ADDENDUM

FINAL ENVIRONMENTAL IMPACT REPORT

Certified October 29, 1996

LUCASFILM LTD.
GRADY RANCH/BIG ROCK RANCH MASTER PLAN

Prepared By:

Marin Community Development Agency

State Clearinghouse No. 95033021

January 2000

Addendum to the 1996 Certified FEIR
Grady Ranch/Big Rock Ranch Master Plan
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Addendum to Lucasfilm Ltd. Grady Ranch / Big Rock Ranch Master Plan Environmental Impact Report

This addendum is prepared to evaluate the impacts of the Big Rock Ranch Precise Development Plan ("PDP"), which is being filed with Marin County to implement part of the Lucasfilm Ltd. Grady Ranch / Big Rock Ranch Master Plan (the "Master Plan"), which was previously approved by the Marin County Board of Supervisors.

The impacts of the Master Plan project were evaluated in the Lucasfilm Ltd. Grady Ranch / Big Rock Ranch Master Plan Environmental Impact Report (the "Master Plan EIR") that the Marin County Board of Supervisors certified on October 29, 1996. Based on the analysis in the Master Plan EIR, the mitigation measures set forth in the Master Plan EIR and adopted by the Board of Supervisors, and an evaluation of the issues presented by the PDP, the County, as lead agency, has determined that the proper method of CEQA review for the PDP is an addendum, pursuant to CEQA Guidelines section 15164.

Under CEQA Guidelines section 15164, a lead agency shall prepare an addendum to a previously certified EIR if changes or additions to the project are necessary or have occurred, provided that none of the conditions described in CEQA Guidelines section 15162 calling for preparation of a subsequent EIR have also occurred. Section 15162, and Public Resources Code section 21166, set forth three events that can trigger preparation of a supplemental EIR:

1. substantial changes are proposed in the project that involve new significant environmental effects or a substantial increase in the severity of previously identified significant effects;

2. substantial changes occur with respect to the circumstances under which the project is undertaken that involve new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or

3. new information of substantial importance shows potential new significant environmental effects or a substantial increase in the severity of previously identified significant effects.

CEQA Guidelines sections 15162(a)(3)(C) and (D) state further that a supplemental EIR may be required where "(C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or (D) [m]itigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

Also, CEQA Guidelines section 15126.4(a)(3) states that "[m]itigation measures are not required for effects which are not found to be significant.

Based on these Guidelines, the County has reviewed the PDP, and determined that an addendum is appropriate under CEQA for the following reasons:

1) The PDP is consistent with the Master Plan evaluated in the 1996 Master Plan EIR, and implements that Plan, including mitigation measures required by the Plan.

2) The 1996 Master Plan EIR evaluated a full range of impacts, including geology and soils, hydrology and drainage, biological resources, visual and aesthetic quality, archaeological and historical, transportation and circulation, and public services, and where significant, proposed measures to mitigate these impacts.

3) No substantial changes are proposed in the PDP that involve new significant environmental effects or a substantial increase in the severity of significant effects previously identified in the 1996 Master Plan EIR.

4) Substantial changes have not occurred with respect to the circumstances under which the PDP is undertaken that involve new significant environmental effects or a substantial increase in the severity of significant effects previously identified in the 1996 Master Plan EIR.

5) No new information of substantial importance that shows potential new significant environmental effects or a substantial increase in the severity of significant effects previously identified in the 1996 Master Plan EIR has come to light.

6) There are no new or considerably different mitigation measures or alternatives from those evaluated in the 1996 Master Plan EIR that would now be feasible or would substantially reduce one or more significant effects of the project, nor have the project proponents declined to adopt any such mitigation measures or alternatives.

7) The project has been modified to reduce overall impacts, as follows:

   a) Reduction of site development overall, so that the existing eastern watershed drainage will not be impacted by grading.

   b) Enhancement and stabilization of the existing, natural drainage rather than reconstruction.

   c) Reduction of the total amount of filled creeks and drainages by approximately 75 percent, to 464 lineal feet.

   d) Elimination of some buildings on the site, reductions in size of other buildings, and consolidation of uses into remaining buildings.

   e) Elimination of the proposed tunnel.

   f) Reduction overall of inundation levels upstream on Big Rock Creek.

g) A decrease in the area of disturbance from 47 acres anticipated by the 1996 Master Plan to 43 acres, which reduces the amount of native grassland affected by grading from approximately 4.5 acres to 3.7 acres.

h) Reduction in size of reservoir from 120 acre feet to 100 acre feet with a surface area reduction from 7.2 to 7.0 acres.

8) These changes do not result in new significant impacts and help to further reduce impacts.

9) The 1996 Master Plan EIR evaluated impacts on wildlife and riparian habitat, and on special status plant and animal species, and found that the Foothill Yellow-Legged Frog ("FYLF"), a California Species of Special Concern, could potentially occur on the site. Surveys conducted at that time found no FYLF species and determined that lack of suitable habitat precluded occurrence. However, the EIR determined that amphibians may be eliminated from areas of proposed grading and inundation for the expanded reservoir and that creek channels and fresh water marsh areas would be disturbed by the project. Mitigation measures proposed in the 1996 Master Plan EIR required preparation of a detailed wetlands mitigation program for restoration enhancement and/or replacement of these habitat areas disturbed or eliminated by the project.

10) Surveys conducted subsequent to 1996 in preparing the detailed wetlands mitigation program for the PDP as required by the 1996 Master Plan EIR, indicated that the FYLF was present or had suitable habitat within the stream channel and/or proposed reservoir inundation area on the Big Rock Ranch site.

11) The mitigation measures proposed in the 1996 Master Plan EIR, and implemented by the PDP, in addition to the detailed wetlands mitigation program measures and related project modifications included in the PDP, will ensure that the FYLF is protected and that any potential new impacts are avoided. These include:

a) A "Foothill Yellow-Legged Frog Mitigation and Monitoring Plan," prepared by Wetlands Research Associates, June, 1999. (Technical Reports Binder, at tab 6c.) This plan includes more specific analysis of potential impacts on the species, mitigation measures in conformance with the mitigation standards set forth in the 1996 Master Plan EIR and adopted as conditions of project approval to avoid those impacts or reduce those impacts below a level of significance, and a detailed monitoring and reporting program to ensure that those measures are implemented as part of the Project. This plan has been submitted to the California Department of Fish and Game.

b) A "Wildlife Protection and Management Plan," prepared by LSA Associates, Inc., October 15, 1999, that includes more general measures to protect wetland habitat and stream corridors. (Technical Reports Addendum Binder, at tab 4c.)

c) A letter from Wetlands Research Associates, Inc., dated, October 28, 1999, that indicates that, with respect to the area around the existing ranch house, "[t]here is also no suitable habitat in this area for any local special status wildlife species," and that "[i]t is our opinion that no additional focused surveys for special status plant or wildlife species are necessary in this area due to the lack of suitable habitat and the level of past disturbances that have occurred on this portion of Big Rock Ranch." (Technical Reports Addendum Binder, at tab 4d.)

d) A "Wetland Mitigation and Monitoring Plan," prepared by Wetlands Research Associates, Inc., dated October 29, 1999, submitted in response to Master Plan Condition of Approval #26, that includes extensive measures to protect wetland habitat. (Technical Reports Addendum Binder, at tab 4e.)

12) In the 1996 Master Plan EIR, the total amount of grading required for the project was estimated to be approximately 234,000 cubic yards based on conceptual plans. The PDP now determines grading to be approximately 305,000 cubic yards based on more precise computer-assisted calculations. The area of disturbance is now therefore anticipated to be 43 acres (within the same planned location) which is reduced from the Master Plan estimate of 47 acres.

13) One of the alternative mitigation measures identified in the 1996 Master Plan EIR was to reduce the area of grading to reduce impacts to special status species and cultural resources. Consistent with this mitigation measure, the PDP includes a reduction in the area to be graded, from that grading estimated to be required in the Master Plan.

14) The mitigation measures proposed in the 1996 Master Plan EIR, and implemented by the PDP, in addition to measures and modifications included in the PDP, will ensure that the Special Status species and cultural resources are protected, and that any potential new impacts are avoided. These include:

a) An approximately eight percent reduction in the overall area where grading would take place.

b) Locating the grading proposed in the same locations as that proposed in the 1996 Master Plan EIR, to avoid any new impacts.

c) A "Civil Engineering Report" prepared by Bookman-Edmonston Engineering, Inc., dated October 29, 1999, that sets forth criteria for site grading, including minimizing to the greatest extent possible the amount of land disturbance and earthwork volumes, minimizing the impacts of grading in environmentally sensitive areas of the project site, and grading the site so as to "repeat the form and function of the surrounding hills," and the form, line, color, and texture of the surrounding terrain, in order to

minimize potential visual impacts. (Technical Reports Addendum Binder, at tab 2.)

d) Sheets C-101 through C-103 of the Plan Submittal, dated July 29, 1999, that show the limits of the area of disturbance as similar to those described in the 1996 Master Plan EIR.

15) The 1996 Master Plan EIR analyzed the project with the Archives Building and the Maintenance Building as two separate buildings. Mitigation was proposed to reduce visual impacts and impacts on cultural resources.

16) The PDP has modified the project to reduce the size of these buildings and locate them together at one location east of Big Rock Creek, to avoid cultural resources and visual impacts.

17) The mitigation measures proposed in the 1996 Master Plan EIR, and implemented by the PDP, in addition to measures and modifications included in the PDP, will ensure that cultural and visual resources are protected and that any potential new impacts are avoided. These include:

a) A "Civil Engineering Report," prepared by Bookman-Edmonston Engineering, Inc., dated October 29, 1999, which states that the revised location positions the Archives Building "so that it is completely screened from view at any point along Lucas Valley Road and screened from view on most of the Big Rock project site." (Technical Reports Binder, at tab 3.)

b) A "Civil Engineering Report," prepared by Bookman-Edmonston Engineering, Inc., dated October 29, 1999, which includes digital renderings of the site as viewed from Lucas Valley Road, reflecting this modification. (Technical Reports Addendum Binder, at tab 2.)

c) A "Special Status Plant Protection Plan," prepared by LSA Associates, Inc., dated July 29, 1999, which indicates that this change in the project will not create any new impacts on Special Status plants. (Technical Reports Binder, at tab 6e.)

d) A "Review of Archaeological Recommendations for Mitigation of Impacts," prepared by Archaeological Consultants, dated March 1999, which states that "each element of the [1996] Master Plan in the Big Rock Ranch development area which potentially created significant impacts to important cultural resources has been redesigned, relocated, or eliminated so as to avoid significant impacts to these resources." (Technical Reports Binder, at tab 8.)

Based on the foregoing Marin County has determined that no major revision of the 1996 Master Plan EIR is needed, and that there is no new significant effect or substantial increase in severity of a significant impact, or change in circumstances or new information requiring

Habitat Protection and Management

Following project construction, Big Rock and Dairy Creeks, and Tributary 8, will be protected and managed as FYLF habitat. Livestock will be excluded from these areas in order to maintain high water quality, reduce siltation of FYLF breeding areas, and encourage the establishment of native vegetation. In the absence of grazing, riparian vegetation (especially willow) will be managed to ensure that canopy cover is not allowed to completely shade reaches that provide stream habitat conditions preferred by FYLF.

Stockpond enhancement measures will include removal of the introduced bullfrog population when the pond is dewatered. Bullfrogs in the stockpond are likely the primary obstacle to FYLF movement between Dairy Creek, Big Rock Creek, and Nicasio Creek.

MONITORING

The monitoring plan will consist of the elements below. During the 5-year monitoring period, adjustments will be made as required to meet the annual success criteria.

Annual Stream Habitat Assessment

In May of each year for five years following project construction, Stream Habitat Assessments will be conducted to document changes in habitat structure in Dairy, Big Rock, Tributary 8, and Nicasio Creeks. If noticeable degradation in habitat conditions is documented, the applicant will consult with CDFG to determine appropriate action.

Annual Surveys

In May of each year for five years following project construction, FYLF surveys will be conducted in Dairy, Big Rock, Tributary 8, and Nicasio Creeks. Density indices will be determined and compared with baseline data.

REPORTING

The applicant will submit an annual FYLF report to the California Department of Fish and Game discussing results of the annual assessment and surveys. The report will be due by December 31 of each year during the five-year monitoring period.

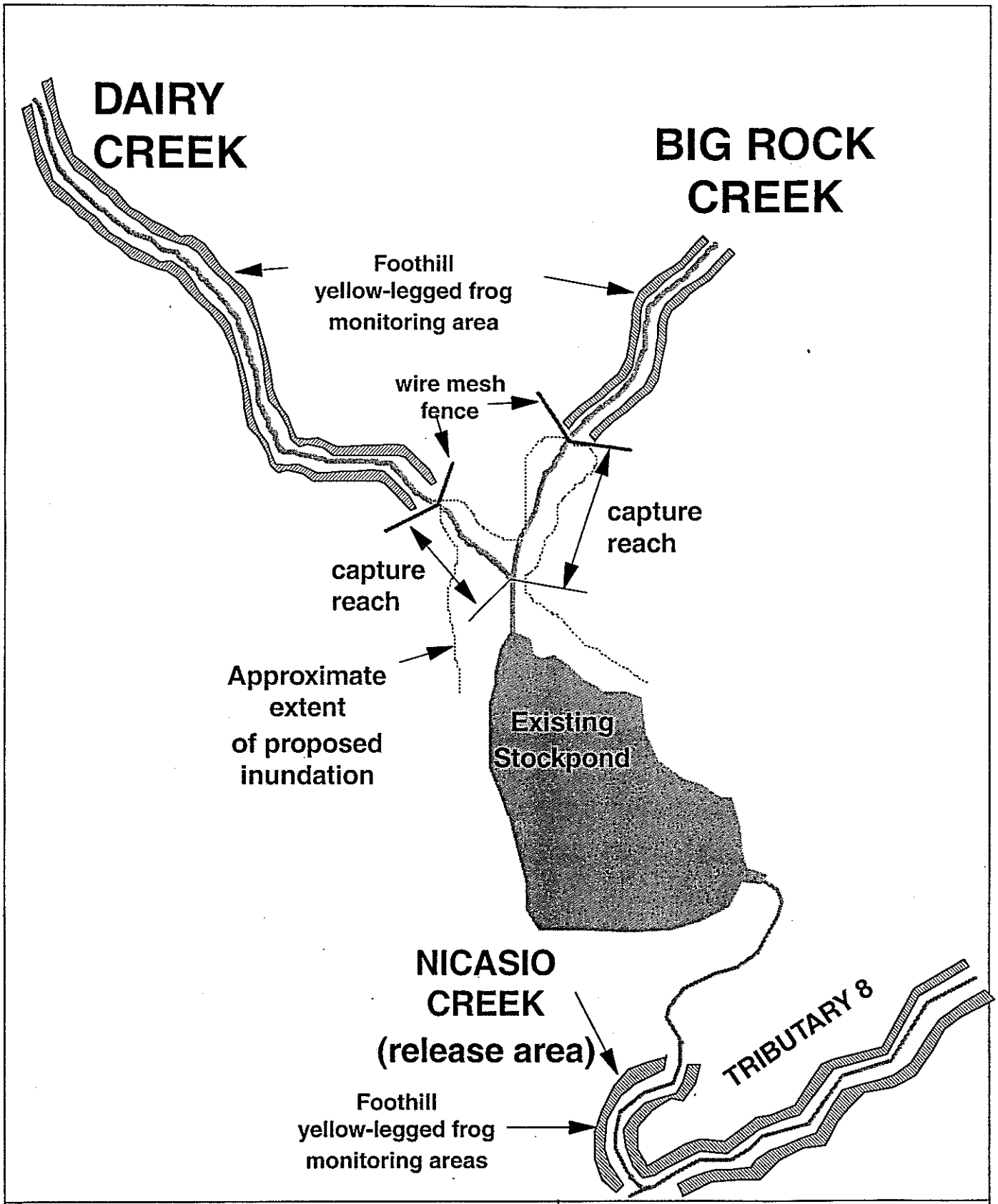

Figure 3. Schematic diagram of placement of wire mesh and locations of FYLF capture effort.

Wetlands Research Associates, Inc.

California Native Species Field Survey Form

Mail to:
Natural Diversity Data Base
California Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, California 95814

For office use only
Source Code _____ Quad Code _____
Elm Code _____ Occ # _____
Copy to _____ Map Index # _____

Date of field work: 05 - 13 - 99 (mo day year)

Scientific Name: RANA BOYLII

Common Name: FOOTHILL YELLOW-LEGGED FROG

Species Found? ☒ yes ☐ no _____ If not, why?

Total # Individuals 3 Subsequent visit? ☐ yes ☒ no

Is this an existing NDDB occurrence? _____ ☒ no ☐ unk. (Yes, Occ. #)

Collection? If yes: _____ number _____ Museum/Herbarium

Reporter: JEFF DREIER

Address: 2169-G E. FRANCISCO BLVD.
SAN RAFAEL, CA 94901

Phone: (415) 454-8868

Plant Information

Phenology: _____ % vegetative _____ % flowering _____ % fruiting

Animal Information

Age Structure: 2 # adults _____ # juveniles _____ # unknown

☐ nesting ☐ breeding ☐ foraging ☐ wintering ☐ roosting ☐ burrow site ☒ other

Location (Please also attach or draw map on back.) 38° 03' 11" N 122° 37' 38" W

BIG ROCK AND DAIRY CREEKS. BOTH ARE TRIBUTARIES TO BIG ROCK STOCKPOND. FROGS OBSERVED APPROX. 800 FEET UPSTREAM OF STOCKPOND.

County: MARIN Landowner/Mgr: PRIVATE

Quad Name: SAN GERONIMO Elevation: 664 FT UTM: _____

T _____ R _____ ¼ of _____ ¼ Sec _____ T _____ R _____ ¼ of _____ ¼ Sec _____

Habitat Description (Plant communities, dominants, associates, substrate/soils, aspects/slope)

BOTH DAIRY AND BIG ROCK CREEKS ARE SMALL STREAMS WITH SUBSTRATES OF COBBLE, GRAVEL, AND BEDROCK. FLOWS ARE PROBABLY INTERMITTENT IN SUMMER AND FALL. SPARSE CANOPY OF OAK AND BAY.

Other rare spp.?

Site Information Overall site quality: ☐ Excellent ☒ Good ☐ Fair ☐ Poor

Current/surrounding land use: GRAZING

Visible disturbances, possible threats: GRAZING, SEDIMENTATION, STOCKPOND ENHANCEMENT

Comments: ONE ADULT OBSERVED IN BIG ROCK CREEK; 2 ADULTS IN DAIRY CREEK. STREAM NAMES NOT ON QUAD MAP.

Determination: (Check one or more, fill in the blanks)

___ Keyed in a site reference: _____
___ Compared with specimen housed at: _____
✓ Compared with photo/drawing in: STEBBINS
___ By another person (name): _____
___ Other: _____

Photographs: (Check one or more)

	Slide	Print
Plant/animal	___	___
Habitat	___	✓
Diagnostic Feature	___	___

May we obtain duplicates at our expense? ☒ Yes ☐ No

ATTACHMENT B
Habitat Assessment Field Data Sheet for High Gradient Streams

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET#	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY	DATE _____ TIME _____ AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___(LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _____

WILDLIFE PROTECTION AND MANAGEMENT PLAN

BIG ROCK RANCH, MARIN COUNTY, CALIFORNIA

October 15, 1999

Prepared for:

Lucasfilm Ltd.
P.O. Box 2009
San Rafael, CA 94912

Prepared by:

LSA Associates, Inc.
157 Park Place
Pt. Richmond, California 94801
(510) 236-6810
LSA Project #CVA830

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EXECUTIVE SUMMARY

This *Wildlife Protection Measures* addresses protection and management of wildlife resources at Big Rock Ranch as required by Condition of Approval 22. This plan addresses the following issues: stream corridors as wildlife habitat, reservoir as wildlife habitat, deer exclusion fencing, free roaming dogs, and feral pig control.

Stream corridors will be protected by a 100-foot buffer in the open space areas. Invasive exotic wetland plant species will not be introduced to the site and riparian understory vegetation will be enhanced. Pedestrian access will be largely prohibited west of the reservoir and dense vegetation will be established along the perimeter of the reservoir.

