesticide accumulation has affected the reproduction of condors through eggshell thinning. Attempted predation of condor chicks by golden eagles has been reported. Reduced numbers of livestock carcasses due to changing ranching practices have probably contributed to the species decline in recent years (Zeiner et al. 1990a). Historic in Snow Creek (SJ) and Holcomb Valley (BB). Habitat Code: Occ in SB Mtns: +; in SJ Mtns: +. Status: FE SE CFP R5 SBNF.

Bald Eagle (*Haliaeetus leucocephalus*): Bald eagles occur in a variety of habitats. Key habitat components are large bodies of water or rivers with abundant fish, and large trees or snags with heavy limbs or broken tops. Dense stands of conifers are used for communal roosts. Winter roosts may be 10-12 miles from feeding areas. Platform stick nests are usually built 50-200 feet from the ground in the largest tree in an old growth stand, especially ponderosa pine. Nests are typically located within 1 mile of permanent water. Nest stands may have canopy cover of less than 40%, so long as the nest itself is shaded. Bald eagles feed on fish, carrion, and occasional small mammals. No information on home range size is available, but breeding territories have been recorded ranging from 11-45 ha. Bald eagles breed from February to July, with peak activity from March to June. This species is monogamous, and reaches breeding age at 4-5 years. Pairs produce a clutch of usually 2 eggs (range 1-3). The incubation period is 34-36 days, and the young are semialtricial and hatch asynchronously (Zeiner et al. 1990a). Wintering at Lake Hemet (SJ), Arrowhead, Gregory, Grass Valley, Green Valley Lakes, and Mojave River (AH), Big Bear, Baldwin, and Erwin Lakes (BB), Jenks Lake (SG), possibly Lost Lake (CA). Two nesting attempts at Miller Canyon and Silverwood Lake were unsuccessful (1990 and 1992). Habitat code: L. Occ in SB Mtns: uT, uWV; in SJ Mtns: oT, uWV. Status: FT(downlisted from FE on 8/11/95) SE CFP R5 SBNF.

Peregrine Falcon (*Falco peregrinus*): Peregrine falcons are associated with open habitats near water, in the vicinity of cliffs and canyons. They prey primarily on birds, and are capable of killing birds up to the size of a duck. Peregrines occasionally prey on mammals, insects, and fish as well. They attack and kill birds in flight. Peregrines nest on high cliffs, dunes, and banks. These falcons may use abandoned raptor nests, but generally make scrapes in pebbles or debris on a rock ledge. They breed from early March to late August. A clutch of usually 3-4 (sometimes up to 7) eggs is incubated for 32 days. They may lay a second clutch of eggs if the first is removed or destroyed early in the season. Pesticides have contributed to the decline of this species through eggshell thinning. Golden eagles, great horned owls, raccoons, and other mammals are occasional predators, especially of young birds (Zeiner et al. 1990a). Known from: migrant in Big Bear Valley (BB), Lake Hemet, Lily and Red Tahquitz Rocks (SJ), introduced at Cajon (CA). Habitat code: gml. Occ in SB Mtns: rT, rWV; in SJ Mtns: rT, rWV. Status: FE SE CFP R5 SBNF.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*): The willow flycatcher is a riparian bird. It nests in dense willow thickets, in meadows and stream areas. It feeds on insects, and occasionally on seeds and berries. Willow flycatchers lay a clutch of 3-4 eggs in June, and incubate them 12-13 days. The young fledge at 13-14 days. Willow flycatchers defend a territory of approximately 0.7 ha. An important habitat component is dense growth of the lower branches within willow thickets. For this reason, cattle grazing may impact these birds heavily. Brown-headed cowbirds, a nest parasite favoring edge conditions, have also been associated with the decline of this species (Zeiner et al. 1990a). Occurrence: nesting at Thurman Flats (SG); migrant to Bluff Lake, Big Bear Basin, desert riparian (Terrace Springs) (BB), Mojave River (AH), Bautista Canyon, Strawberry and Herkey Creeks, Garner Wash, lower Palm and Andreas Canyons (SJ). Habitat code: r. Occ in the SB Mtns: rT, oSR; in the SJ Mtns: rT. Status: FE SE SBNF.

Coastal California Gnatcatcher (*Polioptila californica californica*): Inhabits arid coast scrub below 2500'. The black-tailed gnatcatcher has been recently split by taxonomists from the California gnatcatcher. California gnatcatchers are probably serially monogamous. Pairs raise a brood of young together, but may change partners within a breeding season (Carlson, pers. comm.). The birds are sedentary, and occupy a territory of approximately 4 ha. (RECON 1987, Atwood 1980). They defend the territory from a variety of bird species during the breeding season (Carlson, pers. comm.).

The range of the California gnatcatcher historically extended from Baja California north along the coastal slope of California, to the Santa Clara Valley in Ventura County, west of the transverse and peninsular ranges, and as far east as the San Gorgonio Pass (Grinnell and Miller 1944, Garrett and Dunn 1981, Dunn and Garrett 1987, Atwood 1988). At present, in the United States the species extends to its northern limit in Orange County and western Riverside county (Dunn and Garrett 1987). California gnatcatchers have been reported on the lower coastal slopes of the San Gabriel Mountains, Los Angeles County, but now may be extirpated from this area (Garrett and Dunn 1981).

California gnatcatchers are year round residents in southern California (Remsen 1978, Atwood 1980), although they may move from coastal sage habitats to more humid shrub habitats during the dry season (Unitt 1984).

California gnatcatchers initiate nest building in early May, producing a clutch of 3-4 bluish gray eggs, speckled with reddish brown. The nest is a deep cup of grass, bark, fiber and paper, lined with soft fur, feathers and plant material, 1 and 1/2 by 1 and 1/4 inches. Nests are usually placed approximately 1 meter high in *Artemesia californica* or *Optunia spp.* shrubs (Woods 1921, Atwood 1980, RECON 1987). Both sexes incubate, and the young hatch after approximately 14 days of incubation (Woods 1921). The young fledge after 9-11 days in the nest, and are cared for and fed by the adult birds for approximately 15 days after leaving the nest (Woods 1921). They disperse from the parental territory towards summer's end or after about 45 days (Woods 1921).

The population decline in California gnatcatchers has been attributed to habitat destruction for housing developments and other human activity by many authors (Woods

1921, Grinnell and Miller 1944, Remsen 1978, Atwood 1980, 1988, Garrett and Dunn 1981, Unitt 1984). The naturally patchy distribution of the coastal sage scrub plant community has been "exaggerated" by development activities according to Atwood (1988), increasing the vulnerability of the gnatcatcher to extinction. Apparently suitable habitat has been found uninhabited by gnatcatchers in many parts of southern California (Atwood 1980). Other factors that may be involved in the gnatcatcher's decline are nest parasitism by brown-headed cowbirds, and predation by domestic cats introduced by development (Atwood 1980, Garrett and Dunn 1981, Dunn and Garrett 1987). Occurrence: Lytle Creek and Etiwanda (CA). Status: FT ST CSC SBNF.

Least Bell's Vireo (*Vireo bellii pusillus*): Inhabits low, dense riparian growth along water or along dry parts of intermittent streams. Typically associated with willow, cottonwood, baccharis, wild blackberry, or mesquite in desert localities. This Vireo uses thickets of willow and other low shrubs for nesting and roosting cover. It gleans insects from foliage and branches, usually within 2.5 m (8 ft) of ground. Eats some fruits.

Least Bell's vireo has drastically declined or vanished entirely throughout its California range in recent decades, apparently from cowbird parasitism and habitat destruction and degradation. *V.b.pusillus* is endemic to southern California and Baja California, it is now a rare, local, summer resident below about 600 m (2000 ft) in willows and other low, dense valley foothill riparian habitat and lower portions of canyons mostly in San Benito and Monterey cos. and along the western edge of the deserts in desert riparian habitat. Builds an open cup nest of pieces of bark, fine grasses, plant down, horse hair. Nest is often placed on slender branch of willow, other shrub, mesquite, or other small tree, usually 0.6-0.9 m (2-3 ft), but sometimes 0.3-3.0 m (1-10 ft). Usually found near water, but also inhabits thickets along dry, intermittent streams (Zeiner et al. 1990a). Habitat code: r. Occ in SB Mtns: rSR*; in the SJ Mtns: rSR*. Occurrence: Lower Andreas Canyon (SJ), Mojave River (AH), Cajon Canyon, Cajon Wash (CA), Whitewater (SG). Status: FE SE R5 SBNF PIF2.