A fence will be located around the proposed development to exclude deer from the developed portion of the ranch. Cattle fencing will exclude cattle from the serpentine slope west of the reservoir. This cattle fencing will also be designed to exclude feral pigs. Feral pigs will be excluded from the western serpentine slope and a seep located in the central portion of the ranch. With the exception of hunting and cattle ranching, dogs will be required to be leashed when in the open space areas.

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INTRODUCTION

This wildlife protection and management plan is for the Big Rock Ranch in Marin County, California. The applicant is Lucasfilm Ltd. The wildlife plan is in response to the Master Plan and Use Permit with the County of Marin and specifically addresses the County's Conditions of Approval as they relate to wildlife on the subject property. The County certified the project on October 29, 1996.

SCOPE OF WILDLIFE PLAN

This wildlife plan is in support of the Precise Development Plan (PDP), required by the County. Specifically this wildlife plan addresses the County's Condition of Approval number 22, which contains the following elements:

- Treatment of stream corridors as wildlife habitat
- Treatment of the reservoir as wildlife habitat
- Deer exclusion fencing

In addition, this wildlife plan addresses the following issues from the *Final Environmental Impact Report: Lucasfilm Ltd. Grady Ranch/Big Rock Ranch Master Plan* (June 1996, Marin County Community Development Agency, State Clearinghouse No. 95033021) and other general wildlife concerns:

- Free roaming dogs
- Feral pig control

BACKGROUND

Description of Big Rock Ranch

Big Rock Ranch consists for two parcels totalling approximately 1,117 acres. The ranch is located north of Lucas Valley Road in the Lucas Valley area west of the City of San Rafael. The ranch extends from Lucas Valley Road north to Big Rock Ridge, between the Grady Ranch on the east and Skywalker Ranch on the west. Elevations on Big Rock Ranch range from approximately 450 to 1,800 feet.

The approximately 2-acre existing reservoir on the Big Rock Ranch was created by damming Nicasio Creek with an approximately 19-foot high earthen dam. In addition to Nicasio Creek, Dairy Creek, Big Rock Creek, and a number of unnamed tributaries run through the ranch. There are also a number of seeps and springs and some seasonal wetlands on-site. Current land use on the ranch is cattle range.

Project Description

Lucasfilm Ltd. will be constructing office and related facilities on the Big Rock Ranch site in an approximately 56-acre development area near the entrance to Lucas Valley Road and adjacent to the existing reservoir. The rest of the property will remain in open space with the planned land use of light grazing.

OBJECTIVES

The objectives of the *Wildlife Protection Measures* are to protect wildlife habitat. This will be done by 1) maintaining wildlife corridors through Big Rock Ranch, 2) providing access by wildlife to the reservoir, 3) provide a safe method of using and locating deer fencing, 4) control free roaming dogs, 5) and control feral pigs.

WETLAND HABITAT PROTECTION

The primary intent of Condition 22 is to protect wildlife habitat by restricting the amount of disturbance within the stream corridors and other sensitive habitats on the site.

STREAM CORRIDORS

Condition: Pedestrian pathways, lighting, ornamental landscaping, and other improvements often associated with open space areas should be restricted to a minimum of 100 feet from channel banks.

Actions:

- Lighting will be low level lighting similar to that which is currently installed at Skywalker Ranch. No adverse effects on wildlife are anticipated from lighting.

- Ornamental landscaping will be limited to a few "garden courts" immediately adjacent to the development buildings. Even this landscaping will emphasize native species. Outside of the garden courts, all landscaping will be native plant restoration.

- No exotic wetland plants, as defined by the U.S. Fish and Wildlife Service (Reed 1988), will be planted anywhere on site. This measure will help ensure that invasive wetland plants will not escape the ornamental plantings and then become established in the natural areas where they could result in an alteration of wildlife habitat.

Condition: Understory vegetation and shrubs should be retained and enhanced within the corridors to provide protective cover and discourage human disturbance.

Actions:

- Because of the developed closed canopy in the existing riparian areas, which limits sun light to the areas below, the actual riparian understory is fairly sparse. Where understory vegetation exists, it will be encouraged.

- In the riparian forest revegetation zones, where young trees will be planted, there will be opportunities to introduce appropriate understory vegetation. Key understory species include California blackberry (*Rubus ursinus*), rush (*Juncus* spp.), horsetail (*Equisetum arvense*), and bulrush (*Scirpus microcarpus*). Subtree and shrub species include arroyo willow (*Salix lasiolepis*), and blue elderberry (*Sambucus mexicana*). Plantings will be dense to discourage human entry.

RESERVOIR AND NATIVE GRASSLANDS

Condition: Proposed pedestrian paths along the edge of the expanded reservoir on Big Rock Ranch should be restricted to the northern side of the reservoir where development is proposed. Pedestrian access along the west side of the reservoir should be discouraged to minimize disturbance to wildlife on at least one shoreline.

Action: There will be no trails on the west side of the reservoir. Furthermore, the population on the site are corporate employees and under control of corporate policies that this is sensitive wildlife habitat and entry will not be permitted, except for habitat management purposes.

Condition: Discouraging access by pedestrians and cattle would also limit access to the sensitive native grasslands associated with the serpentine outcrops on the western slope above the reservoir.

Action: The native grasslands in the serpentine area on the western slope of the reservoir will be fenced to discourage entry by cattle and people. Signs will be posted to notify people that this is a sensitive habitat and entry is not allowed, except for habitat management purposes.

Condition: Dense emergent vegetation should be established around the perimeter of the expanded reservoir on Big Rock Ranch to provide protective cover and enhance the wildlife habitat value of this open water feature.

Action: A wetland revegetation plan has been developed for the Big Rock Ranch. Refer to the *Landscape Vegetation and Management Plan* and Drawing L-1 for details regarding revegetation along the reservoir shoreline. Rev. 1

FENCING AND ANIMAL CONTROL

DEER FENCING

Conditions

Methods to exclude deer from the proposed development areas should be coordinated with and meet the approval of the California Department of Fish and Game (CDFG) (Nichols-Berman 1996). The importance of maintaining wildlife corridors along stream channels and across the valley floors must be balanced with long-term management problems and property damage to landscape improvements from deer. The proposed location of deer fencing around the perimeter of the development areas should be adjusted to preserve important wildlife movement corridors and to maintain partial access to the reservoir on Big Rock Ranch.

Condition: Wildlife access should be maintained on the west side of the expanded reservoir on Big Rock Ranch.

Action: The *Fencing Plan* provides for access by wildlife to the western shore of the expanded reservoir. The west side of the reservoir will be fenced to keep out cattle, but the fence will be low enough for easy access by deer jumping over the fence. Small wildlife species will also be able to go through the fence.

Condition: Exclusionary fencing could be screened behind proposed landscaping on the southwestern end of the new dam and drop down into the reservoir. The fencing could then continue near the tributary drainage which converges with Dairy Creek just south of the western structure of the Main Office Building.

Action: The *Fencing Plan* in conjunction with the proposed landscape plantings allows access to the reservoir and the streams but excludes them from the development area. The deer fencing will be similar to that used currently on Skywalker Ranch. The fencing will be of welded wire, which will allow smaller animals access to the development area, but exclude cattle, pigs, and deer. The fence will be 7 feet high with wooden poles. Special attention to the siting of the fence will be made at weak spots where deer may enter such as at the bottoms of slopes and across drainages.

Consultation with CDFG

The project consulted with Fred Botti on December 4, 1998. Mr. Botti is the CDFG Unit Biologist for the Big Rock Ranch. He is familiar with the situation on Skywalker Ranch regarding deer fencing.

Mr. Botti noted that while CDFG does not favor the use of exclusionary fencing for deer on private property, they will not oppose it as long as undue harm to the deer is avoided and as long as movement corridors are maintained. Mr. Botti noted that deer may inadvertently get trapped within the exclosure area. In those cases, CDFG would be reluctant to issue depredation permits to remove the deer.

Actions:

- Smooth welded or sheep wire will be used on the exclusionary deer fence. No barbed wire will be used, which could harm deer.

- A double cattle guard at the entrance road will be modified so that the spaces between the rails will be small enough that the deer's feet will not slip through. Deer can become caught, panic, and break a leg on standard cattle guards. A double custom-made guard will be manufactured for the entrance road with spans closer together than on an ordinary cattle guard.[1] Before installation CDFG will be invited to inspect the guard.

CATTLE FENCING

Condition: Cattle should still be restricted from the sensitive native grasslands associated with the serpentine outcrops.

Action: The fencing plan shows fencing preventing the entry of cattle onto the western serpentine slope that supports the native grassland. The fence will be low enough for easy access by deer jumping over the fence. In addition, cattle will be excluded by the deer fence from the development area, where the mitigation grassland areas will be planted.

---

[1] Benner's Gardens (6974 Upper York Road, New Hope, PA 18938, tel. 800/753-4660) offers a commercial product called "Deer Guard." This product is 14.5 long and is offered at widths of 10, 12, and 14 feet. The unit gradually ramps up to a height of 9 inches, supported by a frame. Thirty-two bars are bolted to a frame. The bars are 1.5 inches wide and spaced 3.5 inches apart. Further investigation and consultation with CDFG would be necessary to ensure that use of the Deer Guard would address CDFG's concerns.

Additional Action: In addition to the County's Conditions of Approval, the project will fence a sensitive seep area from cattle and feral pigs that is located in the open space portion of the Big Rock Ranch property. This seep is approximately 200 feet and 60 feet in size. It is located in the northwestern portion of the site. Substantial rooting by feral pigs in the seep and grazing by cattle was noted on a visit in October, 1998. The fencing will be welded wire which will allow foxes and smaller mammals access to the seep, but will prevent pigs and cattle from impacting this sensitive and valuable habitat.

FERAL PIGS

Damage by feral pigs was noted below Big Rock Ridge in the open space areas of the ranch. Pigs are a non-native pest species that have a high reproductive potential and can significantly damage sensitive wildlife habitat such as seeps. In addition, pigs compete with native wildlife such as deer and pigeons for mast crops (e.g., acorns). Pigs also directly prey on native wildlife such as salamanders and frogs. If not controlled, pig populations can become quite large resulting in extensive destruction of wildlife habitat.

Actions:

- As discussed above, the cattle fencing will be made of sheep, welded wire, which would exclude pigs from enclosed areas but allow access to smaller animals.

- As discussed above, the major seep area in the northwest portion of the ranch property will be fenced to exclude pigs.

FREE ROAMING DOGS

Free roaming dogs in the open space areas can harass and harm native wildlife and disrupt cattle grazing operations.

Action: Dogs will be required to be leashed.

Wetlands Research Associates, Inc.

October 28, 1999

Mr. Matt Sherrill
Conversion Management Associates
121 Spear Street, Suite B-10
San Francisco, CA 94105

Dear Matt:

We are providing this letter to address the potential for special status plant and animal species occurrences in a 600 feet by 600 feet area centered on the existing ranch house at Big Rock Ranch in Marin County. Plant and wildlife biologists from Wetlands Research Associates, Inc. (WRA) have observed this area during several site visits over the past eight months.

The area around the ranch house has a long history of disturbance and is presently occupied by the house, other outbuildings, gravel driveways, a lawn, and other ornamental landscaping. In the past there was a livestock feed lot and extensive dairy operation in this area. Aerial photographs taken in 1952 and 1970 show stockyards, feedlots, dairy barns, other outbuildings, and the ranch house covering an area extending from Lucas Valley Road to areas 400 feet north of the current ranch house. This heavily impacted area extended from the eastern property boundary, for 800 feet to the west. These past dairy-related impacts encompassed the entire area that is the subject of this letter. Heavy grazing activity continues on the portions of this area just north of the ranch house.

No special status plants were observed in this area in 1999, and no suitable habitat for such species recorded in Marin County exists in this area. In addition, there is no serpentine soil habitat evident in the ranch house area that would support special status plants restricted to this type of habitat.

There is also no suitable habitat in this area for any local special status wildlife species. The vegetation in this area is almost exclusively non-native grassland with ornamental lawns and shrubs closer to the house.

It is our opinion that no additional focused surveys for special status plant or wildlife species are necessary in this area due to the lack of suitable habitat and the level of past disturbances that have occurred on this portion of Big Rock Ranch.

Sincerely,

Thomas E Fraser

Tom Fraser
Associate

2169-G East Francisco Blvd., San Rafael, CA 94901 (415) 454-8868/FAX (415) 454-0129

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WETLAND MITIGATION AND MONITORING PLAN

BIG ROCK RANCH, MARIN COUNTY, CALIFORNIA

October 29, 1999

Prepared for:

Lucasfilm Ltd.
P.O. Box 2009
San Rafael, CA 94912
415/662-1800

Prepared by:

Wetlands Research Associates, Inc.
2169 East Francisco Boulevard, Suite G
San Rafael, California 94901
415/454-8868

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EXECUTIVE SUMMARY

Lucasfilm Ltd. submits this Wetland Mitigation and Monitoring Plan (Mitigation Plan) in accordance with Condition of Approval No. 26 of the Marin County Approval of the Big Rock Ranch Master Plan and to outline the methods for providing compensatory mitigation for the filling of Section 404 jurisdictional wetlands and waters. The primary objectives of the Mitigation Plan are to (1) identify the total acreage of wetlands and other jurisdictional waters affected by the Big Rock Ranch project ("Project") and (2) describe the compensatory mitigation activities designed to replace affected wetland and aquatic habitat, including enhancement and replacement of wetland and riparian vegetation. The Mitigation Plan therefore addresses in detail the estimated impacts of the Project, proposed compensatory mitigation activities, mitigation implementation and planting schemes, and maintenance and monitoring of mitigation sites.

There are several aquatic sites within and immediately adjacent to the Development Area that are subject to Section 404 of the Clean Water Act, including a reservoir, seasonal wetlands, and ephemeral and intermittent drainages. In total, the Big Rock Ranch project will result in the filling of 0.45 acre of wetlands and 0.30 acre of streams (i.e., a total of 0.75 acre of jurisdictional areas). To mitigate this impact, Lucasfilm proposes to create replacement habitat by creating 0.90 acre of wetlands, and creating and restoring 4.44 acres of streams and open water. In addition, Lucasfilm will create new riparian habitat and enhance existing riparian habitat to compensate for impacts to portions of several seasonal drainages. The following table provides an overview of the general mitigation scheme. rev. 1 rev. 1

Table 1. Section 404 jurisdictional acreage within and adjacent to the Development Area

	Existing (ac)	Impacted (ac)	Preserved (ac)	Created/Restored (ac)
Intermittent and Ephemeral Drainages	1.56	0.30	1.26	0.44
Reservoir	2.1	0	2.1	4.0
Seasonal Wetlands	0.49	0.45	0.04	0.90
Total	4.15	0.75	3.40	5.34
Total Preserved, Created, and Restored Area			8.74 acres	

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Lucasfilm will monitor and maintain the wetland and riparian mitigation areas for five years, and will implement measures to protect the mitigation areas in perpetuity. Fences will be installed to protect created wetland and riparian mitigation areas from cattle grazing.

The activities proposed in this Mitigation Plan reflect Lucasfilm's demonstrated commitment to environmental protection and enhancement at Big Rock Ranch. Implementation of the Mitigation Plan will result in an overall enhancement of the Project area due to 2:1 replacement of wetlands, creation and enhancement of aquatic and riparian habitat, and management of grazing activities.

1. PROJECT DESCRIPTION

1.1 Location of Project

The 56-acre project area is located within Big Rock Ranch, 3800 Lucas Valley Road, Nicasio, California approximately five miles west of Highway 101 (Figure 1). Big Rock Ranch is bounded by rural residential and agricultural lands, including Skywalker Ranch to the west and Grady Ranch to the east. Big Rock Ranch is owned by Lucasfilm Ltd.

1.2 Brief Summary of Overall Project

Lucasfilm owns the proposed project site and plans to build office and related facilities within a portion of the Ranch. Big Rock Ranch is 1,117 acres. Only a small portion (56 acres, referred to as "the Project Area") will be impacted by the proposed development (Figure 2). The remaining acreage will be preserved as open space or agricultural trust lands. Of the Project Area's 56 acres, only 43 acres are proposed for disturbance and construction of facilities. rev. 1

The Project Area consists of 56 acres of gentle to moderately sloped land. This area includes the lower slopes of hillsides and the upper reaches of streams and ephemeral drainages. Elevations within the Project Area range from 550 to 900 feet, while elevations within the entire Big Rock Ranch range from 450 to 1,800 feet. The Project Area is dominated by upland grassland and oak woodland, and also includes several intermittent creeks and ephemeral drainages. In addition, there are a few seasonal wetlands within the Project Area that total less than one-half acre.

Within the Project Area, Lucasfilm plans to construct approximately 184,700 square feet of office and storage space. The complex will consist of a main office and commons building (97,096 square feet building footprint), an archives building (17,064 square feet building footprint), a day care/fitness building (9,685 square feet building footprint) and a gatehouse kiosk. The development plans include the expansion of an existing degraded stock pond, with a current capacity of 40 acre-feet, to a 100 acre-foot reservoir. The remainder of Big Rock Ranch will be preserved as agricultural open space. rev. 1

The reservoir area will be enhanced through the addition of open water acreage, the creation of a vegetated wildlife corridor to connect areas above and below the dam, and the creation and enhancement of aquatic and riparian habitat in and around the reservoir. Other proposed enhancement and mitigation measures include the planting of native riparian vegetation and expansion of seasonal wetland areas, which will result in an overall environmental enhancement of the Ranch.

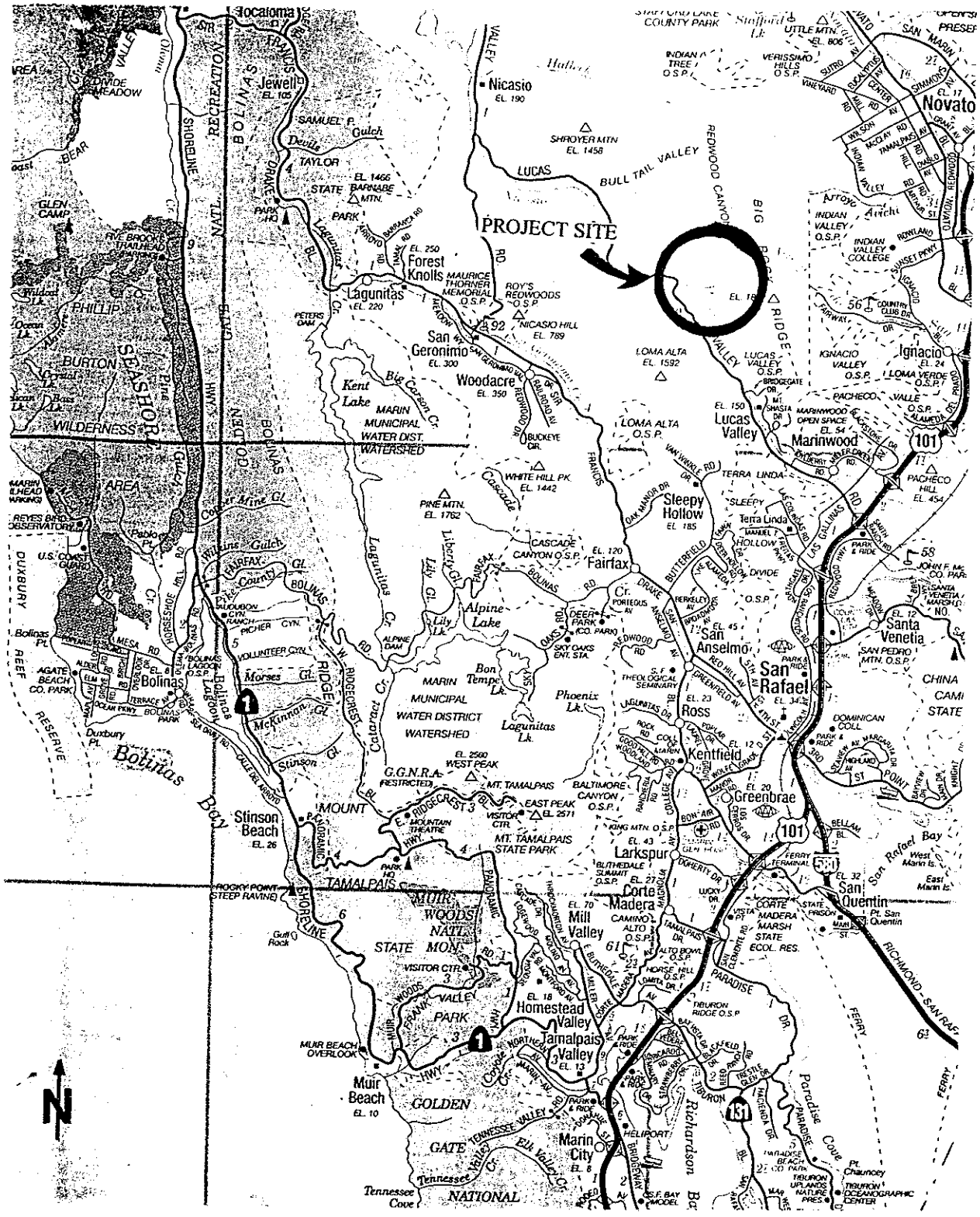
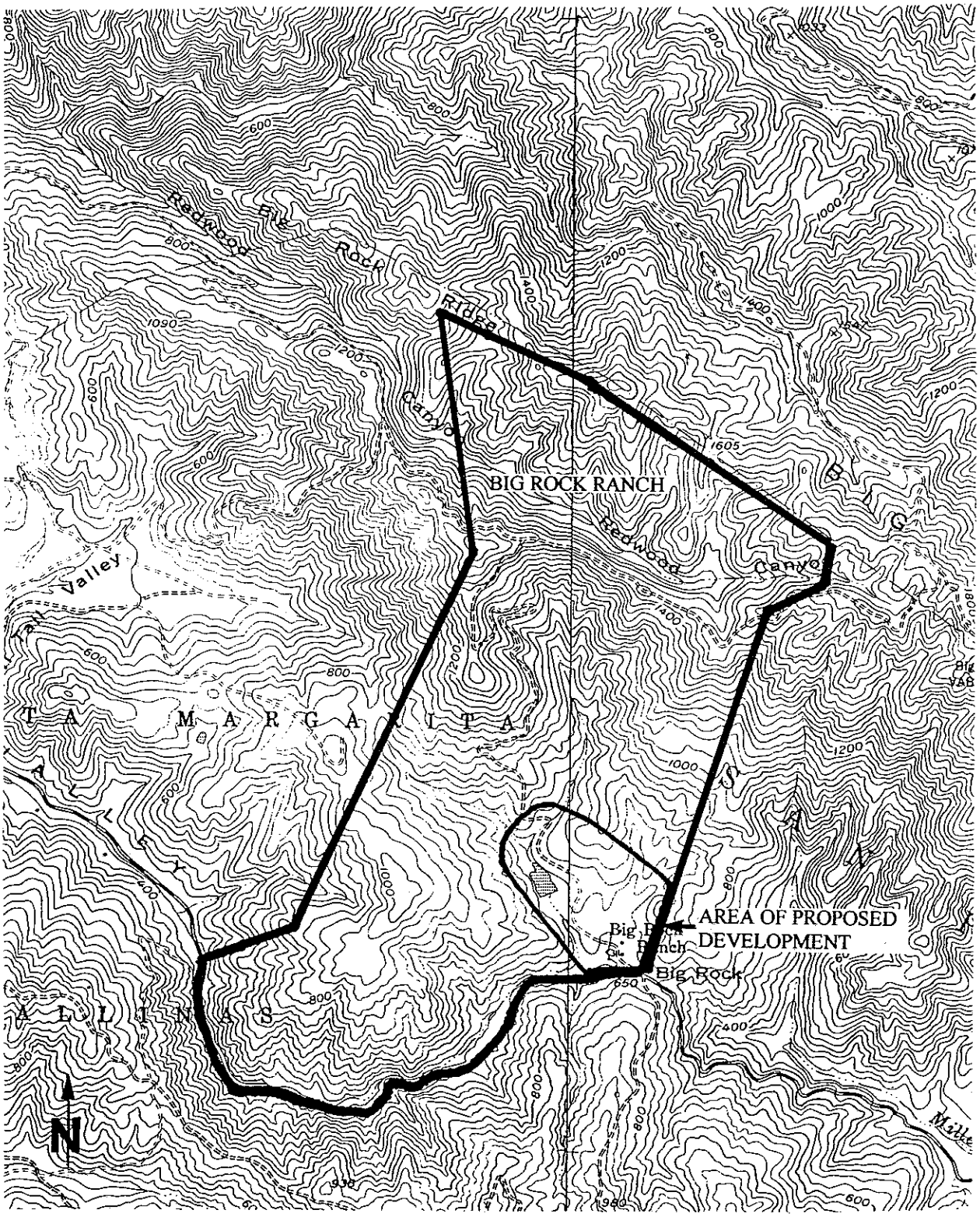


FIGURE 1

Wetlands Research Associates, Inc.

PURPOSE: Construction DATUM: NGVD MAP SOURCE: CSAA 1995	REGIONAL MAP 10,000 0 10,000 20,000 FEET SCALE 1: 240,000 Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. SHEET: 1 OF 3 DATE: July 29, 1999



Wetlands Research Associates, Inc.

FIGURE 2

PURPOSE: Construction DATUM: Mean Sea Level MAP SOURCE: USGS Novato and San Geronimo quadrangles	LOCATION MAP 1000 0 1000 2000 FEET SCALE 1: 24,000 Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. SHEET: 2 OF 3 DATE: July 29, 1999

1.3 Responsible Parties

The applicant is:

Lucasfilm Ltd.
PO Box 2009
San Rafael, California 94912
Contact: Gordon Radley, President
Phone: (415) 662-1800

The preparer of this plan is:

Wetlands Research Associates, Inc.
2169 East Francisco Boulevard, Suite G
San Rafael, California 94901
Contact: Michael Josselyn
Phone: (415) 454-8868

1.4 Jurisdictional Areas to be Filled

A wetland delineation for the Project Area was conducted by LSA Associates, Inc. using the methods described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). A preliminary delineation map was supplied to the Corps on December 1, 1998 by LSA Associates, Inc. Following a field inspection in January 1999, Lucasfilm Ltd. and the Corps agreed that additional information was required to finalize the verification of the jurisdictional delineation. A second submittal was supplied to the Corps on March 18, 1999 including a final delineation map for Corps approval. The second map was approved by the Corps on May 24, 1999, and a Corps Project Number 24120N was assigned to this project. Brian Wirtz of the San Francisco District, Regulatory Branch is the project manager for the Corps.

The Marin County Soil Survey (SCS 1985) indicates that four soil mapping units occur on the Project Area (Figure 3). Bonny Doon Variant-Gilroy-Gilroy Variant loams, 50 to 75 percent slopes is found on the moderate slopes adjacent to Nicasio Creek. Los Osos-Bonnydoon complex, 30 to 50 percent slopes is found on a level terrace adjacent to Lucas Valley Road at the southern end of the Project Area. Gilroy-Gilroy Variant-Bonnydoon loams, 30 to 50 percent slopes is found on higher slopes south of Nicasio Creek. Tocaloma-McMullin complex, 50 to 75 percent slopes is found on higher slopes north of Nicasio Creek. All four of these soils are relatively thin, loamy soils developed on uplands. None of these soil types are listed as hydric soils on the Marin County hydric soil list (SCS 1992). Parent materials of these soil types are siltstone, claystone, and serpentinite.

Approximately 0.03 acre of vegetated seasonal wetlands, 0.13 acre (431 linear feet) of intermittent drainages, and 0.002 acre (33 linear feet) of ephemeral drainages will be filled as a result of the proposed project. An additional 0.42 acre of seasonal wetlands, 0.17 acre of intermittent drainages, and 0.001 acre of ephemeral drainages will be flooded for reservoir expansion. Tabulations of affected drainage segments on the Project Area are shown in Tables 2 and 3. Wetland and drainage impacts are shown on Sheet W-1 "Waters of the U.S. - Affected Jurisdictional Areas" of the Plan Submittal.

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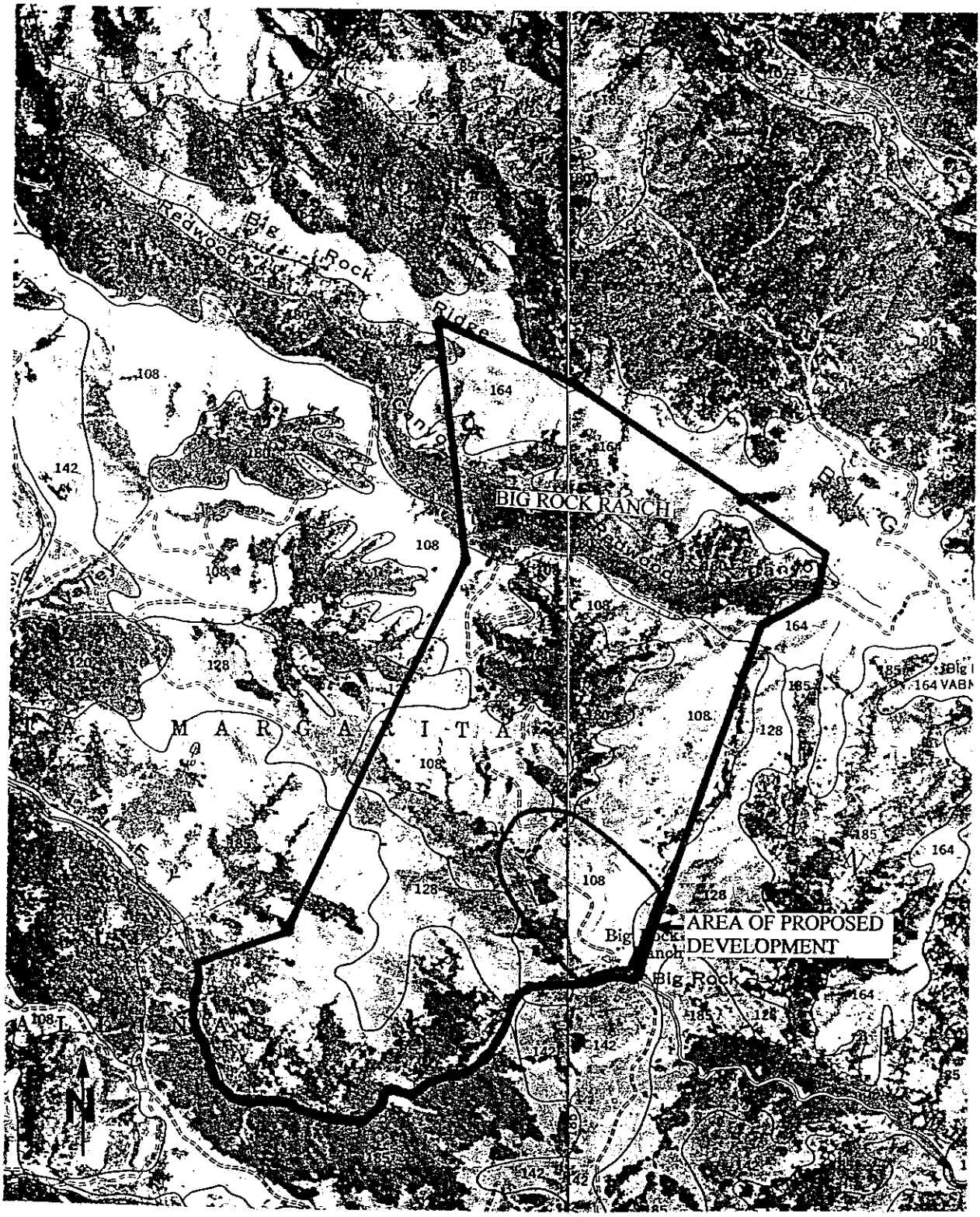

Wetlands Research Associates, Inc.

FIGURE 3

PURPOSE: Construction	SOIL MAP	BIG ROCK RANCH
DATUM: NGVD	1000 0 1000 2000 FEET	LOCATION: Lucas Valley Road
MAP SOURCE: SCS Marin County	SCALE 1: 24,000 Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. SHEET: 3 OF 3 DATE: July 29, 1999

Table 2. Seasonal drainages to be filled on Big Rock Ranch

Impacted Stream	Average Width (feet)	Impact Length (linear feet)	Impact Area (square feet)	Impact Area (acres)
Drainage 1 (Big Rock Creek)	9	97	873	0.02
Drainage 3	4	10	40	0.001
Drainage 6 (ephemeral)	2	33	66	0.002
Dairy Creek	16	81	1,296	0.03
Nicasio Creek	13.9	243	3,385	0.08
Total	12.2	464	5,660	0.13

Rev. 1

Table 3. Seasonal drainages to be flooded on Big Rock Ranch

Impacted Stream	Stream Type	Impact Area (square feet)	Impact Area (acres)
Drainage 1 (Big Rock Creek)	Intermittent	3,256	0.07
Drainage 3	Intermittent	610	0.01
Drainage 4	Intermittent	360	0.01
Drainage 5	Ephemeral	50	0.001
Dairy Creek	Intermittent	3,310	0.08
Total	Ephemeral	50	0.001
	Intermittent	7,536	0.17

Rev. 1

1.5 Types, Functions, and Values of the Jurisdictional Areas to be Filled

The types of jurisdictional waters to be filled in the Project Area are seasonal drainages and seasonal wetlands. All Section 404 jurisdictional areas on the Project Area have been subject to current and past livestock grazing. rev. 1

1.5.1 Seasonal drainages

Several drainages originate within the upper reaches of Big Rock Ranch and flow through the Project Area. Nicasio Creek begins at the bottom of the spillway of the existing reservoir and flows off-site along the valley floor. The reservoir is filled by two smaller creeks whose watershed is confined to Big Rock Ranch. These two intermittent drainages, Big Rock Creek and Dairy Creek, merge just upstream of the existing reservoir. Associated with these three named creeks are several other un-named intermittent and ephemeral drainages, all of which are within the boundaries of Big Rock Ranch (Sheet W-1).

The drainages within the Project Area carry ephemeral or intermittent flows. Therefore, these seasonal drainages provide water for wildlife in the wet season only. About 10 percent of these seasonal streams within and immediately adjacent to the Development Area will be impacted by this development. This total includes 33 linear feet of ephemeral drainages and 431 linear feet of intermittent drainages that will be filled, and 0.17 acre of ephemeral and intermittent drainages that will be flooded. rev. 1 rev. 1

Intermittent drainages have been affected by current and past cattle grazing activities on the Ranch, through bank breakdown and erosion. The drainages support minimal vegetation within the stream channel, but the banks support vegetation such as sedges (*Carex* spp.), rushes (*Juncus* spp.), Italian ryegrass (*Lolium multiflorum*), wild rose (*Rosa californica*), and willows (*Salix* spp.). Many of these drainages have scoured or incised banks, due to the suppression and/or removal of vegetation along their banks. Trees are uncommon in the drainages that will be impacted, occurring either as solitary trees or in small, isolated clusters.

Non-native grass species dominate in the ephemeral drainages. There are few, if any, tree and shrub species along the banks of these drainages. Eroded channels, exacerbated by cattle grazing activity, are common along ephemeral drainages on Big Rock Ranch.

The watersheds for all of the drainages are contained within Big Rock Ranch. All flows within the drainages are generated from storm runoff.

The existing portion of Nicasio Creek that lies between the base of the existing reservoir spillway and the proposed reservoir spillway/splashpool will receive supplemental water from a low level outlet intake in the new reservoir. This water source will ensure the continued healthy existence of this riparian corridor.

1.5.2 Seasonal wetlands

Four seasonal wetlands are present in the Project Area totaling 0.49 acre. Three of the seasonal wetlands occur in low-lying depressions in the central and southern portions of the Project Area and capture direct rainfall and sheet flow, creating seasonally saturated soils for several weeks to several months during the rainy season (Sheet W-1). These wetlands are small and isolated. A larger delta wetland area lies adjacent to the upper end of the reservoir, and was formed by deposit of coarse, sandy sediments carried into the reservoir by Dairy and Big Rock Creeks. A total of 0.03 acre of jurisdictional wetlands will be filled and 0.42 acre of jurisdictional wetlands will be flooded by this project.

The seasonal wetlands are dominated by hydrophytic vegetation including Bermuda grass (*Cynodon dactylon*), umbrella sedge (*Cyperus eragrostis*), Baltic rush (*Juncus balticus*), iris-leaved rush (*Juncus xiphioides*), Italian ryegrass, rabbitfoot grass (*Polypogon monspeliensis*), and spiny cocklebur (*Xanthium spinosum*). The green vegetation in the seasonal wetlands in the Project Area attracts grazing livestock. As a consequence, the wetlands are severely impacted by cattle grazing.

The Ranch provides a wide variety of wildlife habitat types including forest, woodland, open grassland, and riparian corridors. The proximity to open space and other undeveloped land and limited human use contribute to the wildlife habitat value of the Ranch. Two special status animal species have been reported within jurisdictional areas on the property. Surveys conducted in March 1996 and May 1999 found that a population of western pond turtles inhabits the reservoir on Big Rock Ranch. This subspecies is considered a species of special concern by the California Department of Fish and Game (CDFG), but has no legal protective status under the California or Federal Endangered Species Acts. A May 1999 survey located foothill yellow-legged frog on the property. This species is considered a species of special concern by the California Department of Fish and Game, and a federal species of concern by the U.S. Fish and Wildlife Service, but has no legal protective status under the California or Federal Endangered Species Acts. A site assessment for California red-legged frog (CRLF) was conducted within the Project Area by Wetlands Research Associates in March 1999, and full surveys were conducted in May 1999. No CRLFs were found on the site. Potential habitat within the existing reservoir contains bullfrogs (*Rana catesbeiana*) and bass (*Micropterus* sp.).

2. GOALS OF MITIGATION

The goals of the mitigation measures for the proposed project include:

- Avoid and minimize impacts to wetlands and other waters of the United States to the extent possible and replace wetland and waters habitat that is lost as a result of development;
- Compensate for wetland fill by the creation of seasonal wetlands on the property at a 2:1 ratio of created to filled area;
- Enhance selected streams through bank stabilization, bank plantings, and planting of new riparian canopy tree species;
- Create two new stabilized stream channels with bank and riparian tree plantings;
- Preserve habitat permanently through the establishment of a conservation easement to protect the avoided and enhanced wetlands, buffers, and dispersal corridors.

2.1 Types of Habitat to be Created

The type of habitats to be created and/or restored as part of the compensatory mitigation will be seasonal wetlands, stream channels, and open water (Sheet W-2 "Wetlands Mitigation Plan" of the Plan Submittal). Water sources for the three created seasonal wetlands will come from surface water flows, direct precipitation, high water flow in Drainage 8 (mitigation wetlands 1 and 2), and Drainage 9 (mitigation Wetland 3). Existing water flows in Dairy Creek, Drainage 4, Drainage 7, Drainage 8, and Drainage 9 will serve as the main water sources for the restoration of portions of each respective stream channel. Direct precipitation, existing surface flows, and re-contoured rev. 1

surface flows will serve as the main water sources for the newly created mitigation stream channels. Existing water flows in Dairy Creek and Big Rock Creek will serve as the main water sources for the expanded reservoir. Watersheds for the three seasonal wetland mitigation sites are shown in Figure A-1. Native plants currently growing in the seasonal wetlands and riparian stream channels in the Project Area will be the target species for the mitigation wetlands and stream channels respectively.

The wetland mitigation will provide, at a minimum, habitat functions and values similar to those currently existing on the project site. A net gain of 4.58 acres of wetland, stream, and open water area will result from implementation of this mitigation plan. All created wetland features will be fenced to exclude cattle. rev. 1

2.2 Functions and Values of Habitat to be Created

The proposed compensatory wetland mitigation areas will include creation of three seasonal wetlands totaling 0.9 acre, each of which will be adjacent to existing wetlands or drainages, thereby increasing the value of the existing on site wetland and riparian habitats. The restored stream channels will follow the routes of existing drainages. The created drainages will be in areas where seasonal surface flow currently exists. The wetland and waters functions and values within the mitigation areas will exceed the functions and values of the jurisdictional areas impacted by the project through three main changes: (1) larger size of mitigation wetlands and waters, (2) greater native vegetation cover, and (3) elimination of cattle grazing within mitigation wetland and water areas. Expanded areas of seasonal wetland and riparian stream habitats created at the mitigation sites will provide important functions and values that include:

- Expansion of wetland habitat for wildlife; including mammal, bird, reptile, amphibian, and invertebrate species;
- Reduction in erosion and turbidity by stabilization and planting of creek banks;
- Establishment of plants in the mitigation sites that will take up nutrients and transform them into organic plant tissues, thereby improving water quality and increasing food available for herbivores, detritivores, and other organisms;
- Creation of wetlands that will increase flood storage volume along Drainage 8, thereby reducing flood flow and decreasing impacts of storm events on the Project Area and in the downstream watershed;
- Restoration and creation of riparian corridors that will increase flood storage volume along Drainages 4, 7, 8, and 9, and Dairy and Nicasio Creeks, thereby reducing flood flow and decreasing impacts of storm events in the Project Area and in the downstream watershed.

conservation easement on the land. Any subsequent owners of the Project Area will be informed of the easement and their responsibilities for completion of necessary implementation, monitoring, and/or remediation.