Mountain Plover (*Charadrius montanus*): Prefers open plains with low herbaceous or scattered shrubs. They breed at moderate elevations on open plains and short grass prairies. These are ground nesting birds, often having 2 broods a season, which may include from 1-4 eggs. Incubation takes 28-31 days and the young fledge around 33-34 days. Nests are built among hummocks, or around cactus or scattered shrubs, often near cow patties with which they line their nests. They feed on grasshoppers, crickets, beetles, and flies. They winter in Baja and Mexico. Males incubate 1st clutch while females incubate 2nd one which is laid 11-13 days after completion of 1st. They are not found on shores nor is this a mountain dwelling plover (Ehrlich et al. 1988). Occurrence: migrant in BB. Status: CSC PIF1 *.

San Bernardino Merriam's Kangaroo Rat (*Dipodomys merriami parvus*): This animal uses desert flats or slopes with sparse to moderate canopy coverages, and sandy to gravelly substrates. It is active year-round, usually during twilight hours. Burrows are used to escape extremes in heat and predators, and are usually located at the base of shrubs. Kangaroo rats are granivorous, but will also eat leafy vegetation in spring and arthropods. Water is obtained metabolically from food and from moisture in food. These rats are aggressively solitary; territory size is less than home range. Reproductive activity

may begin in December and usually ends by summer. Four young (range 1-5) are born after a gestation period of 33 days. Weaning occurs 24-33 days after birth. Females are capable of breeding shortly after weaning (Zeiner et al. 1990b). Occurrence: Valle Vista, San Jacinto Valley (SJ), Cajon Wash (CA). Historic: Cucamonga, Day, Deer, and Etiwanda Canyons (CA), lower Santa Ana River (SG). Status: CSC *.

Peninsular Bighorn Sheep (*Ovis canadensis cremnobates*): This grayish to brownish-gray sheep has a creamy white rump and massive coiled horns (small, not coiled in females) that spiral forward, out, then coil back to form an arc. Habitat is steep, rugged terrain with sparse growths of trees. Gregarious. Sexes usually separate in summer. Rams join ewes and lambs in the fall. May move to lower elevations in the winter. Both a browser and a grazer, feeds on a great variety of plants. Probably lives 15 years in the wild. Females breed at 2 1/2 years. Rutting season usually November through December. One young born May-June, sometimes 2 lambs. Gestation period about 180 days. Lambs follow mother soon after birth. This species has been exterminated out of much of its former range. Occurrence: Santa Rosa and San Jacinto Mountains <4000' (SJ). Status: FE ST CFP R5 SBNF.

Status Codes:

FE = Federally endangered
FT = Federally threatened
PE = Proposed for listing as endangered
PT = Proposed for listing as threatened
* = Former Category 2 Candidate for listing; taxa that may warrant listing but for which substantial information to support a proposed rule is lacking.
CE = State endangered
CT = State threatened
CFP = State Fully Protected; species listed prior to CA ESA
CP = State Protected (amphibian or reptile); may not be taken or possessed at any time except with permit for scientific collecting or scientific purposes
CSC = State Species of Special Concern
CR = State Rare; meets one or more of the following criteria:
1) species that are biologically rare, very restricted in distribution, or declining throughout their range, or a critical stage in their lifecycle when residing in CA;
2) populations in CA that may be peripheral to the major portion of a taxon's range, but which are threatened with extirpation in CA;
3) taxa closely associated with a habitat that is declining in CA.

R5 = USDA Forest Service Region 5 Sensitive species
SBNF = San Bernardino National Forest Sensitive species
PIF = Forest Service Partners in Flight Watch List 1996; 1=highest priority, 2=high priority, 3=moderate priority.

Bird Occurrence Codes:

Seasons:

WV - Winter Visitor: resident outside of the migration period generally November-March.

SR - Summer Resident: nesting but not remaining through the winter.
SV - Summer Visitor: seen during the summer but does not nest.
R - Resident: present year-round.
T - Transient: migrating through the region during the spring (March-June), or fall (August-November).
V - Visitor: occurrence irregular, may be seen at any time of the year.
* - breeds on a regular basis.

Degree of Observability:

c - common: always encountered in the proper habitat.
u - uncommon: usually encountered in small numbers in proper habitat.
o - occasional: seen only a few times a year in proper habitat.
r - rare: >10 records for SBNF, but not expected.
+ - extirpated.

Habitat Codes:

a - aerial; usually seen in flight, often over habitats.
r - riparian; streamside thickets and woodlands.
g - grasslands, fields, and agricultural areas.
m - marsh/meadows; both freshwater areas and moist meadows.
c - chaparral and coastal sage scrub.
w - woodland; oaks, conifers, oak-conifer associations, pinyon-juniper.
d - desert; Joshua tree woodlands, creosote bush scrub.
l - lakes, reservoirs, and their margins.
u - urbanized areas.

(from Birds of the San Bernardino National Forest - A Field Checklist)

Biological Opinion (1999) were clear in concluding that there is a lack of quantifiable data on the impacts of dust on the carbonate species plants, and that the impacts are unknown. In addition they indicated a desire to determine the impacts of dust. Much of the potential dust emissions at the Sentinel overburden site are carbonate dust. There is no hard data on the actual impacts of carbonate dust on the carbonate endemic plants. There is a need to generate quantified data so that the impacts (detrimental or beneficial) if any, may be determined and mitigated to non-significance.

4.0 EXISTING DUST CONTROLS MEET REGULATORY STANDARDS

Existing dust controls in the crusher and quarry area include use of Magnesium Chloride and water for dust suppression on haulage roads, quarry roads and ramps, and the use of foam and fog sprays at the crusher for dust control. These methods result in a 75% reduction of emissions. In addition a bag house dust collection system is being installed at the Sentinel crusher screen which is the single largest emitter at the crusher. The bag house will remove >95-98% of the PM 10 emissions, which will result in a quite significant reduction of overall emissions. See Section 3.

These existing dust controls meet the required air quality standards, and permits have been granted by the Mojave Desert Air Quality Management District for the Sentinel quarry operation. The dust controls are required to be in place and operative and regular monitoring by agency personnel insures that the regulatory standards are met.

5.0 DUST EMISSIONS BASED ON AIR QUALITY MODELING FOR THE BUTTERFIELD 5 OVERBURDEN SITE

Emissions calculations from the Sentinel quarry operation were established using the MDAQMD Mineral Guidance Equations. All crushing and screening and conveyor transfer points are used with water spray and fog nozzles to establish 75% reduction for controls. Other emissions calculations were generated for drilling and blasting, loading and hauling and dumping of ore and overburden. In addition wind erosion from unpaved roads, stockpiles, quarry faces and overburden piles were also calculated. Details are included in Section 3.

At the Butterfield 5 overburden site modeled emissions have been calculated, and are shown in the following table. The table compiles several sources of emissions at the site.

TABLE 3. SHOWING CALCULATED DUST EMISSIONS (TSP) WHICH WOULD BE GENERATED AT THE BUTTERFIELD 5 OVERBURDEN SITE.

SOURCE OF EMISSIONS	UNCONTROLLED TSP	CONTROLLED AND AMOUNT (%) TSP

Unpaved road travel Dump road only 0.25 mi	188 lb/yr	75% CONTROL (Water and chemical) 47 lb/yr
Handling, dumping of load at site	269 lb/yr	269 lb/yr
Wind erosion from active overburden dumping area	86 lb/yr	75% CONTROL (Water area to form crust) 21.5 lb/yr
Vehicle emissions while at overburden site	77 lb/yr	77 lb/yr
TOTAL MODELED EMISSIONS	620 lb/yr UNCONTROLLED	**414.5 lb/yr WITH EXISTING AND PROPOSED CONTROLS**

TSP = Total suspended particulate = total dust

The air emissions calculations indicate that with dust control a total of 414 lbs/year of TSP (total suspended particulate = total dust) dust would be generated per year from trucks dumping overburden at the Butterfield 5 overburden site. However, the wind direction and velocity have great control on dust dispersion and deposition and are discussed in the following sections.

6.0 CLIMATIC DATA RELATING TO POTENTIAL DUST DEPOSITION

Wind direction and velocity are important in determination of the amount of emissions which may blow in the direction of the endangered plant population. Examination of climatic data from the Mojave Desert Air Quality Management District, from the Lucerne Valley area, the National Climatic Data Center (NCDC) and discussions with meteorologists were utilized to provide and analyze climatic data relative to dust dispersion and deposition. See Section 4.