Table 6. Size of proposed mitigation stream segments on Big Rock Ranch

Mitigation Stream	Mitigation Type	Length (linear feet)	Average Width (feet)	Area (square feet)
Drainage 1 (Big Rock Creek)	Creation	91	30	2,730
Drainage 4	Restoration	145	3	435
Drainage 7	Restoration	335	2	670
Drainage 8	Restoration	1,281	8	10,248
Drainage 9	Restoration	402	2.5	1,005
	Creation	140	3	420
Dairy Creek	Restoration	327	8	2,616
Naboo Creek	Creation	300	4	1,200
Total		3,021	6.4	19,324

rev. 1

rev. 1

4.3 Existing Functions and Values of Wetland and Stream Mitigation Areas

The proposed wetland mitigation sites will be located in areas that are currently uplands with native and non-native grasses and forbs. Wetland mitigation site locations were chosen based upon topography, soil type, hydrologic regime, and accessibility. All potential wetland mitigation sites are located on flat terrain with poorly drained soil types and can serve as detention basins for water. Potential wetland mitigation sites encompass only upland grazing areas and possess limited habitat functions and values.

Stream restoration areas are located along existing intermittent streams with broken or degraded canopies, eroded channel banks, or barriers to wildlife migration. Stream creation sites are located in areas which would naturally receive runoff after proposed construction grading.

4.4 Present and Proposed Uses of Mitigation Areas

Proposed wetland and stream mitigation areas are presently vacant and used for livestock grazing. Once these sites are developed into mitigation wetlands and created/restored streams with riparian plantings, grazing activity in these areas will cease. No new land uses are proposed for any of these mitigation sites.

4.5 Jurisdictional Delineation of Mitigation Areas

A wetland delineation for the Project Area was conducted by LSA Associates, Inc. using the methods described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). No jurisdictional areas were found within the proposed wetland mitigation sites. The existing stream channels in the areas proposed for stream restoration were delineated as jurisdictional waters. These areas will remain after proposed stream mitigation measures have been implemented.

4.6 Present and Proposed Uses of All Adjacent Areas

Areas adjacent to the mitigation locations on Big Rock Ranch are currently and historically used for cattle grazing. No changes are planned for the Ranch as a whole, but the areas immediately adjacent to these mitigation sites will be surrounded by fencing to exclude cattle from the mitigation areas.

4.7 Zoning

The Project Area is within the sphere of influence of Marin County which has zoned this property for agricultural and residential uses. Zoning for this property allows a potential maximum density of one residential unit per 30 acres.

5. IMPLEMENTATION PLAN

5.1 Rationale for Expecting Implementation Success

Expansion of wetlands along Drainage 8 involves creating wetlands adjoining existing wetlands along this creek channel. The weirs that direct water from Drainage 8 to these wetlands will be constructed at elevations that provide hydrologic regimes sufficient for supporting the growth of hydrophytic vegetation. Wetlands 1 and 2 will rely on existing high water flows in Drainage 8. Retention of water in these mitigation wetlands will be enhanced by the construction of berms around each wetland and by the soils present at these locations. Basin bottoms will be flat in order to allow soils of the entire basin to become inundated with a minimum of water input. Berms around the downstream perimeter of each wetland basin will be constructed to increase soil moisture storage by containing near-surface groundwater flow in the basins.

The two main sources of water for Wetland 3, direct precipitation and runoff from the surrounding uplands, will provide a hydrologic regime sufficient for developing seasonal wetland conditions (Table 4). A water budget calculated for the mitigation area based on 30-year averages of climatological data found that average water delivered to this 0.4-acre wetland will be no less than 15 inches/acre each month from December to February (Table 4). Retention of this water in the wetland area will be enhanced by the construction of a berm around the wetland and by the soils present on the site. On site investigations show that the main soil type in the mitigation area is a silty clay, a poorly drained wetland soil that ponds water. Wetland soils from impacted areas will be stockpiled and backfilled into the created wetland to provide wetland soils and a seed bank.

5.2 Responsible Parties

The applicant will be responsible for implementation of this mitigation plan.

Lucasfilm Ltd.
P.O. Box 2009
San Rafael, California 94912
Contact: Gordon Radley, President
Phone: (415) 662-1800

5.3 Mitigation Site Preparation

Seasonal wetland mitigation sites will be constructed in summer and early fall. Seeding and planting of the three seasonal wetland mitigation sites will occur in the late fall to take advantage of winter rains for plant establishment.

During construction of mitigation wetlands, a person qualified in wetland restoration will monitor construction of the wetlands to ensure they are constructed as specified herein.

Erosion control measures will be implemented that will conform to Best Management Practices mandated by the Regional Water Quality Control Board (RWQCB). Silt fencing will be installed around the perimeter of preserved wetlands and stream corridors.

5.3.1 Wetland 1 and Wetland 2 mitigation sites

Wetland 1 and Wetland 2 will be located on stepped terraces adjacent to the stream channel of Drainage 8 (Sheet W-2). The terraces will be constructed by grading back the existing stream banks. Figures A-2 and A-3 illustrate the plan for grading Wetland 1 and Wetland 2, respectively. Figures A-4 and A-5 provide a representative cross-section for grading Wetland 1 and Wetland 2, respectively. The wetland terraces will be stepped to allow each wetland to follow the elevation of the stream channel. Figure A-6 provides a representative cross-section of the stepped wetland terraces.

Wetlands 1 and 2 will receive water from the stream channel during storm events that produce high water levels. Water will enter the wetlands via a coupled in-stream boulder weir and side channel boulder weir. Figure A-2 and Figure A-3 illustrate respectively the locations of the in-stream and side-channel weirs for Wetland 1 and Wetland 2. Figure A-7 illustrates a schematic design of an in-channel boulder weir that will be used for Wetland 1 and Wetland 2. Figure A-8 illustrates a schematic design of a side-channel boulder weir that will be used for Wetland 1 and Wetland 2.

Figure A-9 provides a representative cross-section which illustrates the soil section within the wetland, typical wetland planting, and stream bank stabilization techniques associated with the construction of Wetland 1 and Wetland 2. The wetland soil section will consist of the following: compacted subsoil; 18 inches of top soil; and three inches of wetland topsoil. The topsoil will be

salvaged from the excavation of the existing stream bank. The wetland topsoil will be salvaged from the impacted wetlands on site. The wetland topsoil will supply the desired native seed bank necessary to propagate a healthy wetland.

5.3.2 Wetland 3 mitigation site

Wetland 3 will be located on the hillside at the downstream end of Drainage 9 (Sheet W-2). The wetland will be constructed by grading a flat terrace into the hillside and constructing a 12-inch-high berm around the perimeter of the wetland. The bottom of Wetland 3 will be graded for an average maximum water depth of six inches. The water depth will range from zero inches at the edges to twelve inches in the middle. Figure A-10 illustrates the plan for grading Wetland 3. Figure A-11 provides a representative cross-section for grading Wetland 3.

Water will enter Wetland 3 from Drainage 9. Water will exit Wetland 3 from a boulder weir and travel in a grass swale from Wetland 3 into Wetland 2 (Sheet W-2).

Figure A-12 provides a representative cross-section of Wetland 3 which illustrates the soil section within the wetland, typical wetland plantings, and bank stabilization techniques. The wetland soil section will consist of the following: compacted subsoil; 24 inches clay soil; 18 inches topsoil; three inches wetland soil. The clay soil will be salvaged from excavation of the mitigation wetland or excavation of the reservoir bottom. Topsoil will be salvaged from excavation of the wetland terrace. The wetland topsoil will be salvaged from the impacted wetlands on site.

5.3.3 Stream restoration mitigation sites

Stream restoration will occur along Drainage 4, Drainage 7, Drainage 8, Drainage 9, and Dairy Creek (Sheet W-2). Locations and descriptions of stream restoration activities are provided in Appendices A and B as follows: Drainage 4 (Figure A-13, Table B-1), Drainage 8 (Figure A-14, Table B-2), Drainage 9 (Figure A-15, Table B-3), and Dairy Creek (Figure A-16, Table B-4). Stream restoration will include bio-technical restoration of the stream channel and banks and the construction of fences to exclude cattle from the stream corridors. rev. 1

A variety of bio-technical applications will be used to restore the stream channels:

- Vegetated earth reinforced fill head-cut repair (Figure A-17);
- Vegetated bio-log head-cut repair (Figure A-18);
- Loose rock head-cut repair with vegetation (Figure A-19);
- Boulder step head-cut repair (Figure A-20).

A variety of bio-technical applications will be used to restore the stream banks:

- Rock revetment with live willow stakes (Figure A-21);
- Native material revetment (Figure A-22);
- Brush mattress bank stabilization (Figure A-23);

adequate to support the native herbaceous wetland plant species targeted for these areas.

Herbaceous plantings within created and restored mitigation stream channels should not require irrigation. Riparian tree and shrub plantings will be supplied with a drip irrigation system for dry season watering during the first two to three years after planting. This water will ensure the survival of these plantings and reduce the need for replacement plantings.

5.7 As-Built Conditions

A brief letter report outlining the as-built conditions of all wetland and stream mitigation sites will be prepared and submitted to the County, Corps, RWQCB, and CDFG within one month of mitigation site construction.

6. MAINTENANCE DURING MONITORING PERIOD

An important element of each mitigation plan is to create, to the extent possible, wetland habitats that are self-sustaining and maintenance-free over the long term. Initially, maintenance is often necessary to ensure success, but properly created wetland and riparian areas should eventually maintain themselves.

6.1 Maintenance Activities

Initial maintenance activities that will be required on the mitigation site include visual assessments of the planted trees and shrubs in stream mitigation areas. If a significant percentage of these trees or shrubs die following planting, additional planting will occur to ensure that the appropriate density of vegetation is established. If significant levels of erosion occur on the newly graded berms within the wetland mitigation areas, additional seeding will be undertaken. The condition of the berms that surround each seasonal wetland will be examined several times each year to determine if additional strengthening is required. Weed removal will also be undertaken on the mitigation site as needed to ensure vigorous growth by target vegetation. Biologists will monitor the extent of non-native plants listed by the California Exotic Pest Plant council on their A-1, A-2, and B lists. If present within the mitigation areas, appropriate mechanical, chemical, or biological controls will be implemented to either eliminate or to control the species so that it will not have a significant impact on the ecological function of the wetland.

Hydrologic conditions at each wetland and stream mitigation site will be assessed and any modification that becomes necessary will be reported to the Corps prior to implementing such changes.

6.2 Responsible Parties

The applicant will be responsible for mitigation site maintenance.

Lucasfilm Ltd.
P.O. Box 2009
San Rafael, California 94912
Gordon Radley, President
Phone: (415) 662-1800

6.3 Schedule

Observations on tree and shrub survival will be made six months and one year after planting, and on an annual basis for years two through five. Weed observation and removal will happen on an annual basis. Inspection of wetland mitigation site impounding berms will happen during the semi-monthly hydrology monitoring visits.

7. MONITORING PLAN AND REPORTS TO AGENCIES

Monitoring will be required to document habitat development and determine if mitigation performance criteria have been met. Annual reports that discuss monitoring methodology and results will be submitted to the County, the District Engineer of the Corps, the RWQCB, and the CDFG. These reports will assess the progress in meeting performance criteria, and identify any problems with flooding, sedimentation, vandalism, and/or other general causes of poor survival or wetland degradation. If necessary, recommendations to improve success in achieving performance criteria will be made. After five years, a final report describing the success of the mitigation in meeting the performance criteria, and an evaluation of the success of any necessary corrective measures undertaken, will be prepared and submitted to the County, Corps, RWQCB, and CDFG. Reports will be prepared by a qualified wetland biologist with experience in mitigation monitoring.

7.1 Performance Criteria

Following construction of the wetland and stream mitigation sites, a five-year monitoring program will be conducted to determine whether the mitigation sites have achieved functions greater than or equal to the existing nearby wetlands and streams, and whether corrections to the site designs or implementation procedure are necessary. The criteria that will be used to determine the success of the mitigation sites will be:

YEAR 1

- The majority of each wetland mitigation site will be saturated for at least 3 months during the rainy season.
- No permanent standing water will be present in the wetland mitigation sites after May 31.

- Three or more of the six most prevalent plant species found in each wetland mitigation site will be native seasonal wetland species currently growing in wetland areas filled as a result of the development (Table 7).
- At least three native seasonal wetland plant species will have greater than five percent cover each in each wetland mitigation site.
- Survival of stream mitigation tree and shrub plantings will exceed 90 percent.
- Invasive weeds found on the California Exotic Pest Plant Council's List of exotic pest plants of greatest ecological concern in California ("CalEPPC list") will not exceed five percent cover within each mitigation wetland and stream site.

Table 7. Native wetland plant species found in seasonal wetlands on Big Rock Ranch

Scientific Name	Common Name
Eleocharis macrostachya	spikerush
Hordeum brachyantherum	meadow barley
Juncus balticus	Baltic rush
Juncus effusus	softstem rush
Juncus phaeocephalus	brown-head rush
Juncus xiphioides	iris-leaved rush
Lasthenia glabrata	goldfields
Leymus triticoides	creeping wildrye
Mimulus guttatus	yellow monkeyflower
Ranunculus californicus	California buttercup

YEAR 3

- The majority of each wetland mitigation site will be saturated for at least three months.
- No permanent standing water will be present in the wetland mitigation sites after May 31.
- Vegetation percent cover in each seasonal wetland mitigation sites should average at least 50 percent absolute cover.
- Three or more of the six most prevalent plant species found in each wetland mitigation site will be native seasonal wetland species currently growing in wetland areas to be filled.
- At least three native seasonal wetland plant species will have greater than eight percent cover each.
- Survival of stream mitigation tree and shrub plantings will exceed 85 percent.
- Invasive weeds found on the CalEPPC list will not exceed five percent cover within each mitigation wetland and stream site.

YEAR 5

- The majority of each wetland mitigation site will be saturated for at least three months.
- No permanent standing water will be present in the wetland mitigation sites after May 31.
- Vegetation percent cover in each seasonal wetland mitigation site should average at least 75 percent absolute cover.
- Three or more of the six most prevalent plant species found in each wetland mitigation site will be native seasonal wetland species currently growing in wetland areas to be filled.
- Each wetland mitigation site will be dominated[1] by native seasonal wetland vegetation.
- At least three native seasonal wetland plant species will have greater than ten percent cover each in each wetland mitigation site.
- Hydrologic conditions in each mitigation wetland site should meet the hydrology criteria set forth in the Army Corps of Engineers' 1987 manual stating that wetland areas will be subject to inundation for at least five percent of the growing season or 18 days.
- Survival of stream mitigation tree and shrub plantings will exceed 80 percent.
- Invasive weeds found on the CalEPPC list will not exceed five percent cover within each mitigation wetland and stream site.

7.2 Monitoring Methods

Three variables will be monitored over the five-year monitoring period to assess progress in creating wetlands for mitigation at Big Rock Ranch: hydrology, soils, and vegetation.

Hydrology

Each year of the monitoring period, hydrology of the three wetland mitigation sites will be monitored twice a month during the rainy season to ensure that the site is functioning hydrologically as a seasonal wetland. Based on methodologies outlined in the *1987 U.S. Army Corps of Engineers Wetland Delineation Manual*, the wetland will be monitored to ensure that soils are either inundated (visual observation of ponding) or saturated within the root zone (1.0 feet from the soil surface). Observations of surface ponding and duration of inundation will be conducted 14 to 18 days following a major rainfall event and/or on a semi-monthly basis during the winter and spring rainy season. Soils within each wetland mitigation site will be saturated for at least three months during the rainy season. Photographs will be taken as necessary to document hydrologic conditions within the wetland mitigation sites.

Soil

Soil profiles will be examined at three locations within each mitigation wetland once each year to confirm development of the redoximorphic features such as oxidized rhizospheres, gleying, or

[1] Domination by hydrophytic vegetation is defined in the *U.S. Army Corps of Engineers 1987 Wetland Delineation Manual.*

mottling. Sampling points will reflect a range of hydrologic conditions within each wetland; from the lowest points to the edge of each wetland.

Any sedimentation or erosion occurring will also be noted, and remediation measures will be recommended if the problem becomes severe.

Vegetation

Vegetation monitoring involves three components: (1) assessing plant species occurrence and percent cover along transects within each wetland mitigation site, (2) assessing the survival of stream mitigation planted areas, and (3) surveying for the presence of invasive exotic herbaceous weeds.

During years one to five, overall seasonal wetland plant establishment will be examined by monitoring plant species occurrence and percent cover along transects. These transects will be established throughout the range of microhabitats found in each wetland mitigation site. The transects will be set up with fixed endpoints (labeled stakes) that can be used for each of the five years of sampling. Plant species coverage will be measured using percent cover classes within a 0.5-meter-square quadrat every five meters along these transects. Sufficient transects will be established to obtain a statistically significant sampling size within each of the three wetland mitigation sites. Additional sampling also will be conducted in existing wetlands on Big Rock Ranch for comparison. These data will be tabulated and analyzed to assess whether vegetation coverage is meeting the performance criteria goals outlined in Section 7.1. Photographs will be taken at selected permanent photopoints during the vegetation monitoring visit each monitoring year for year-to-year visual comparison. Monitoring will be conducted at the end of the growing season for these wetland plant species, typically late spring (May).

Results of the vegetation sampling will be used to compare plant establishment with specific vegetative performance criteria outlined in Section 7.1. Specifically, each wetland mitigation site should be dominated by native seasonal wetland plant species found in the wetlands to be filled on the project site (Table 7). Starting with the first year of monitoring it is expected that three or more of the six most prevalent plant species growing in each wetland mitigation site will be native seasonal wetland species currently growing on site. To ensure a diversity of species it is expected that at least three native seasonal wetland plant species will have greater than five percent cover each, increasing to greater than ten percent cover each after five years. In addition, at the end of five years vegetation cover will be examined in each wetland mitigation site to determine if it meets the Corps' wetland criteria of >50 percent of the dominant plant species being classified as either obligate (OBL), facultative wet (FACW), or facultative (FAC) according to the wetland status assigned by the U.S. Fish and Wildlife Service (Reed, 1988).

Survival of the planted tree and shrub species within the stream mitigation (creation and restoration) sites will be assessed six months and one year after planting. If Year 1 survival goals are not achieved, the appropriate number of trees and shrubs will be replanted as part of a remedial planting during the first fall following initial planting. In subsequent years planted trees and shrubs will be replaced on an annual basis as needed.

Surveying for the presence of invasive exotic plant species within wetland and stream mitigation sites will occur annually during the monitoring visit. Removal by hand of weeds found on the CalEPPC list will occur where possible if these species are observed within mitigation wetlands or stream corridors.

7.3 Annual Reports to Agencies

Monitoring will be required to document habitat development and determine if mitigation performance criteria have been met. Annual reports that discuss monitoring methodology and results will be submitted to the County, District Engineer of the Corps, RWQCB, and CDFG. These reports will assess the progress in meeting performance criteria, and identify any problems with flooding, sedimentation, vandalism, and/or other general causes of poor survival or wetland degradation. If necessary, recommendations to improve success in achieving performance criteria will be made. After five years, a final report describing the success of the mitigation in meeting the performance criteria, and an evaluation of the success of any necessary corrective measures undertaken, will be prepared and submitted to these same agencies. Reports will be prepared by a qualified wetland biologist with experience in mitigation monitoring.

7.4 Schedule

Vegetation monitoring will occur in May for five years following implementation of this plan. Hydrology monitoring of mitigation wetlands will occur semi-monthly during the rainy season for five years. Annual reports will be prepared and submitted to interested agencies by November 30 of each monitoring year.