6.1 PREVAILING WIND DIRECTION

Examination of climatic data from the Mojave Desert Air Quality Management District, from the Lucerne Valley area, the National Climatic Data Center (NCDC) and discussions with meteorologists verify that the wind blows from 200 to 280 degrees (wind blows ranging from the southwest and northwest towards the east) the vast majority of the time (95-99%). Although there are slight variations depending on the location they are minor, and the prevailing daytime wind direction throughout the region is from the west within the ranges indicated. Evening winds generally blow from the south toward the north. The wind data is important because it shows most of the potential dust emissions from the overburden site would be blowing away from the location of the endangered species. (CP37)

Rose diagram plots of the wind direction demonstrate that the wind nearly always blows away from the endangered species population. Based on the wind rose diagram data, proportional variations in the wind direction, and variations in the overburden site configuration over time, the proportion of time the wind would blow dust from the overburden site in the specific direction of the endangered plants is variable, and ranges from as low as 1% to as much as 4.5% of the time per year but averages only about 3% of the time over the life of the project. Thus the proportion of dust emissions from the overburden site which would be blown in the direction of the endangered species per year is a very small proportion of the dust from the overburden site. The rose diagram also shows that only 1.6% of the strongest winds (greater than 10 mph) blow toward the plant population.

6.2 SEASONALITY OF WIND VELOCITY

Histogram plots of wind velocity over the last 5 years show a very strong pronounced seasonality. Winds display a remarkable regular seasonal variation with very pronounced highest winds during May thru August, and the lowest winds during winter months October thru March. The mean velocity of the wind during the low velocity winter months averages about 5-6 knots/hour, while during the higher velocity summer months wind velocity is about double at 11-16 knots/hour.

The preceding facts are very important with regard to dust emissions at the Sentinel overburden site. As noted in previous discussions, most (85%) of the overburden at Sentinel quarry is moved during the winter months, and some of the overburden rock would be hauled to the expanded Butterfield 5 overburden site. Based on the wind data, the time of year when most of the waste rock would be hauled and placed at the overburden site, coincides precisely with the season when the wind is at its lowest velocity. This is very important because it demonstrates that when the waste rock would be deposited at the Butterfield 5 overburden site during the winter months, the winds are at their lowest velocity of the year, and thus potential wind born dust would be at its lowest levels of the year, and 95-99% of the time blowing in the opposite direction of the plants.

6.3 SEASONALITY OF WIND DIRECTION

Furthermore, it is estimated that 70% of the time when the wind blows toward the endangered plants is during Santa Ana wind conditions, which usually occur mostly during late summer when very little overburden is moved.

6.4 IMPACTS OF WIND ON DUST DEPOSITION

Therefore, based on existing historic climatic data, the potential impacts of dust on the endangered plant population will be minimal due to a number of factors including:

1) Existing prevailing wind direction is away from the plants an average of 97% of the time.
2) Pronounced seasonality of the wind velocity is lowest in winter.
3) Pronounced late summer seasonality of high winds blowing toward the plants (Santa Ana winds at a time of year when very little overburden is moved)
4) Seasonality of the overburden placement at the site coinciding with the lowest winds.
5) Relatively small (35%) proportion of the overburden which would be placed at the

Butterfield 5 overburden site.

6) Very small proportion (15%) of the overburden which will be placed at the B-5 overburden site during summer when winds more often are blowing toward the plants.

Thus natural climatic patterns and the design and proposed use of the overburden site are inherent mitigations which significantly reduce potential dust impacts to virtually zero.

7.0 DETERMINATION OF QUANTITY OF WIND BLOWN DUST FROM BUTTERFIELD 5 OVERBURDEN SITE TOWARD ENDANGERED PLANT POPULATION

This determination considers variations in wind direction over time relative to use of the site during the year. There is a strong seasonality to wind velocity and direction. Furthermore 85% of the overburden is hauled in winter, and only 35% is hauled to the B-5 overburden site. Applying seasonal variations in wind velocity and direction, and seasonal use of the site allows the following site specific emission calculations of dust blown toward the endangered plant population per year.

Total overburden hauled to Butterfield 5 site per year = 80,000 tons/year
Average tons hauled per day = 2150 tons/day
Days hauling overburden to site per year = 37.2 days/year
Total calculated dust emissions from site = 414 lbs/year
Total calculated emissions per day 11.1 lbs/day
Because of seasonal use of site and climatic variations apply the following calculations:

WINTER
5 months = 150 total days
Statistically 1.7 wind blowing toward plants days = 1.13% of total days
85% of overburden hauled in winter months, and 35% hauled to Butterfield 5 site, therefore:
31.6 days hauling to Butterfield 5 site = 21% of total days during 5 month period
31.6 days X 0.0113 = probable number of days wind blowing toward plants in which hauling would occur = 0.35
Emissions blown in direction of plant population = 0.35 days x 11.1 lbs/day = 3.96 lbs/year winter

SUMMER
7 months = 210 total days
Statistically 10 days wind blows toward plants = 4.7% of total days
15 % of overburden hauled in summer months, 35% hauled to Butterfield 5 site therefore;
5.6 = total days haul overburden to Butterfield 5 site during summer
5.6 days x 0.047 = probable number of days wind blowing toward plants in which hauling would occur = 0.26 days
Emissions blown in direction of plant population = 0.26 days x 11.1 lbs/day = 2.92 lbs/year summer

TOTAL CALCULATED EMISSIONS BLOWN IN THE DIRECTION OF ENDANGERED PLANT POPULATION = 4.56 lbs. Winter + 2.92 lbs. Summer = TOTAL 6.9 LBS/YEAR

8.0 DISPERSION MODELING

Dispersion modeling utilizing an EPA aproved (1987) Gaussian dispersion model with an area emission source equal to the active Butterfield 5 overburden disposal site was utilized to model where the dust emissions would be dispersed and the amount deposited in a specific area. Details are shown in Section 4 under climatic data.

The modeling is quite complex and incorporates several variables including wind and atmospheric conditions to calculate the particulate concentrations per cubic meter at ground level. The model applied assumes all particulate within the cubic meter are deposited at that spot, and is thus is the most conservative model. From the model dust emissions deposited at various distances from the source can be calculated.

Total emissions blown in direction of Endangered species population per year = 6.9 lbs from previous wind vector analysis and dust emissions analysis. The dispersion pattern allows volumes of particulate (dust) deposition to be determined for a given area.

8.1 SHAPE, SIZE AND AREA OF DISPERSION PLUME

The most conservative Dispersion modeling applied indicates a rather narrow width to the dispersion plume from the overburden site, of only 10 degrees. Thus, at a distance of 0.25 mile (1320 feet) from the source, the plume is 200 feet wide, and at a distance of 0.5 mile (2640 feet), the plume is 375 feet wide. Less conservative models allow a wider dispersion plume, and therefore a much larger area of dispersion.

The dispersion modeling and wind rose data combined result in a rather narrow dispersion pattern in terms of the wind blowing dust from the overburden site in the direction of the endangered species plants. In other words a very narrow specific wind direction is required for dust to be dispersed in the direction of the endangered plants.

Therefore, based on the wind rose diagram data, proportional variations in the wind direction, variations in the overburden site configuration over time, and the dispersion modeling data, the proportion of time the wind would blow dust from the overburden site in the specific direction of the endangered plants is variable, and ranges from as low as 1% to as much as 4.5% of the time per year but averages only about 3% of the time over the life of the project. Thus the proportion of dust emissions from the overburden site which would be blown in the direction of the endangered species per year is a very small proportion of the dust from the overburden site.

8.2 CALCULATED AMOUNT OF DUST DEPOSITED TOWARD ENDANGERED SPECIES POPULATION FROM BUTTERFIELD 5 OVERBURDEN SITE

Conservative dispersion modeling (EPA approved method) shows that the amount of dust deposited from the Butterfield 5 overburden site in the direction of the endangered species is very minor.

Table 4. Conservative dispersion modeling (EPA approved 1987)showing amount of dust deposited from Butterfield 5 overburden site in the direction of Endangered species population.

Distance From Source	Area of Plume Deposition	Pounds/acre/year Pounds/ft2/year
Up to 0.25 mile	4.05 acres	= 0.94 lbs/acre/year =0.00006 lb/ft2/year
0.25 - 0.50 mile	9.07 acres	=0.17 lbs/acre/year =0.00002 lb/ft2/year
0.50 - 0.75 mile	14.5 acres	=0.06 lbs/acre/year =0.00001 lbs/ft2/year
0.75 - 1.0 mile	19.75 acres	=0.03 lbs/acre/year =0.000009 lbs/ft2/year

As can be seen from the dispersion modeling, even at the closest range of 0 to 0.25 mile only about 0.00006 lb/ft^2/year (6/100,000 of a pound) of dust from the B-5 overburden site would be deposited per square foot per year. As the distance from the source is increased the quantities diminish to very very small quantities (at 1 mile 0.000009 lb/ft^2/year.

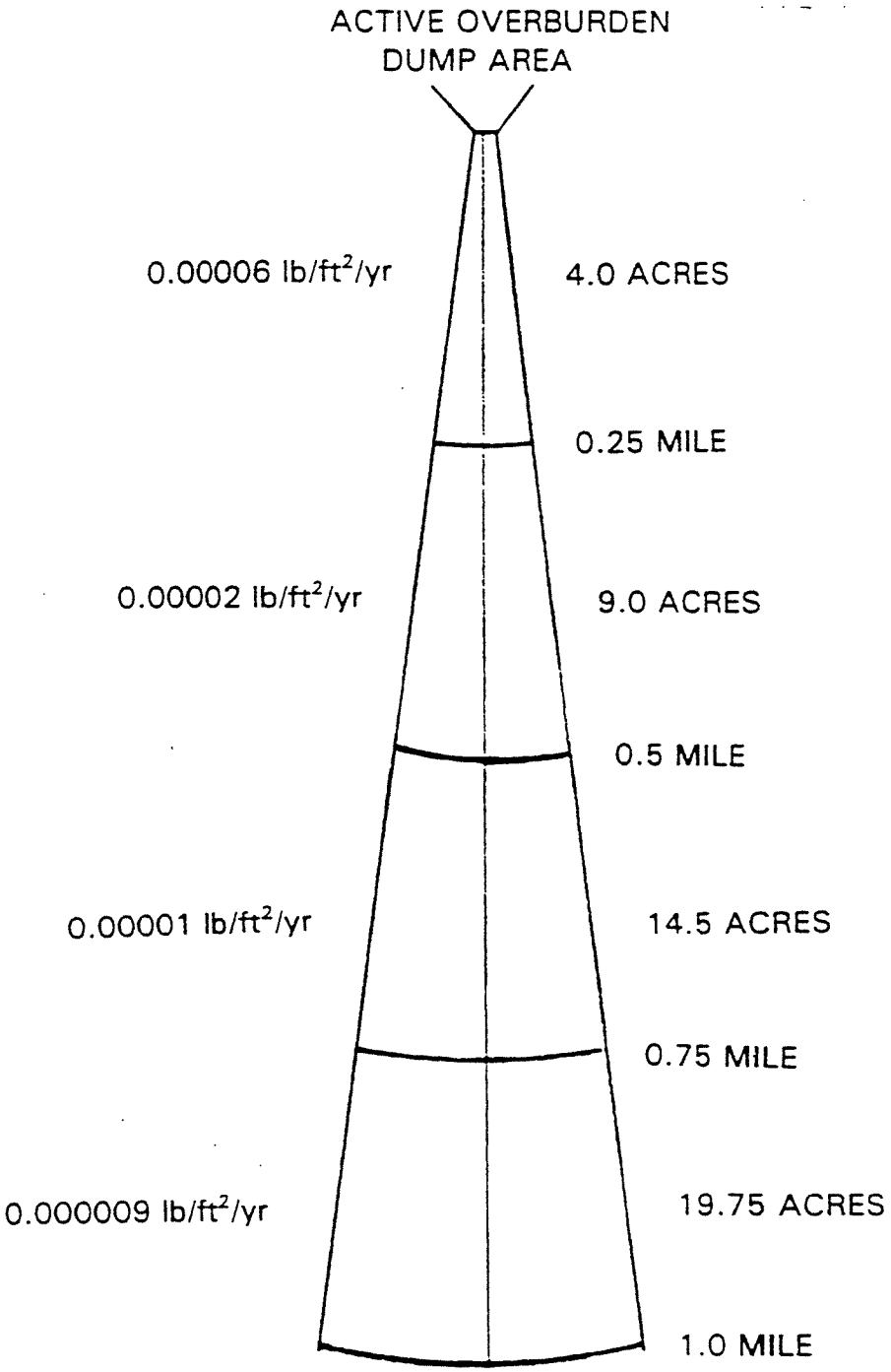
As noted, this dispersion model is conservative, and yields the maximum concentration per square foot. Other models assume a much wider dispersion plume, thus the dust is dispersed over a significantly larger area and the amount of deposition per square foot is reduced even further.

In addition, as the overburden site is built out over time, the distance from the dust source to the plant population increases, and thus the amount of potential dust deposition also decreases over time. The calculated quantities of dust deposition are so small they are virtually zero.

9.0 PROPOSED METHOD OF REDUCING POTENTIAL IMPACTS FROM DUST TO NO SIGNIFICANT IMPACT

Despite the fact that numerous safeguards have been undertaken to reduce impacts to the endangered species such as avoidance of 100% of the population, and that small quantities of carbonate dust may be beneficial to the carbonate endemic plants, and that calculated quantities of dust blown in the direction of the endangered species is virtually zero, it still may be remotely conceivable that impacts to the Endangered species may occur from dust. The following section presents proposed mitigations which will reduce potential impacts to the Endangered species population from dust to virtually zero and no impact.

DISPERSION MODELING DIAGRAM



DISTANCE FROM SOURCE	ESTIMATED % OF EMISSIONS	ESTIMATED EMISSIONS PER YEAR	DISPERSION AREA	MAXIMUM DUST DEPOSITION PER SQUARE FOOT.YEAR
UP TO 0.25 MILE	55%	3.82 lbs/yr	4.05 ACRES	0.00006 lb/ft²/yr
0.25 - 0.50 MILE	23%	1.58 lbs/yr	9.07 ACRES	0.00002 lb/ft²/yr
0.50 - 0.75 MILE	13%	0.89 lbs/yr	14.5 ACRES	0.00001 lb/ft²/yr
0.75 - 1.0 MILE	8.5%	0.58 lbs/yr	19.7 ACRES	0.000009 lb/ft²/yr

THIS DISPERSION MODEL CALCULATED THE MAXIMUM CONCENTRATION. OTHER MODELS ALLOW A LARGER DISPERSION AREA, BUT RESULT IN EVEN LOWER CONCENTRATIONS PER SQUARE FOOT

9.1 PROPOSED DATA ACQUISITION AND MONITORING DURING OVERBURDEN OPERATIONS, ANALYSIS AND DETERMINATION OF DUST IMPACTS AND PROPOSED MITIGATIONS TO REDUCE POTENTIAL DUST IMPACTS TO NO SIGNIFICANT IMPACT

Based on the preceding discussions there is a requirement to determine potential impacts to the endangered species population, what they are and how to mitigate them to no significant impact.

Omya (California) Inc. proposes the following actions during overburden activities to gather and evaluate data, and reduce potential impacts to the endangered plant species from dust to no adverse impact.

The proposed actions can be divided into several categories and include the following:

A. Determine if there are impacts on plants from dust from the operation
   1) Quantify actual dust emissions utilizing air quality sampling techniques utilized by the Air Quality Control District permitting to measure actual emissions of dust during operations at the Butterfield 5 overburden site
   2) Quantified measurements of dust deposition on plants and determination of impacts if any To endangered species population as a result of the Butterfield 5 overburden activities.
B. Additional proposed dust controls at Butterfield 5 overburden site to reduce potential impacts of dust to T&E plants outside the project area
C. Crusher fines existing and future

10.0 QUANTITATIVE MEASUREMENTS OF ACTUAL ONSITE DUST EMISSIONS

In order to measure actual deposition of dust emissions, It is proposed to set up 3 Air quality monitoring instruments, to measure the actual dust emissions from overburden activities at the Butterfield 5 overburden site. One station would be set up 0.5 mile up wind from the overburden site to measure ambient emissions. Another would be set up adjacent to the Endangered species population to measure actual emissions at the site, and a third station would be set up at the north end of the Sentinel quarry, to measure down wind emissions from the entire operation. The measurements would be taken on weekends when operations are idle, during the week while operating, and during operations begin at the overburden site. Results will be compared to determine if there are increased emissions at the Endangered species site, and how significant the increase is over ambient.

Details of the proposal are included in Section 5 Addendum 1.