8. COMPLETION OF MITIGATION

8.1 Notification of Completion

Upon completion of five years of monitoring a final report will be sent to the Corps which details the results of the final year of monitoring. In addition, a Notice of Completion will be prepared, signed by the applicant, and submitted to the Corps to confirm successful completion of the mitigation effort.

8.2 Corps Confirmation

The Corps may require a site visit to confirm successful completion of the compensatory mitigation effort. They may wish to review the site to determine if all performance criteria have been met.

9. CONTINGENCY MEASURES

If annual or final success criteria are not met, the applicant will prepare an analysis of the cause(s)

of failure and, if determined necessary by the County, Corps, or the RWQCB, propose remedial action for approval. The applicant will be responsible for reasonably funding the contingency procedures necessary for successful completion of the mitigation effort.

10. REFERENCES

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Department of the Army. Waterways Experiment Station, Vicksburg, MS 39180-0631.

Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: California (Region 0). U.S. Fish and Wildlife Service Biological Report 88(26.10).

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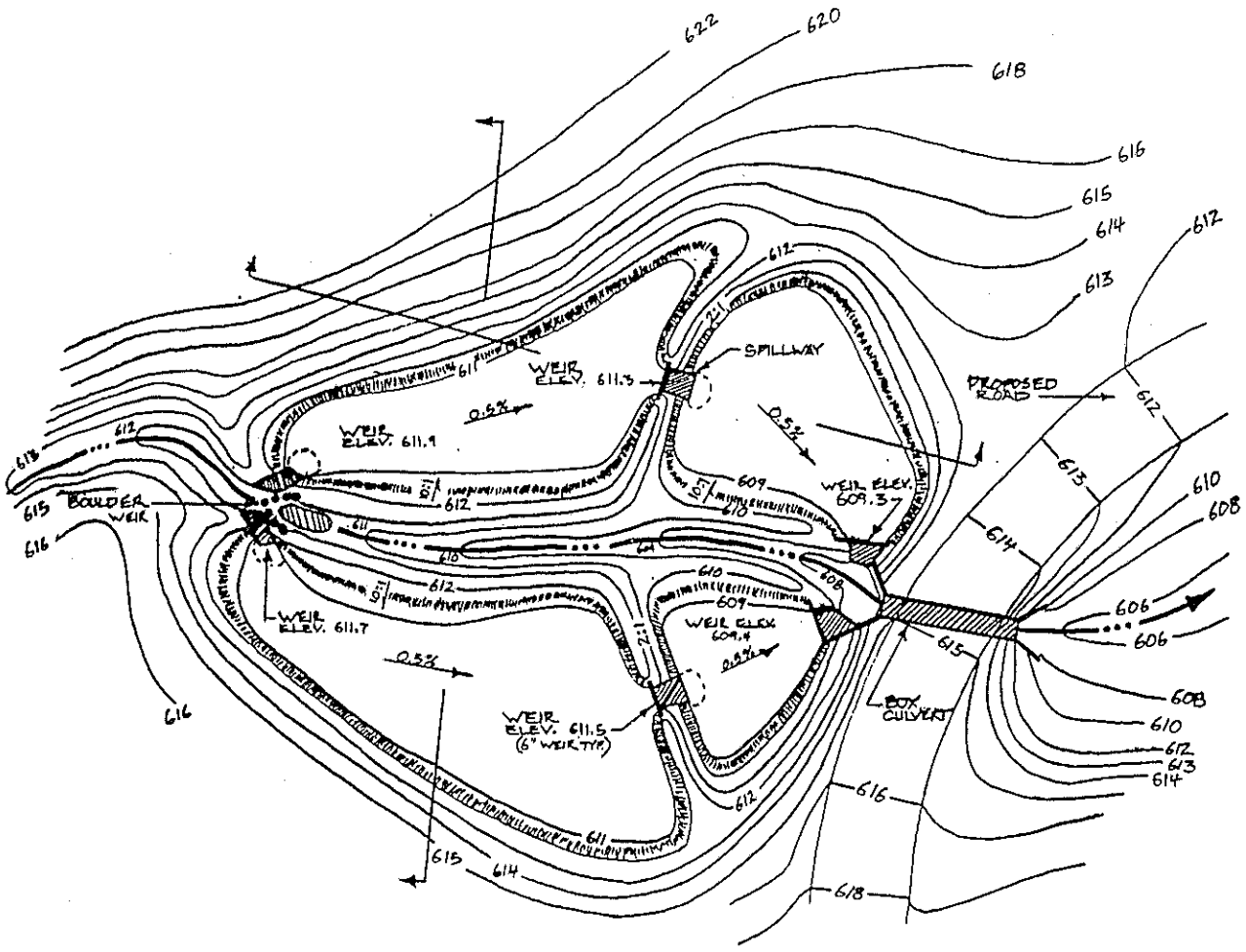
U.S. Department of Agriculture, Soil Conservation Service. 1985. Soil Survey of Marin County, California. In cooperation with the University of California Agricultural Experiment Station.



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE: Prunuske Chatham Inc.

GRADING PLAN FOR WETLAND 1

20 0 20 40 Feet

SCALE: 1 : 480

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415) 662-1800

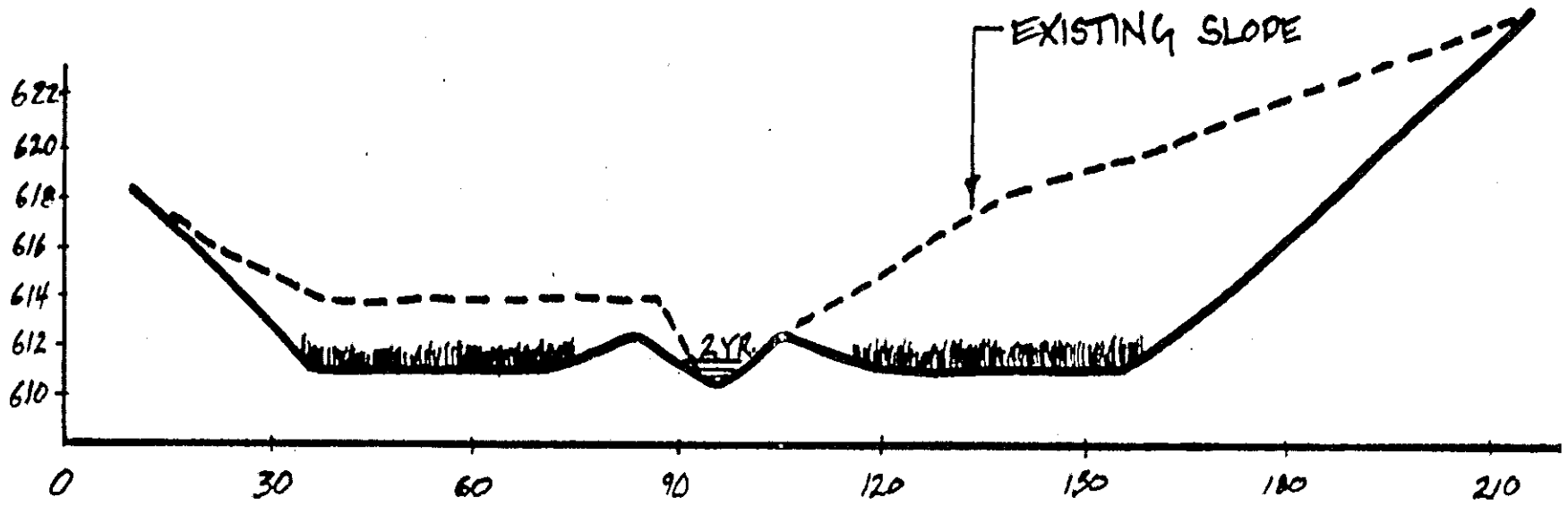
BIG ROCK RANCH

LOCATION: Lucas Valley Road

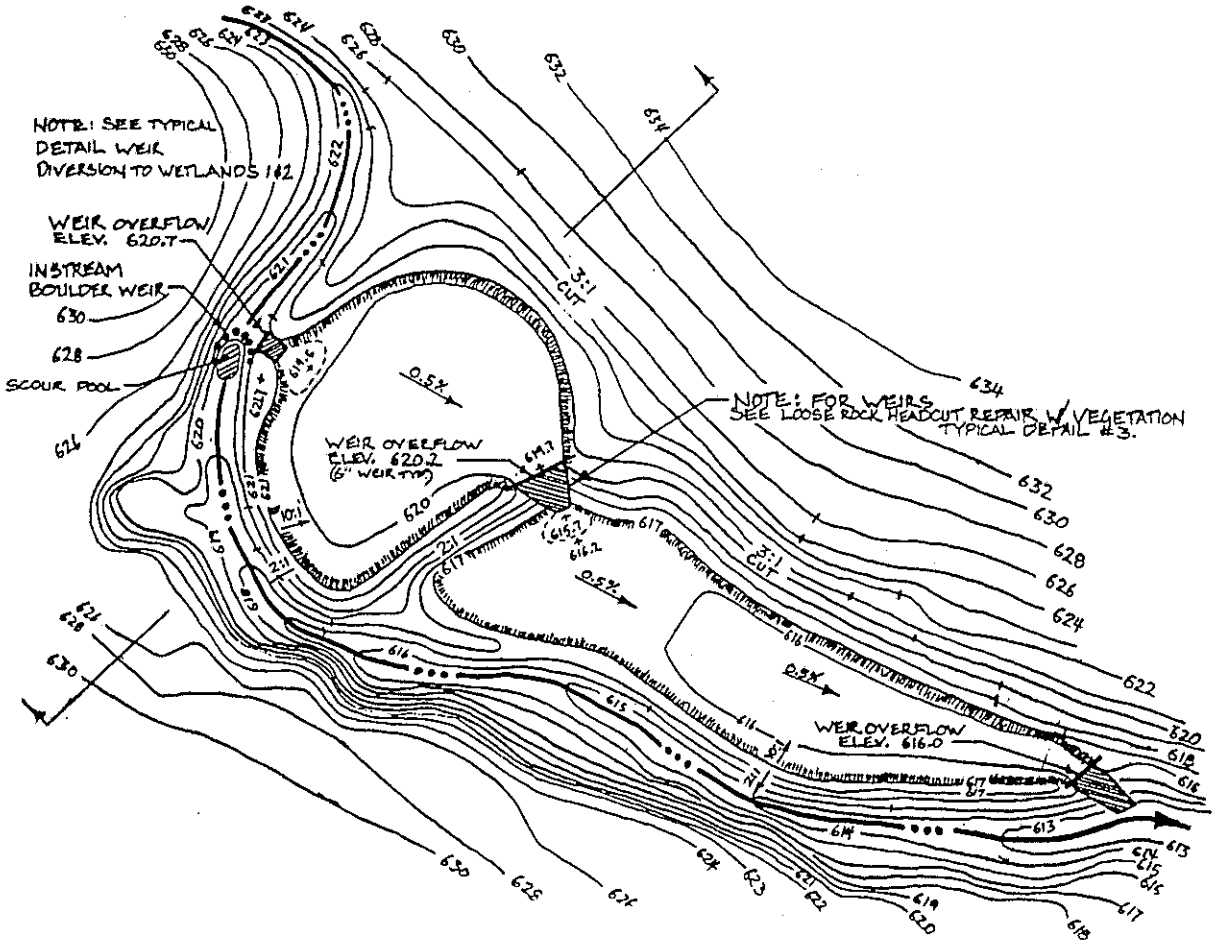
COUNTY: Marin

APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999

SHEET: 2 of 26 FIGURE: A-2



PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Prunuske Chatham Inc.	CROSS-SECTION FOR WETLAND 1 SCALE: SCALE AS INDICATED Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999 SHEET: 3 OF 26 FIGURE: A-3



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE: Prunuske Chatham Inc.

GRADING PLAN FOR WETLAND 2

20 0 20 40 Feet

SCALE: 1 : 480

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415) 662-1800

BIG ROCK RANCH

LOCATION: Lucas Valley Road

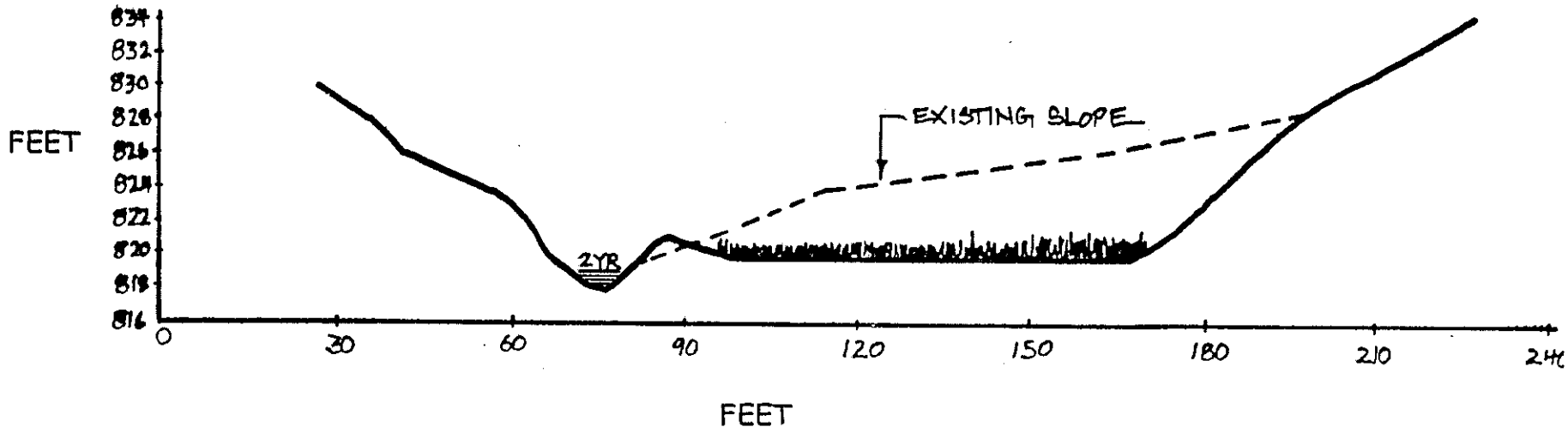
COUNTY: Marin

APPLICATION BY: Lucasfilm Ltd.

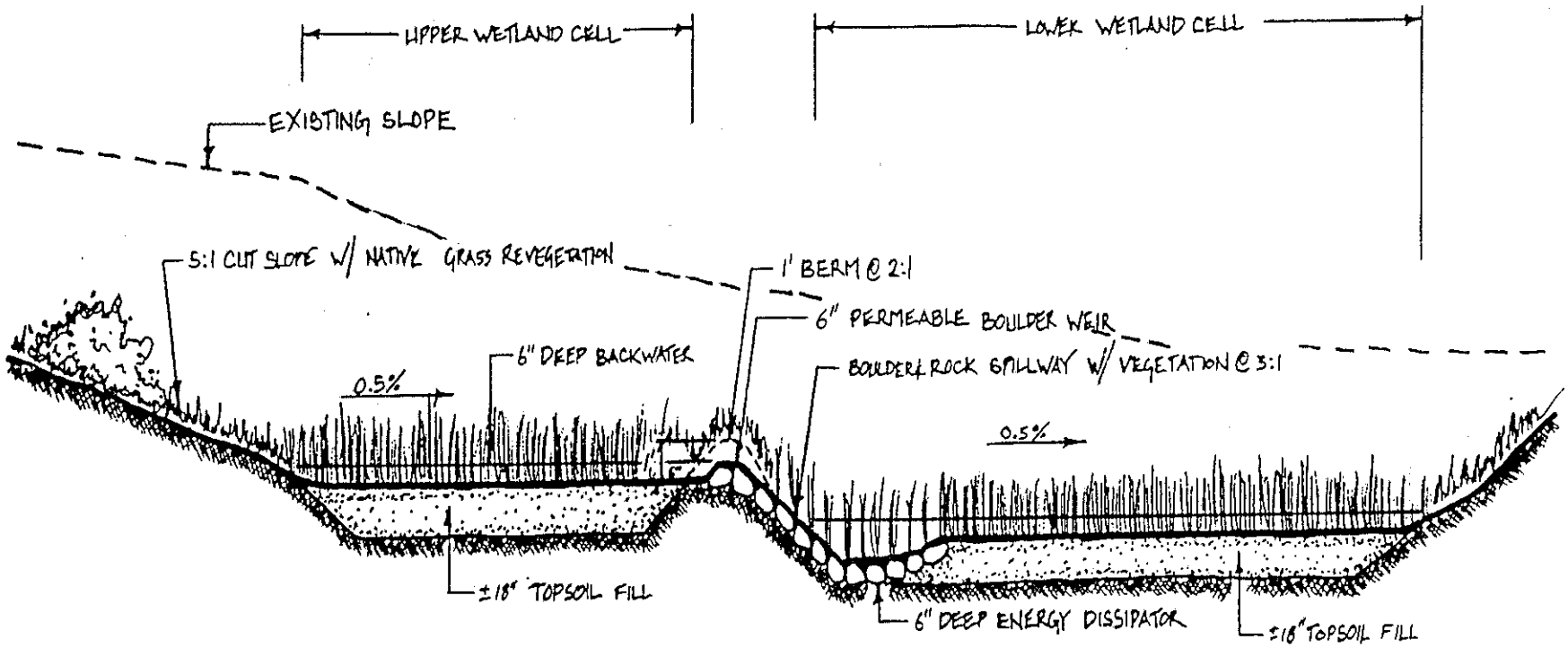
DATE: July 29, 1999

SHEET: 4 OF 26

FIGURE: A-4



PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Prunuske Chatham Inc.	CROSS-SECTION FOR WETLAND 2 SCALE: SCALE AS INDICATED Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999 SHEET: 5 OF 26 FIGURE: A-5



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE: Prunuske Chatham Inc.

STEPPED TERRACE DESIGN FOR
WETLANDS 1 AND 2

SCALE: NOT TO SCALE

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415) 662-1800

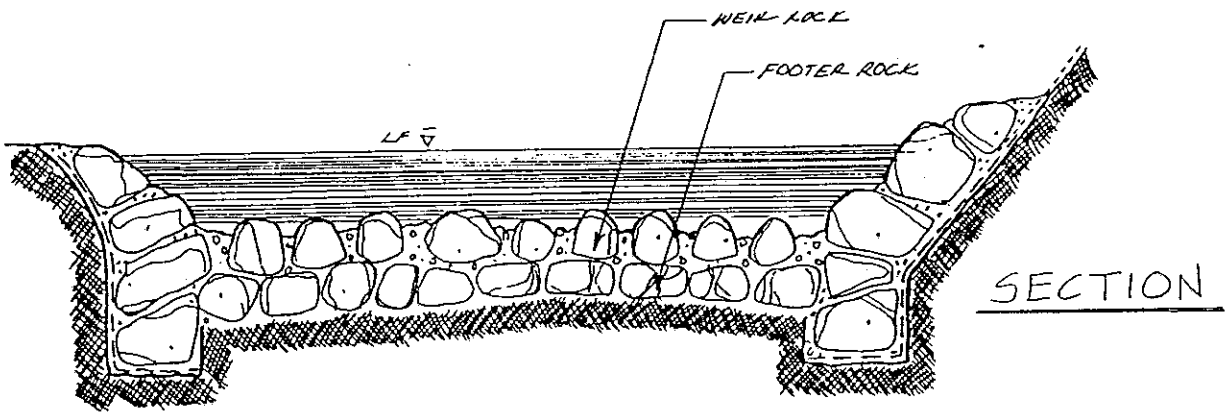
BIG ROCK RANCH

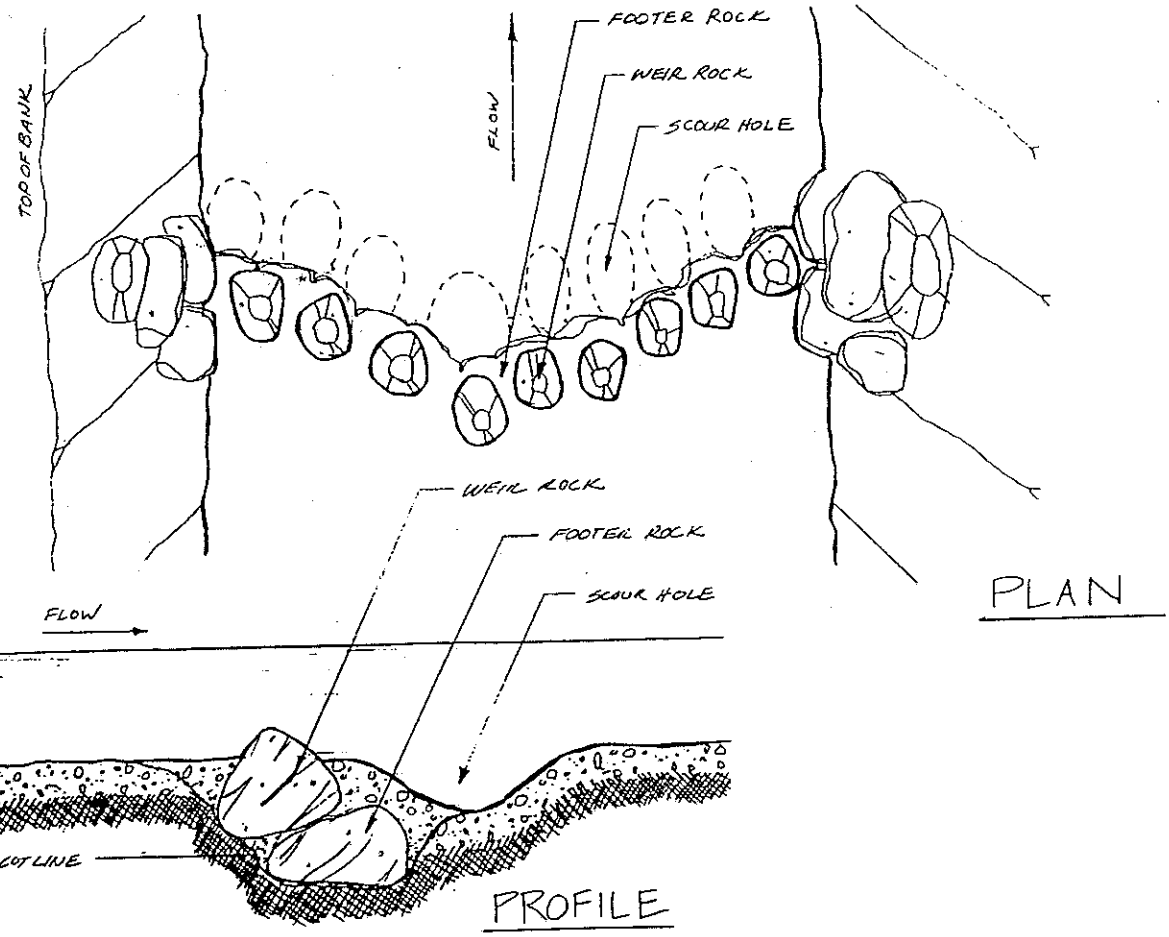
LOCATION: Lucas Valley Road

COUNTY: Marin

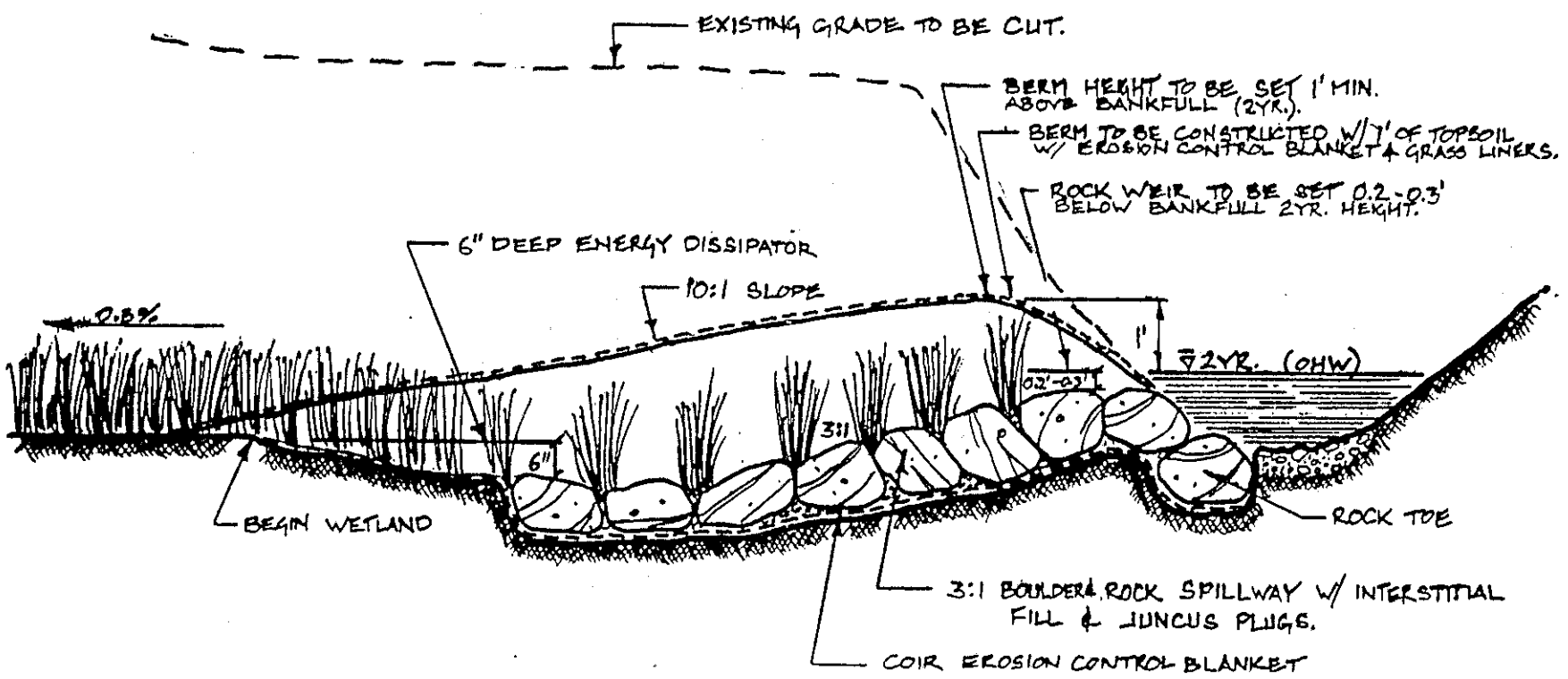
APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999

SHEET: 6 OF 26 FIGURE: A-6

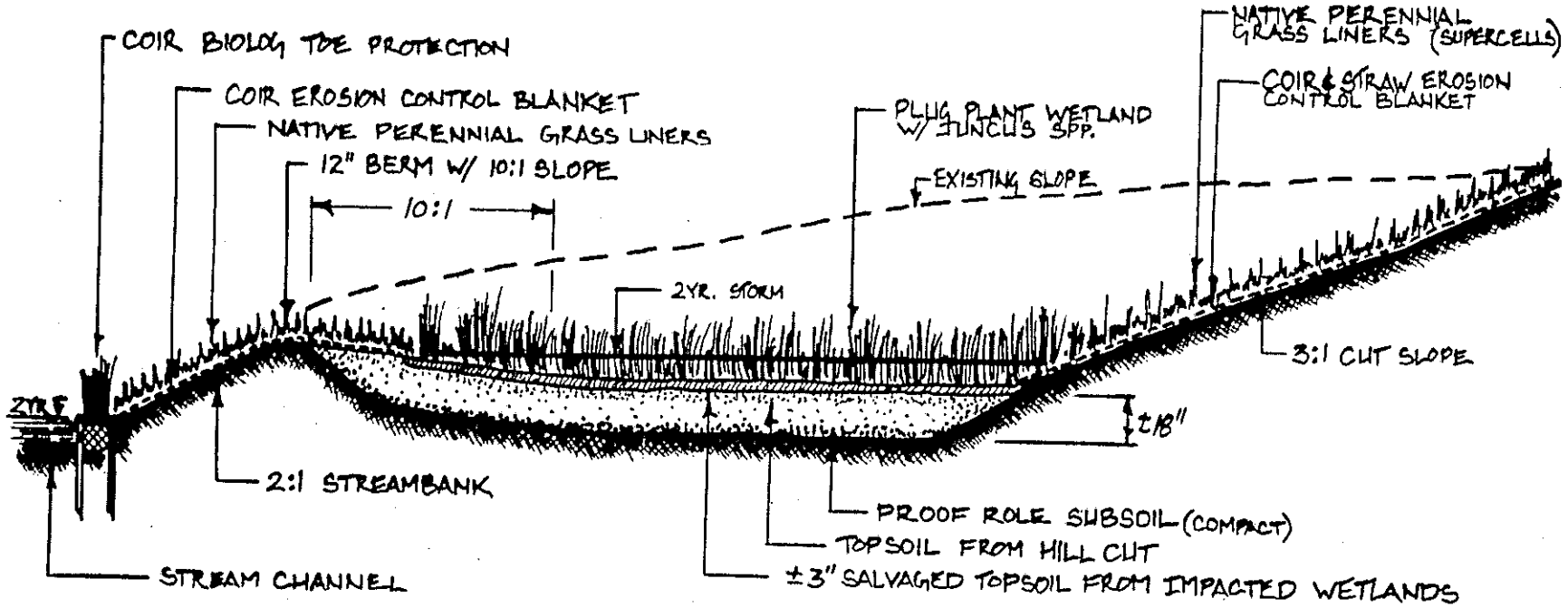




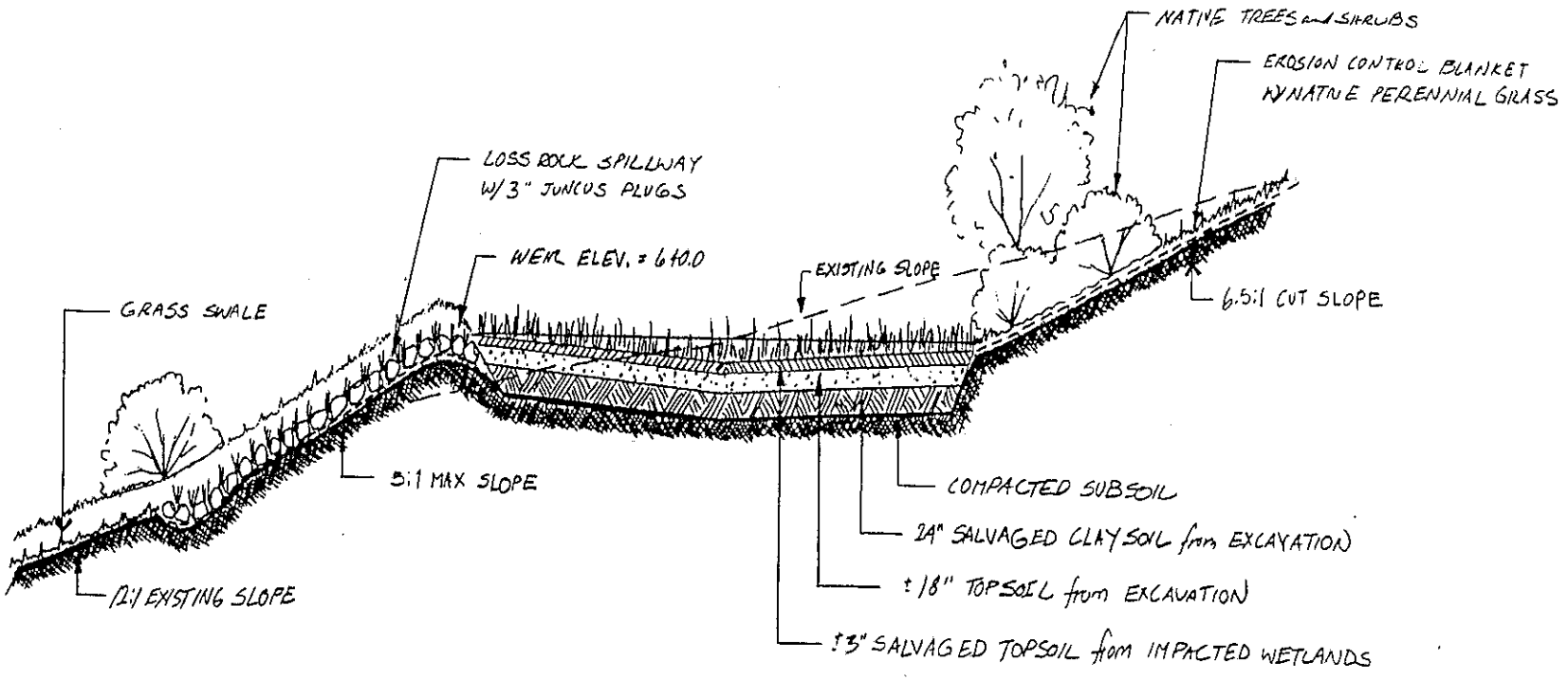
PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Clearwater Hydrology	IN-STREAM BOULDER WEIR DESIGN FOR WETLANDS 1 AND 2 SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin DATE: July 29, 1999 APPLICATION BY: Lucasfilm Ltd. SHEET: 7 OF 26 FIGURE: A-7



PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Clearwater Hydrology, Prunuske Chatham Inc.	SIDE CHANNEL WEIR DESIGN FOR WETLANDS 1 AND 2 SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999 SHEET: 8 OF 26 FIGURE: A-8



PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Clearwater Hydrology, Prunuske Chatham Inc.	SCHEMATIC DESIGN FOR WETLANDS 1 AND 2 SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999 SHEET: 9 OF 26 FIGURE: A-9



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE: Wetlands Research Associates, Inc.

GRADING PLAN FOR WETLAND 3

30 0 30 60 Feet

SCALE: 1 : 720

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415) 662-1800

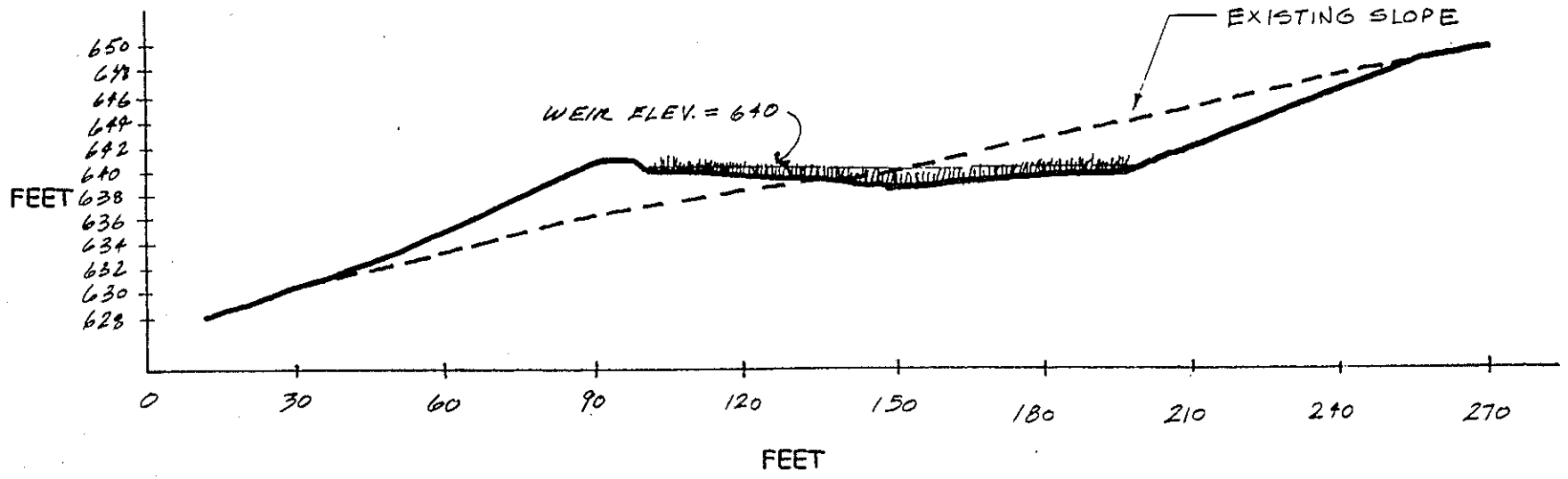
BIG ROCK RANCH

LOCATION: Lucas Valley Road

COUNTY: Marin

APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999

SHEET: 10 OF 26 FIGURE: A-10



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE: Wetlands Research Associates, Inc.

CROSS-SECTION FOR WETLAND 3

SCALE: SCALE AS INDICATED

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415) 662-1800

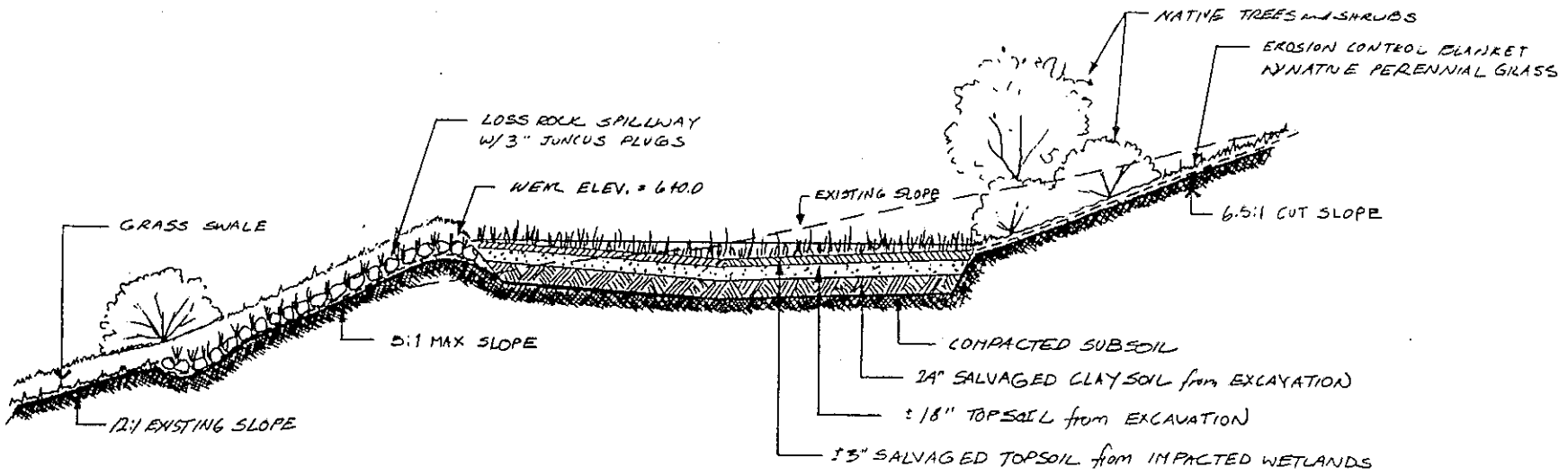
BIG ROCK RANCH

LOCATION: Lucas Valley Road

COUNTY: Marin

APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999

SHEET: 11 OF 26 FIGURE: A-11



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE: Clearwater Hydrology, Prunuske Chatham Inc.