11.0 QUANTIFIED MEASUREMENTS OF ACTUAL DUST DEPOSITION ON PLANTS AND DETERMINATION OF IMPACTS TO PLANTS IF ANY

Scott white has proposed additional study to determine dust deposition and its effects on the Endangered species population near the B-5 pad overburden site. Details of the proposal are

included in Section 5 Addendum 2. The study is intended to distinguish increased dust deposition from ambient levels and to determine impacts if any on the nearby endangered species population. The proposal includes three aspects including the following:

1) Collect and analyze data including dust deposition as grams per square meter of leaf surface area at several points up to 0.25 mile from the source
2) Measure shoot growth of common shrubs from the same array of points
3) Determine dry weight biomass production of endangered species from a series of quadrats along a linear transect from the overburden site to the plant population.

The study will be carried out over a number of years during operations at the Butterfield 5 overburden site and will attempt to determine the impacts of dust from the B-5 overburden site (if any) on the endangered species population.

12.0 ADDITIONAL PROPOSED CONTROLS TO REDUCE POTENTIAL DUST EMISSIONS AT THE OVERBURDEN SITE TO NO SIGNIFICANT IMPACT

As can be seen from the air quality modeling data regulatory agency air quality standards are being met, and several improvements have been implemented at the Sentinel crusher to substantially further reduce particulate matter emissions (dust). These improvements improve the overall air quality impacts, but because of the very pronounced prevailing northeasterly wind and climatic conditions and the location of the crusher nearly 0.5 mile to the north of the overburden site they may have little impact in the area of the overburden site or the population of oxytheca which is nearly 0.5 mile to the south of the crusher. Therefore the following items are proposed to reduce potential emissions of dust derived from the overburden site to no significant impact.

1) Phased development of the overburden site to minimize exposure of newly disturbed ground
2) Phased development of the overburden site so that portion closest to the plant population is developed later to the degree possible.
3) Utilization of the B-5 pad overburden site primarily during winter months when possible
4) Minimize use of the B-5 pad overburden site during oxytheca flowering season when possible
5) Retain existing revegetation on the top of the B-5 Pad as long as possible
6) Minimizing the number of roads and exposed surfaces in the overburden site area
7) Use of dust suppression on heavily utilized overburden roads
8) Minimize exposure of active overburden dumping area
9) Watering of the exposed active overburden dump site when possible while overburden dumping is occurring
10) Restricting dumping at the B-5 overburden site in dry weather, when possible, when the wind is blowing toward the endangered species population.
11) Concurrent reclamation and revegetation of the overburden site as possible.

12.1 PHASED DEVELOPMENT OF THE OVERBURDEN SITE TO MINIMIZE EXPOSURE OF NEWLY DISTURBED GROUND

The overburden site will be expanded in a phased manner to minimize the exposure of newly disturbed ground. Several studies have shown that much of the dust and sediment is derived from newly disturbed ground before erosion controls can be established. Phased development of the overburden site in small increments will allow the minimum exposure of newly disturbed ground and thus minimize the potential for dust from the site.

12.2 PHASED DEVELOPMENT OF THE OVERBURDEN SITE SO THAT PORTION CLOSEST TO THE PLANT POPULATION IS DEVELOPED LATER IN THE SEQUENCE TO THE DEGREE POSSIBLE.

It is proposed to develop the overburden site in a phased manner, so that the portion closest to the Endangered plant population is developed later, to the degree possible. This will allow maximum avoidance and greatest distance from the plants, and thus minimize potential dust impacts.

12.3 UTILIZATION OF THE B-5 PAD OVERBURDEN SITE MOSTLY DURING WINTER MONTHS WHEN POSSIBLE WHEN PLANTS ARE NOT FLOWERING

Most overburden removal (85%) at the Sentinel quarry takes place during the winter months, from December thru April, with relatively small amounts (15%) of overburden mined during the remainder of the year, when the focus is on mining the ore. Because most of the overburden is mined during the winter it is often wet from moisture from rain and snow, and has a relatively high moisture content, and thus the potential dust emissions are greatly reduced. In addition the ground surrounding the overburden site commonly has snow on it during winter months and is not exposed.

Botanical studies suggest the plants usually wither during the fall and winter, to reseed and comeback and flower in the summer, that the plants may be most vulnerable to dust impacts during summer flowering months.

By restricting use of the B-5 overburden site when possible to winter months when most overburden is moved, and when potential impacts are the lowest, and by minimizing use of the site to the degree possible during summer months, the potential to create dust impacts is greatly reduced.

12.4 UTILIZATION OF THE B-5 PAD OVERBURDEN SITE MOSTLY DURING WINTER MONTHS WHEN THE WIND IS AT ITS SEASONAL LOW

Climatic data shows the wind displays a pronounced seasonal variation in which the mean wind velocity is lowest during winter months. Thus, not only does the wind blow 90% of the time away from the plants, but 98.5% of the high winds (>10 mph) are blowing away from the plants, and the wind velocity is lowest in the winter. Thus use of the site during winter months as much as possible will result in reduced potential emissions from dust.

12.5 RETAIN EXISTING REVEGETATION ON THE TOP OF THE B-5 PAD AS LONG AS POSSIBLE

Bare ground has greater potential as a source of dust. The B-5 pad has been previously revegetated. During expansion of the site, the existing vegetation will be retained as long as possible to reduce potential dust emissions from the surface of the site. This will reduce dust emissions from the site.

12.6 MINIMIZING THE NUMBER OF ROADS AND EXPOSED SURFACES IN THE OVERBURDEN SITE AREA

Minimizing the number of roads and exposed surfaces in the overburden site area will reduce potential wind blown dust emissions from the area.

12.7 USE OF DUST SUPPRESSION ON HEAVILY UTILIZED OVERBURDEN ROADS

Dust suppression such as magnesium Chloride and water will be used on overburden roads to minimize sources of windblown dust from the site. Magnesium Chloride typically reduces emissions by an average of 75% from untreated roads, which is very significant.

12.8 MINIMIZE EXPOSURE OF ACTIVE OVERBURDEN DUMPING AREA

The active overburden dumping area can be a significant source of wind blown dust. During the use of the site the area of active overburden dumping area will be kept to a minimum without negatively impacting the efficiency and economics of the operation. By reducing the active use area potential sources of dust are reduced to a minimum.

12.9 WATERING OF THE EXPOSED ACTIVE OVERBURDEN DUMP SITE WHEN POSSIBLE WHILE OVERBURDEN DUMPING IS OCCURRING AND PRIOR TO PERIODS OF NON USE

As previously noted most overburden dumping occurs during winter when the rock is wet. However the active overburden dumping site will be watered when possible while dumping and during adverse wind, to further reduce potential dust emissions from the site. Freezing weather during winter months may prohibit watering at times.

In addition a heavy watering of the site just prior to a period of non use will allow a mud/clay crust to form on the surface which acts as a binder, thus reducing the potential for wind blown dust. Therefore when use of the site would be reduced during summer months the exposed dump area would be heavily watered to allow the crust to form, and reduce potential dust during periods of non use. The AQMD recognises this as a significant method of controlling dust, and emissions are reduced by up to 75%.

12.10 RESTRICTING DUMPING AT THE B-5 OVERBURDEN SITE DURING DRY WEATHER WHEN HIGH WIND IS BLOWING TOWARD THE ENDANGERED SPECIES POPULATION

As noted in previous items the prevailing wind blows away from the overburden site toward the northeast. In addition during the winter much of the rock is damp from rain and snow, and thus under normal overburden conditions there is no dust problem.

However up to 4.5% of the time the wind may blow toward the population of endangered species, and up to 1.5% of the wind over 10 mph blows in the direction of the plants. When possible, Omya will restrict dumping at the B-5 overburden site during dry summer weather during those periods of time when high wind (>10 mph) is blowing toward the plant population. This will allow a significant reduction in potential dust emissions, particularly in high winds when the potential impacts may be greatest.

12.11 CONCURRENT RECLAMATION AND REVEGETATION OF THE OVERBURDEN SITE AS POSSIBLE

Concurrent reclamation of the overburden site will occur as possible to minimize the potential dust emissions from the overburden pad. Revegetation will consist of placement of growth media and habitat logs, revegetation with native species as prescribed in the reclamation plan and irrigation for two years. Experience has shown that the revegetated sites are not sources of wind blown dust.