SCHEMATIC DESIGN FOR WETLAND 3

SCALE: NOT TO SCALE

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415) 662-1800

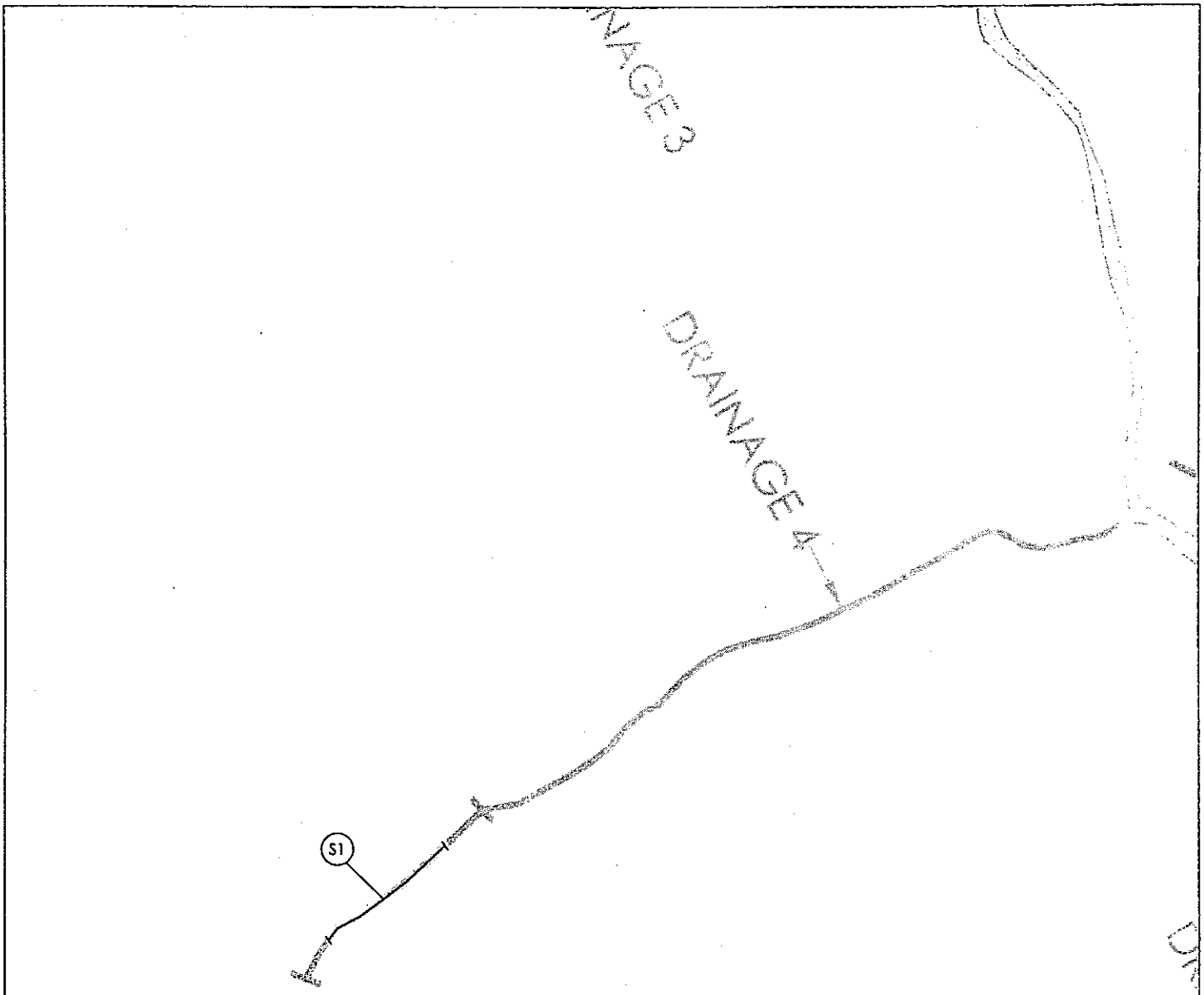
BIG ROCK RANCH

LOCATION: Lucas Valley Road

COUNTY: Marin

APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999

SHEET: 12 OF 26 FIGURE: A-12



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE:Bookman-Edmonston Engineering INC.

STREAM RESTORATION SITE
FOR DRAINAGE 4

0 100 FEET

SCALE 1:1200

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415)662-1800

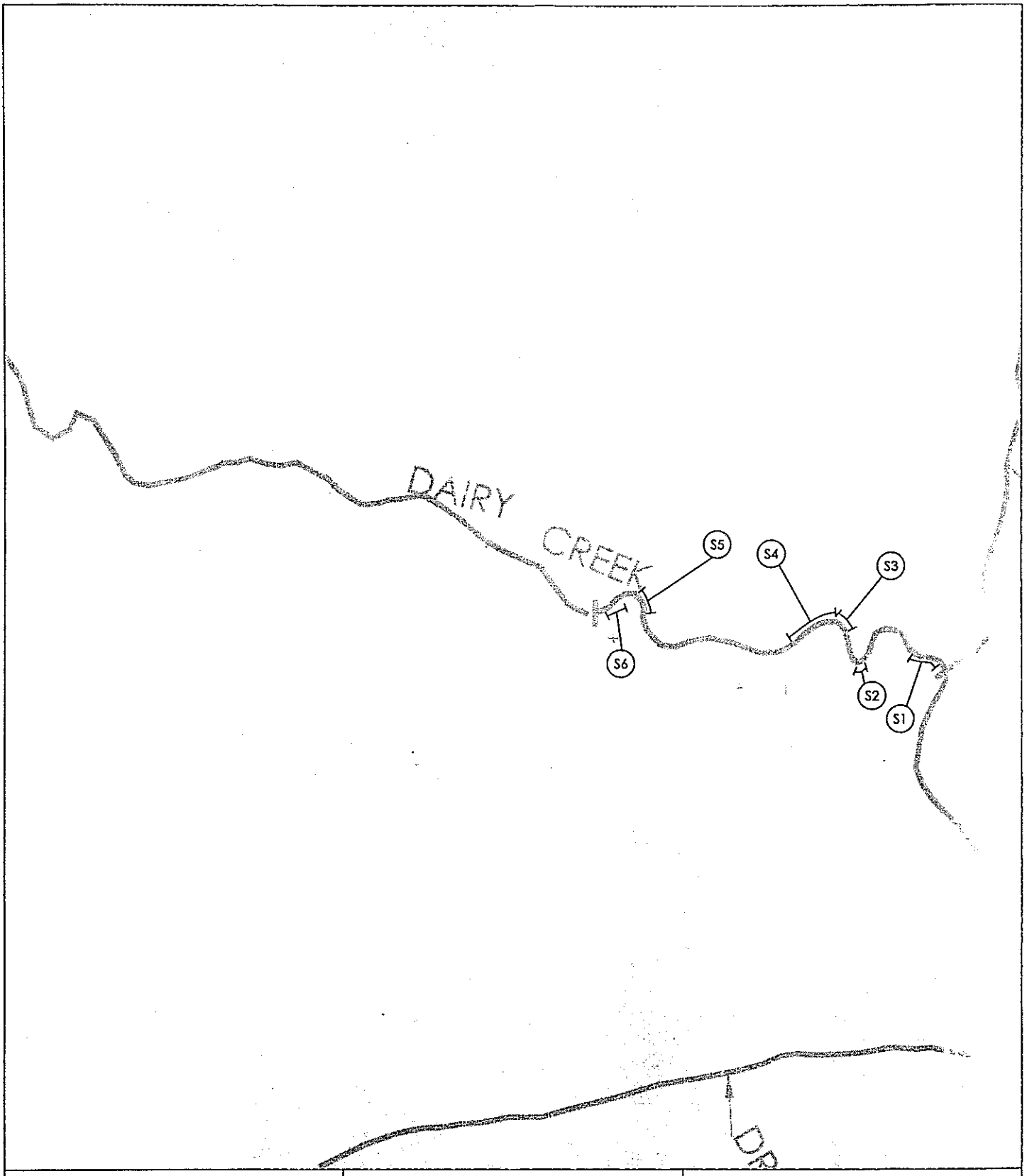
BIG ROCK RANCH

LOCATION: Lucas Valley Road

COUNTY: Marin DATE: July 29, 1999

APPLICATION BY: Lucasfilm Ltd.

SHEET 13 of 26 FIGURE: A-13



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE:Bookman-Edmonston Engineering INC.

STREAM RESTORATION SITES FOR DAIRY CREEK

0 100 FEET

SCALE 1:1200

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415)662-1800

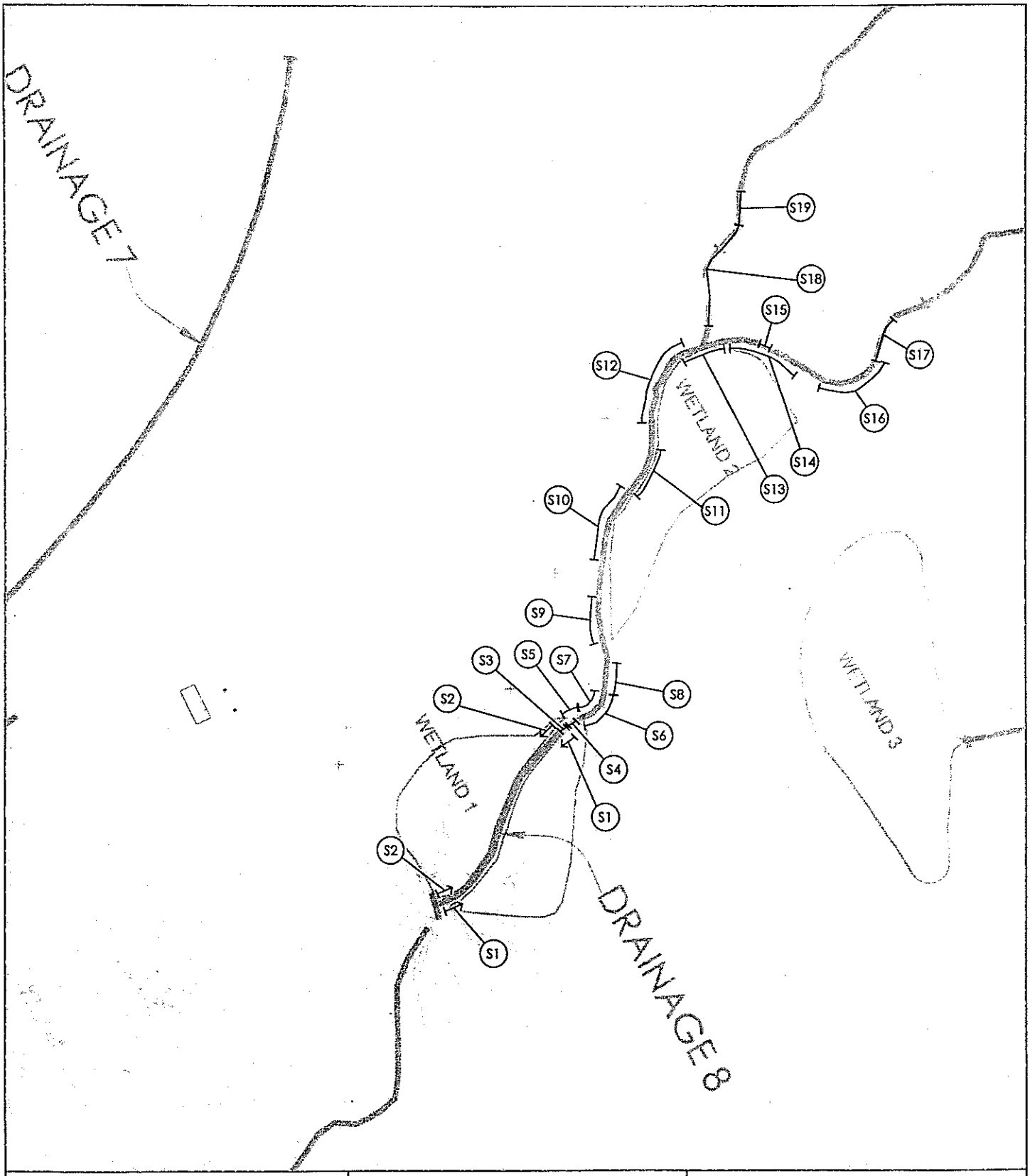
BIG ROCK RANCH

LOCATION: Lucas Valley Road

COUNTY: Marin DATE: July 29, 1999

APPLICATION BY: Lucasfilm Ltd.

SHEET 14 of 26 FIGURE: A-14



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE:Bookman-Edmonston Engineering INC.

STREAM RESTORATION SITES FOR DRAINAGE 8

0 100 FEET

SCALE 1:1200

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415)662-1800

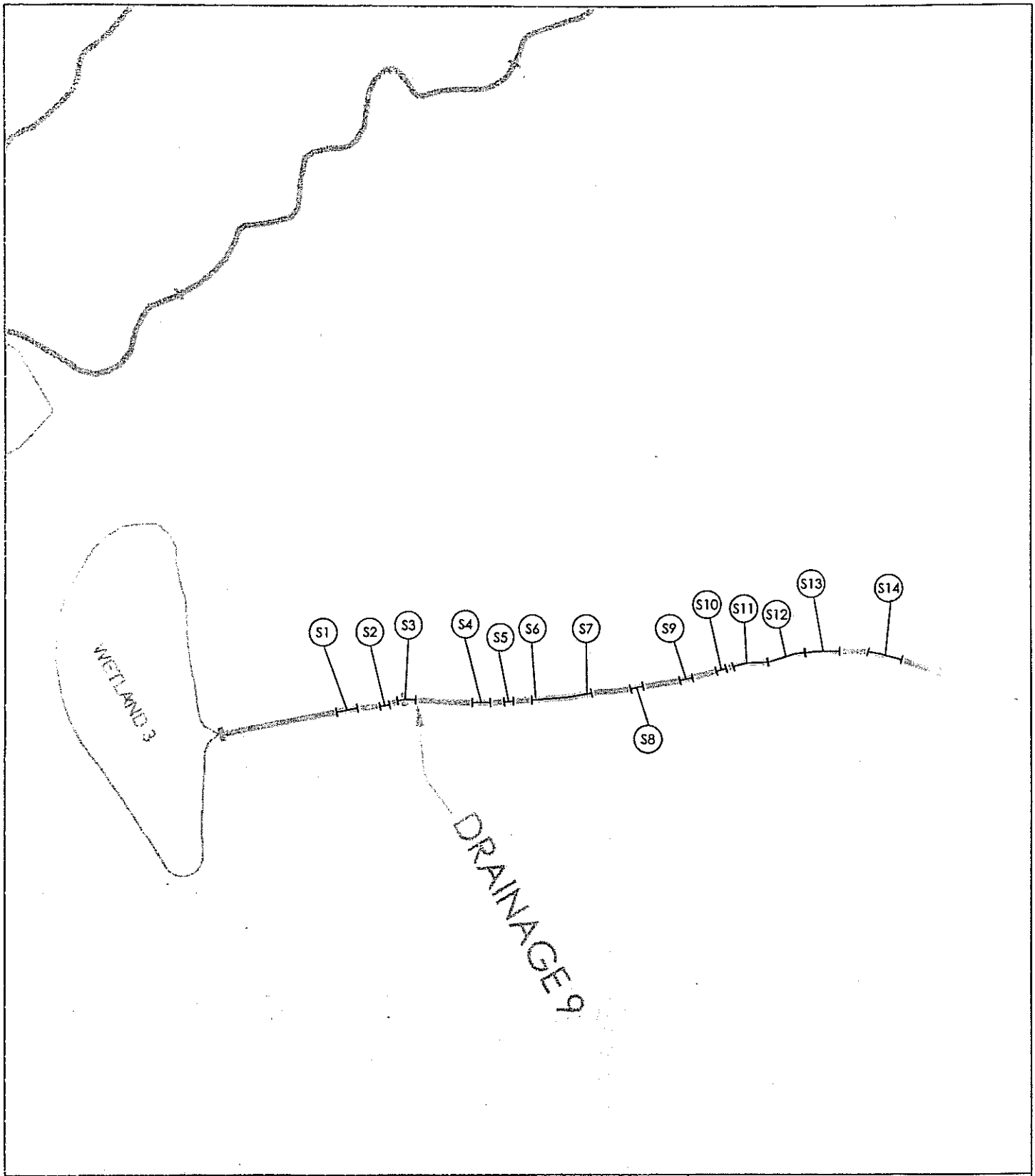
BIG ROCK RANCH

LOCATION: Lucas Valley Road

COUNTY: Marin DATE: July 29, 1999

APPLICATION BY: Lucasfilm Ltd.

SHEET 15 of 26 FIGURE: A-15



PURPOSE: Mitigation

DATUM: NGVD

MAP SOURCE:Bookman-Edmonston Engineering INC.

STREAM RESTORATION SITES FOR DRAINAGE 9

0 100 FEET

SCALE 1:1200

Lucasfilm Ltd.
PO BOX 2009
San Rafael, CA 94912
(415)662-1800

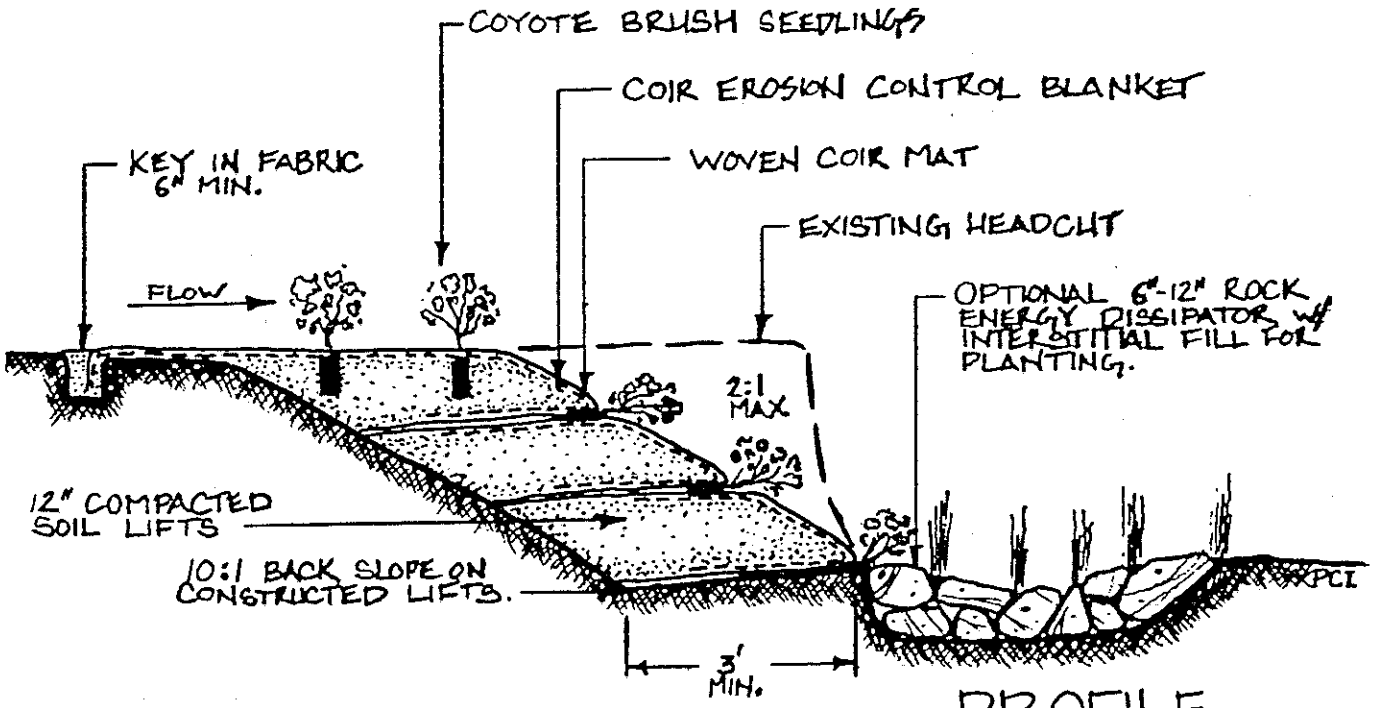
BIG ROCK RANCH

LOCATION: Lucas Valley Road

COUNTY: Marin DATE: July 29, 1999

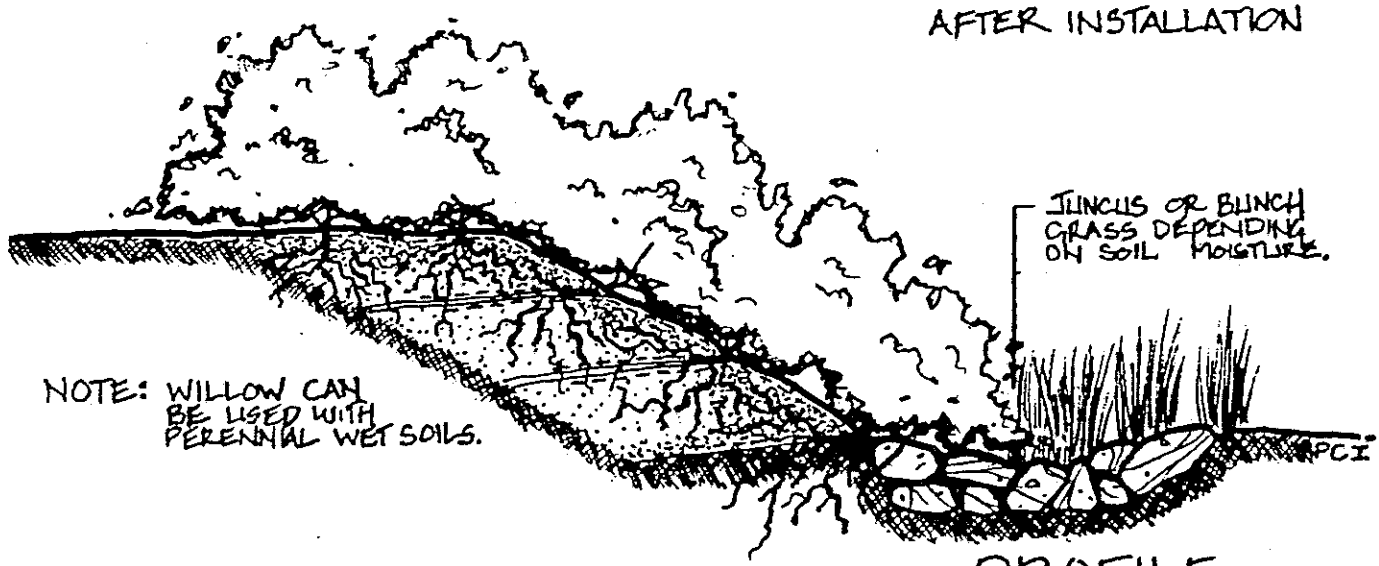
APPLICATION BY: Lucasfilm Ltd.