13.0 CRUSHER FINES EXISTING/FUTURE

Fines (-1/4" material) are screened off at the crusher, in order to improve the quality of the final product. Crusher fines are of lower quality, and In the past the crusher fines have largely been a waste product, and have been disposed of in the B-5 pit overburden site. Stockpiled crusher fines are a potential source of windblown dust. Omya is currently working on several aspects of the fines relating to reducing potential impacts from dust, and include;

1) Eliminating or reducing the amount of fines produced.
2) Marketing the crusher fines
3) Watering the stored piles of crusher fines to eliminate source of dust ,
4) Incorporating the fines with the overburden as backfill in the overburden site.

13.1. ELIMINATING OR REDUCING FINES PRODUCED AT CRUSHER

Omya has been working on reducing the quantity of fines produced at the crusher. During the last few years we have changed screen sizes and modified the crusher, and have reduced the proportion of fines produced substantially. Based on the raw material and the product specifications however, it is not possible to eliminate the production of all crusher fines.

13.2. MARKETING OF CRUSHER FINES

Some fines produced are of good quality however, and have been stockpiled and saved for potential future product sales. Omya is currently working on marketing the crusher fines, as they may be utilized in a several low value consumer products. Transportation costs are crucial in the successful marketing of the material. Omya will continue to work on marketing the crusher fines. When successful, this will reduce the total quantity, and make better utilization of the resource.

13.3. WATERING OF STORED FINES PILES

If any substantial quantity of fines will be stored prior to disposal or sale, they will be watered regularly to eliminate wind blown dust from the pile. Watering the fines pile allows a carbonate crust to form on the outside of the pile, and which forms an effective barrier preventing dust from blowing from the pile. This will allow a 75% reduction in emissions from the fines pile.

13.4. BURYING FINES WITH OVERBURDEN MATERIAL

If the existing stockpiled fines can be sold they will be trucked off site. If some of the fines can not be sold they will be incorporated into the overburden and disposed of at the B-5 Pit, or as backfill in the mined out portion of the Sentinel quarry. They will not be a source of dust.

14.0 CONCLUSION

Science based air quality modeling combined with verified climatic data collected by the Mojave Desert Air Quality District and the National Climatic Data Center and dispersion modeling, demonstrate that the modeled amount of dust which would be generated at the overburden site and deposited in the direction of the Endangered plants is virtually zero, (0.00006 lb/ft^2) at a distance of 0.25 mile and decreases to 0.000009 lb/ft^2 (9/1,000,000 of a pound) at a distance of 1 mile.

Nevertheless, Omya proposes monitoring and additional studies during overburden activities at the Butterfield 5 overburden site, which we believe will gather and analyze valuable science based objective data on the actual dust emissions from the overburden site and determine the actual potential impacts of carbonate dust on the Endangered carbonate endemic species population. Furthermore the numerous proposed additional mitigations proposed will reduce the amount of potential dust deposition, and thus potential impacts from dust to virtually zero and no impact.

The science based objective data gathering and determination of effects (if any) will be the first time any hard data will be collected to answer the questions regarding impacts of dust on the carbonate endemic plants. Obtaining this data is greatly desired by the Forest Service and required by the Fish and Wildlife Service Biological Opinion regarding the endangered species.

This proposal complies with the requirement to generate data and answers as required by Federal agencies, but also includes mitigations to eliminate potential impacts to the endangered species to virtually zero, and thus fulfills regulatory requirements for no impact to the endangered species.

ISO-9002 CERTIFIED

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Date: July 26, 2000

ROBIN BUTLER
San Bernardino National Forest
Big Bear Ranger District
P.O. Box 290
Fawnskin CA 92333

RE: SENTINEL QUARRY EXPANSION AND USE OF CRYSTAL CREEK HAUL ROAD

Dear Robin:

As a follow up to our meeting of July 25, 2000 which was attended by representatives from the Forest Service, Fish and wildlife Service and Omya, I am providing documentation which clarifies the proposed Sentinel quarry expansion and long term use of the Crystal Creek haul road. One reason the USFWS has not completed evaluation of the BA is the misconception that the Sentinel quarry expansion will increase the length of time of use of the Crystal Creek haul road, and thus may result in increased potential impacts to carbonate plant occurrences which may have been present adjacent to the road. This is incorrect. Although the life of the Sentinel quarry is extended, the use of the haul road is not extended beyond the existing approved Plan.

The documentation comes from the Plan of Operations for the Sentinel Quarry expansion which was submitted to the Forest Service on October 10, 1998 (page 71-74), and from the existing approved Plan of Operations (page 73) which was approved in June 1994.

The documentation demonstrates that although the life of the Sentinel quarry is extended, the use of Crystal Creek haul road is not extended beyond the existing currently approved plan. As can be seen in the documentation, reclamation of the extended Sentinel quarry and facilities would be completed in 2046 (page 71-74 Sentinel POO), and reclamation of the Crystal Creek haul road is scheduled to be completed in 2056 (page 73 approved POO).

Thus, clearly there is no conflict, or issue regarding use of the haul road and potential additional impacts to carbonate endemic plant populations which may have existed adjacent to the haul road. The submitted and approved plans demonstrate that there would be no extended use of the road beyond the already approved Plan, with the Sentinel quarry expansion.

Sincerely,

Omya (California) Inc.

Howard Brown

cc: Doug McPherson (USFWS)
enclosure

FROM PLAN OF OPERATIONS SENTINEL QUARRY EXPANSION REVISED VERSION SUBMITTED OCTOBER 10,1998 (PAGE 71-74)

2.7.1 RECLAMATION SCHEDULE SENTINEL QUARRY

Sentinel Quarry includes the existing active quarry and planned 7.7 acre (currently undisturbed) expansion over the next 37 years.

Concurrent reclamation of the Sentinel Quarry will include backfilling and revegetation of the backfilled portion of the pit. Final reclamation of Sentinel Quarry will occur after 2035 when currently known reserves are exhausted. Reclamation will include measures for public safety, extensive backfilling concurrent with mining will occur. Colorization will be tested to reduce color contrasts. Ripping and placement of growth media and organics and reseeding and revegetation of accessible quarry benches and roads will also occur. Growth media will be placed on 30% of the accessible surface area averaging 2 feet thick, Placement will maximize revegetation success and visual enhancement utilizing the island concept. Irrigation may occur for 2 years and will be followed by monitoring for 10 years or less if requirements are met sooner.

The haul road from Turn 15 to Turn 19 will be reclaimed after 2037 as access is necessary to monitor other sites. Reclamation will include pulling in berms, ripping the road and reseeding. For details of scheduling see Table 18 and various sections of the plan for more detailed discussions of various aspects of Sentinel reclamation.

Table 19. Sentinel quarry reclamation schedule

SENTINEL QUARRY

ACTIVITY	*YEAR BEGIN*	*YEAR COMPLETE*
Active Mining	**In Progress**	2035
Backfilling	2003	2035
Public Safety	2036	2036
Growth media placement	2008	2036
Revegetation	2009	2036
Irrigation	2010	2037
Monitor	2037	2046

Items completed or in progress shown in **bold** type

2.7.2 RECLAMATION SCHEDULE BUTTERFIELD 5 PAD OVERBURDEN SITE

Reclamation of the Butterfield 5 pad overburden placement area began in 1989 and included ripping, placement of growth media, organics (logs) and reseeding and revegetation. The site was irrigated for two years. Monitoring began in 1990 and will continue for another year.

The overburden site will be reactivated. The surface of the expanded pad will be concurrently reclaimed when possible as the pad is built outward. Final reclamation will include slope reduction to 2/1. Therefore reclamation of the site will be ongoing and concurrent during the life of the active pad building activity.

The second incremental expansion of the overburden site expansion would cover road 3N87, and would occur in 2014. The road will be reclaimed after 2014 during the second incremental expansion as the existing road would be impacted by the overburden site. OMYA will reclaim 3N87. The road will be ripped, and revegetated. Drainages will be reestablished where disrupted by the existing road.

Table 20. Butterfield 5 Pad overburden site reclamation schedule

BUTTERFIELD 5 PAD OVERBURDEN PLACEMENT SITE

ACTIVITY	*YEAR BEGIN*	*YEAR COMPLETE*
Growth Media placement	**1988**	**1988**
Organics placement	**1988**	**1988**
Revegetation	**1988**	**1988**
Irrigation	**1989**	**1990**
Monitor	**1989**	1999
Reactivate dump pad and continue intermittent overburden placement	1999	2035
Concurrent growth media placement	2005	2035
Concurrent organics placement	2005	2035
Concurrent and final Revegetation	2005	2036

Irrigation	2005	2037
Reclaim 3N87	2013	2013
Final recontouring reduce slope to 2/1	2036	2036
Final Monitoring	2037	2046

Items completed or in progress shown in **bold** type.

Table 21. Phased reclamation of the overburden site.

RECLAMATION PHASE	ACTIVITY AREA	YEAR(S)
Phase 1	Complete backfilling Butterfield 5 pit area, south to rerouted B-3 road. After backfilling completed growth media and revegetate former pit	1998-2006
Phase 2	Butterfield 5 Pad. Concurrent with mining and site development, phased expansion to the south, building the pad to highest elevation. Reclamation of the pad will include growth media and revegetation.	2007-2035
Phase 3	After completion of mining phase. Slope reduction, recontouring, growth media placement and revegetation	2036-2037
Phase 4	Final monitoring	2037-2046

2.7.3 RECLAMATION SCHEDULE CRUSHER SITE

The existing crusher site will be utilized for another 15 years. The crusher will then be moved to the Black hole Overburden site. The old crusher site will be incorporated into the Sentinel Quarry Pit. This schedule therefore pertains to the future Black hole crusher site

The crusher site will be active until all currently minable ore is exhausted, about 2035. At that time the site will be reclaimed. Reclamation will include site cleanup and removal of any buildings or equipment. Reclamation will also include recontouring as necessary, maintenance of drainage controls, ripping, placement of growth media, organics (logs), and revegetation during fall planting season. The island concept will be utilized and will cover 30% of the surface in a manner which will allow maximum visual enhancement and revegetation success. Irrigation for 2 years and monitoring for 10 years is proposed. For details of scheduling see Table 21 and various sections of the plan for more detailed discussions of various aspects of crusher site reclamation.

Table 22. Crusher site reclamation schedule

BLACK HOLE CRUSHER SITE

ACTIVITY	*YEAR BEGIN*	*YEAR COMPLETE*
Active crushing	2015	2035
Dismantle/site cleanup	2036	2036
Recontour	2036	2036
Growth Media placement	2036	2036
Revegetation	2036	2036
Irrigation	2036	2038
Monitor	2037	2046

Items in progress or completed are shown in **bold** type.

FROM EXISTING APPROVED PLAN OF OPERATIONS (APPROVED JUNE 1994)

PAGE 73 SECTION 5J CRYSTAL CREEK HAUL ROAD RECLAMATION SCHEDULE

(Note schedule is modified to reflect the new Sentinel Expansion Plan reclamation schedule, but the **ending date for completion of Crystal Creek haul road reclamation is not changed from existing approved plan.**

CRYSTAL CREEK HAUL ROAD

ACTIVITY	*YEAR BEGIN*	*YEAR COMPLETE*
Active Hauling	**IN PROGRESS**	**2035**
Reclamation Access for other sites	2036	2046
Haul road reclamation Pull in berms, drainages, rip roadway and seed	2046	2046
Monitor	2047	2056

Items completed or in progress shown in **BOLD** type.

Howard Brown
07/31/2000 11:20 AM

To: Robin Butler, Dev Volgarino
cc:
Subject: Omya Sentinel Quarry Expansion/Desert Tortoise

SENTINEL EXPANSION PROJECT
NOTE ON TORTOISE HABITAT

The existing public road (Crystal Creek Road) from the Omya plant in Lucerne Valley to the Forest Service Boundary crosses both public (BLM) and private land and allows access to a number of private homes in the area, and Omya is but one user of the road. The public road to the Forest Service boundary has been in existence for at least 100 years, and is part of the San Bernardino County road system.

The portion of the road on Forest Service land to the quarries is a restricted use road (no public access to the quarries). Reclamation of the haul road would include the portion of the road on Forest Service land. The portion of the road below (north of the Forest Service boundary) is a public road and is not included reclamation plans.

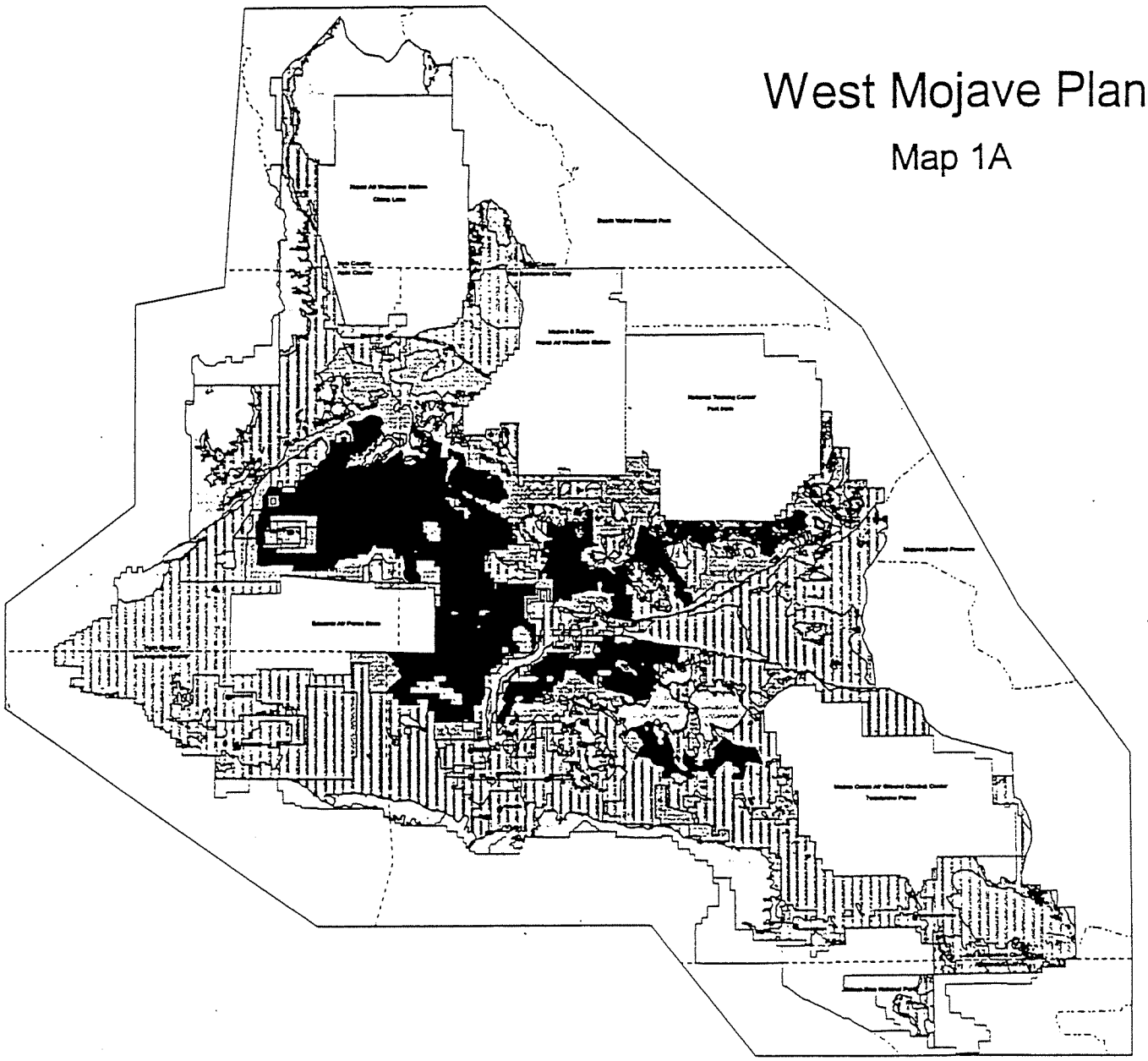
The BLM West Mojave Plan maps of tortoise habitat show that the area immediately below (north) the Forest Service Boundary is considered Non Tortoise Emphasis. Desert Tortoise habitat extends to about 4200 feet, and the Forest Service boundary at the road is at 5120 feet and is thus outside the range of habitat. Omya use of the portion of the road on Forest Service land is outside the habitat range of the Desert tortoise. The public road portion of the road does include low tortoise emphasis and non tortoise emphasis.

Use of the public portion of the road by public users up to the Forest boundary, would continue after Omya reclamation requirements are completed. Use of the public portion of the road by Omya as a result of the Sentinel quarry expansion would NOT extend beyond the already approved permitted reclamation plan.

Desert Tortoise Emphasis Zones

West Mojave Plan

Map 1A

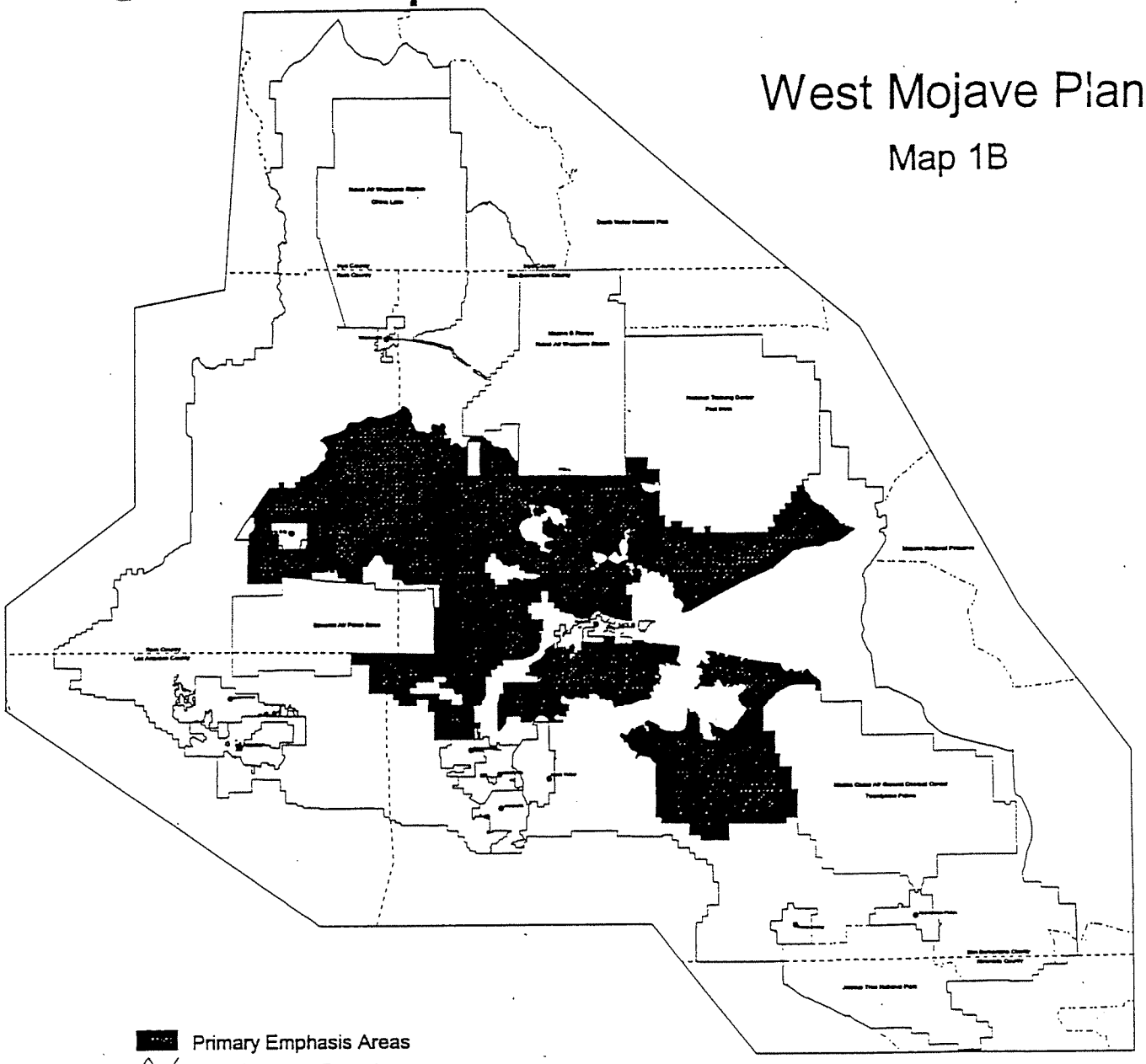


- High Tortoise Emphasis
- Medium Tortoise Emphasis
- Low Tortoise Emphasis
- Non Tortoise Emphasis
- Planning Area Boundary
- National Park Boundary
- Military Boundary
- City Boundary

Primary Desert Tortoise Emphasis Areas

West Mojave Plan

Map 1B



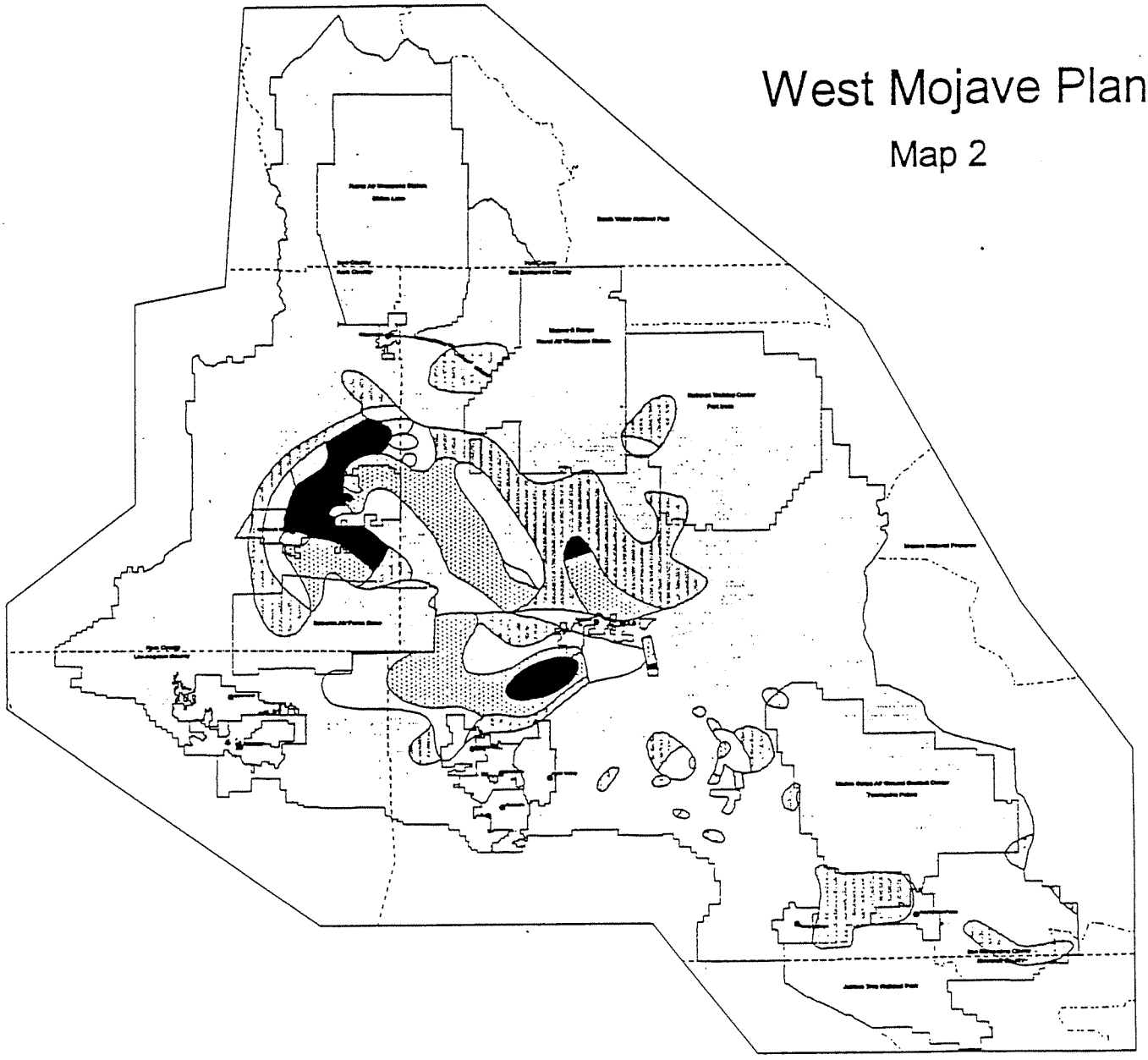
Primary Emphasis Areas
Planning Area Boundary
National Park Boundary
Military Boundary
City Boundary

N

Desert Tortoise Density (Berry 1984)

West Mojave Plan

Map 2



- 0 - 20 per sq. mile
- 21 - 50 per sq. mile
- 51 - 100 per sq. mile
- 101 - 250 per sq.mile
- > 250 per sq. mile
- Planning Area Boundary
- National Park Boundary
- Military Boundary
- City Boundary