SHEET 16 of 26 FIGURE: A-16



PROFILE

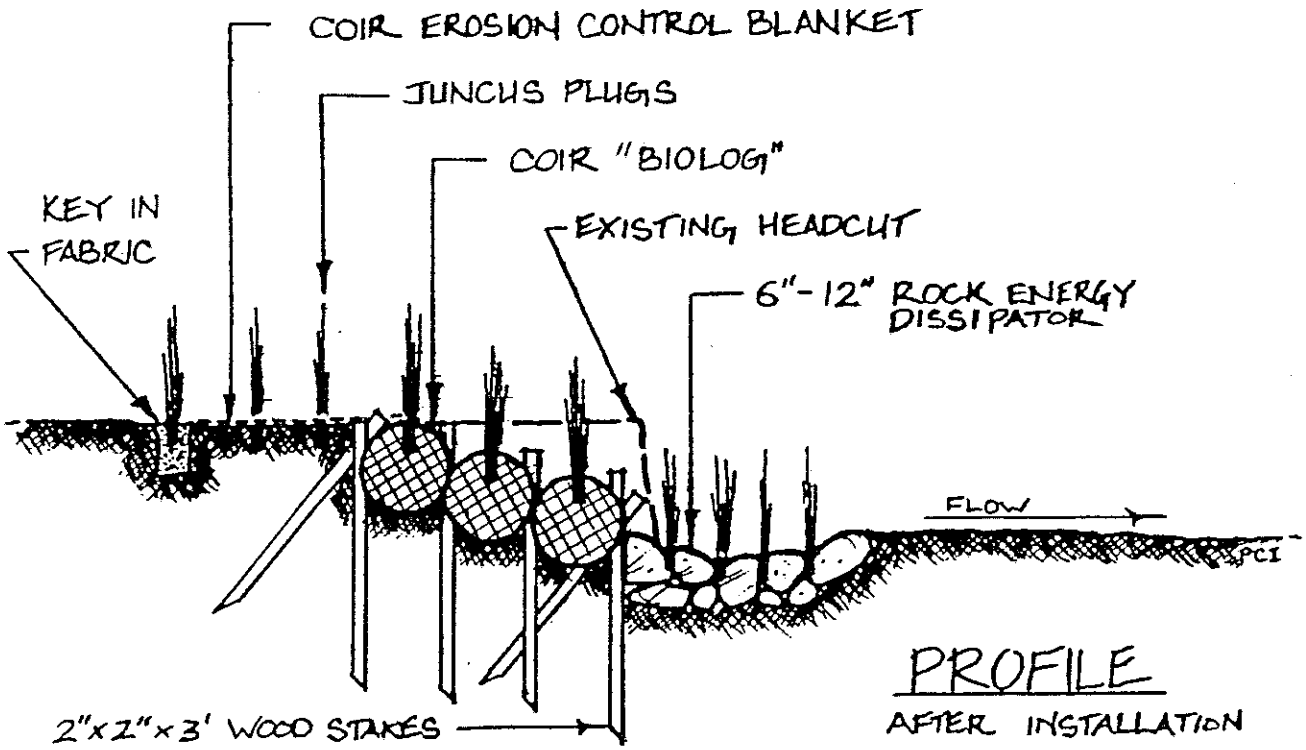
AFTER INSTALLATION



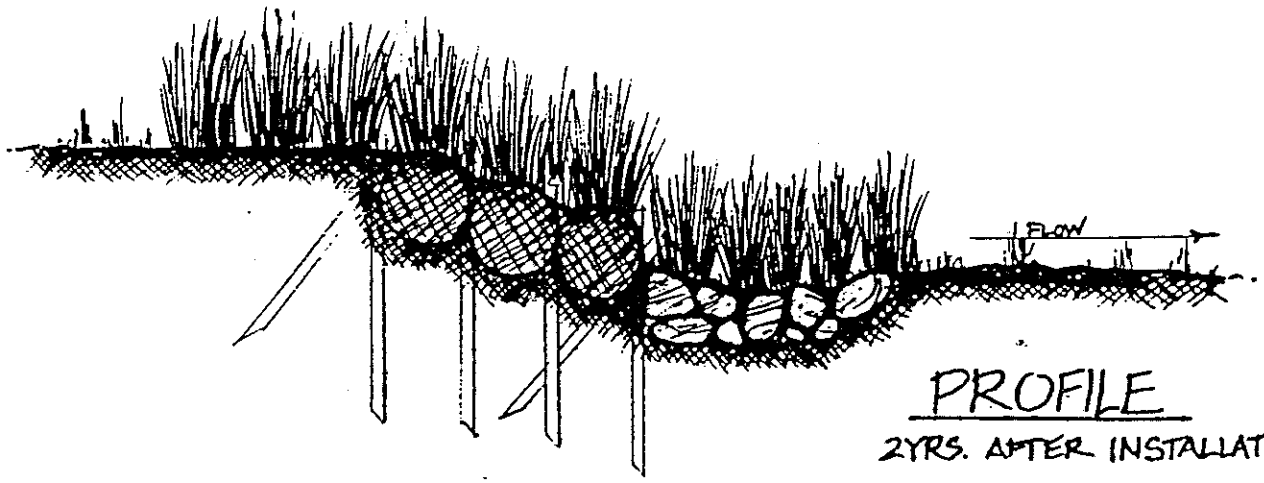
PROFILE

2YRS. AFTER INSTALLATION

PURPOSE: Mitigation	VEGETATED EARTH REINFORCED FILL HEAD-CUT REPAIR	BIG ROCK RANCH
DATUM: NGVD	SCALE: NOT TO SCALE	LOCATION: Lucas Valley Road
MAP SOURCE: Prunuske Chatham Inc.	Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	COUNTY: Marin DATE: July 29, 1999 APPLICATION BY: Lucasfilm Ltd. SHEET: 17 OF 26 FIGURE: A-17



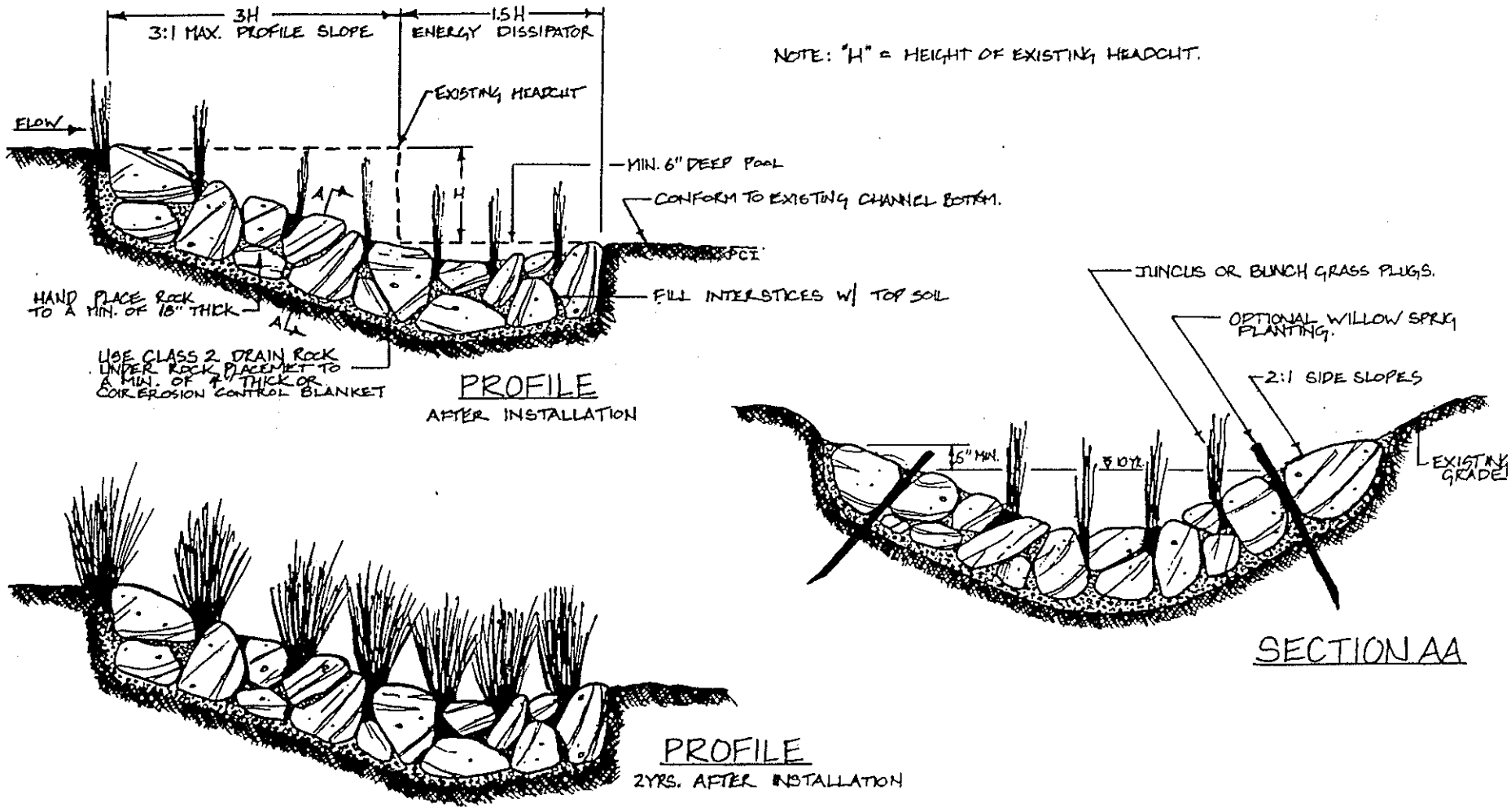
PROFILE
AFTER INSTALLATION



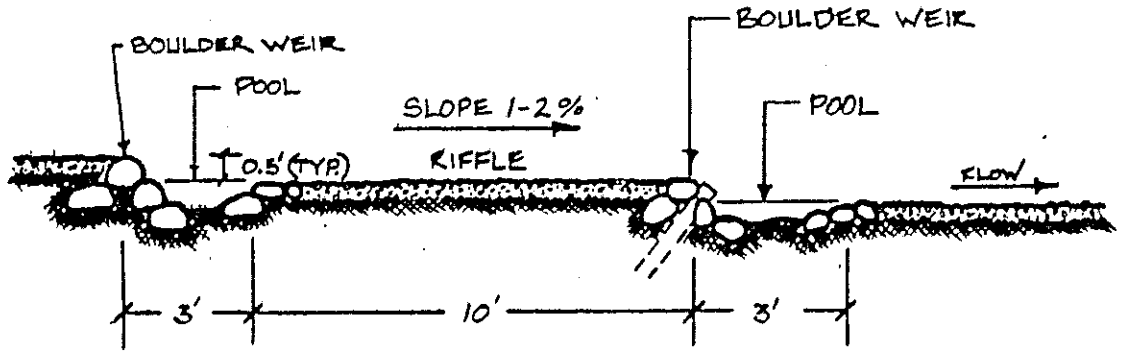
PROFILE
2YRS. AFTER INSTALLATION

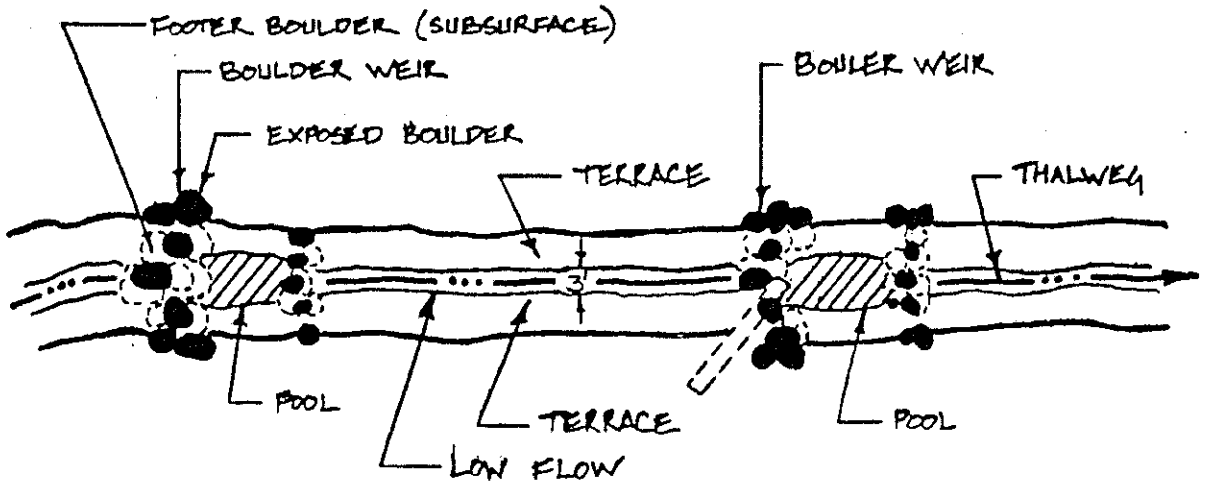
NOTE: TO BE USED IN SMALL DRAINAGES ONLY.

PURPOSE: Mitigation	VEGETATED BIO-LOG HEADCUT REPAIR	BIG ROCK RANCH
	SCALE: NOT TO SCALE	LOCATION: Lucas Valley Road
DATUM: NGVD		COUNTY: Marin DATE: July 29, 1999
	Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	APPLICATION BY: Lucasfilm Ltd.
MAP SOURCE: Prunuske Chatham Inc.		SHEET: 18 OF 26 FIGURE: A-18

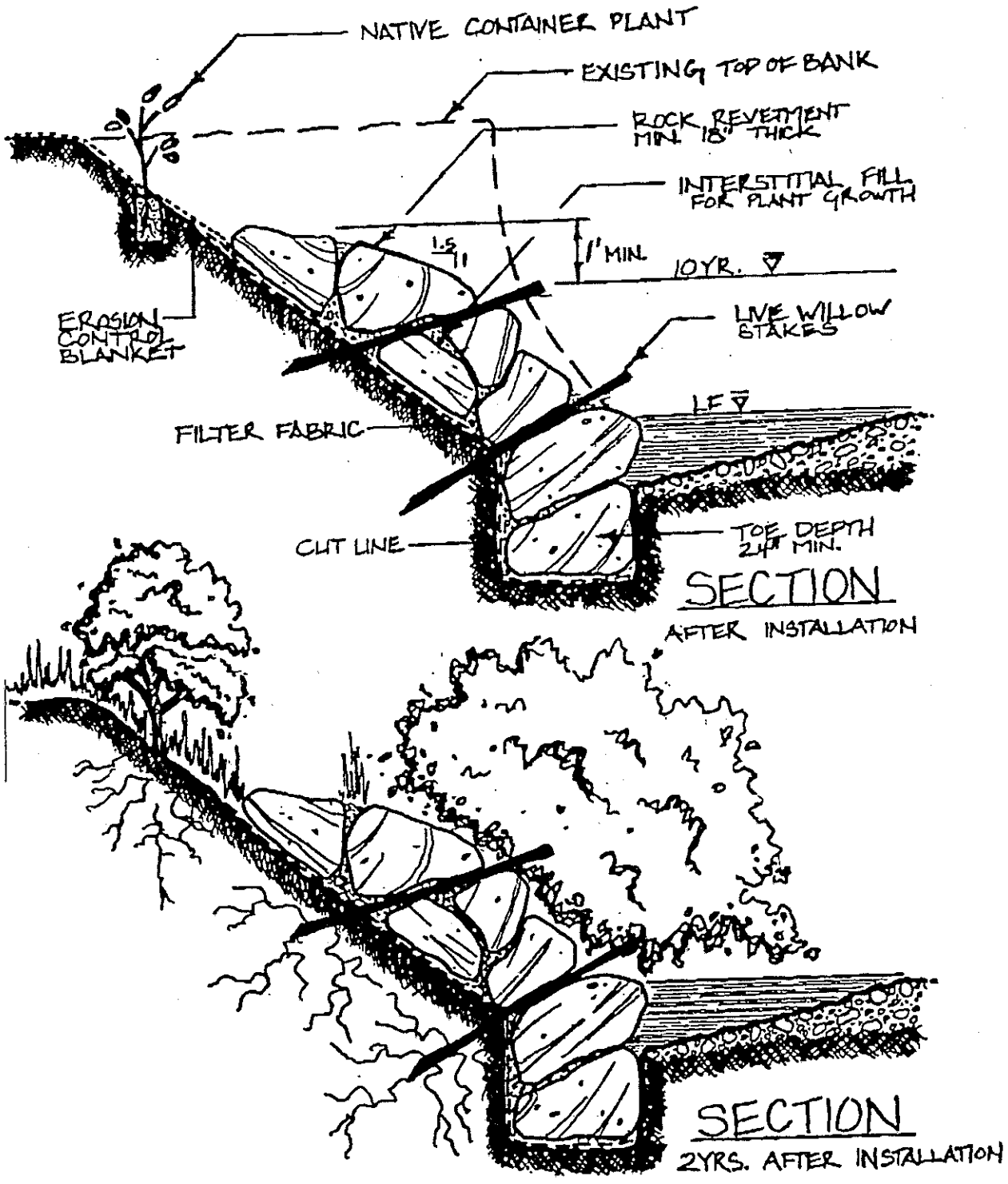


PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Prunuske Chatham Inc.	LOOSE ROCK HEAD-CUT REPAIR WITH VEGETATION SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999 SHEET: 19 OF 26 FIGURE: A-19

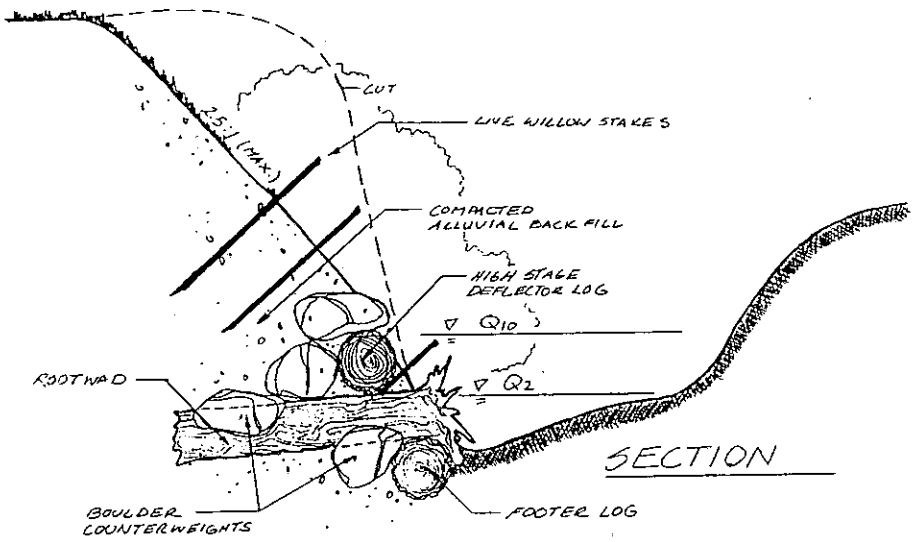


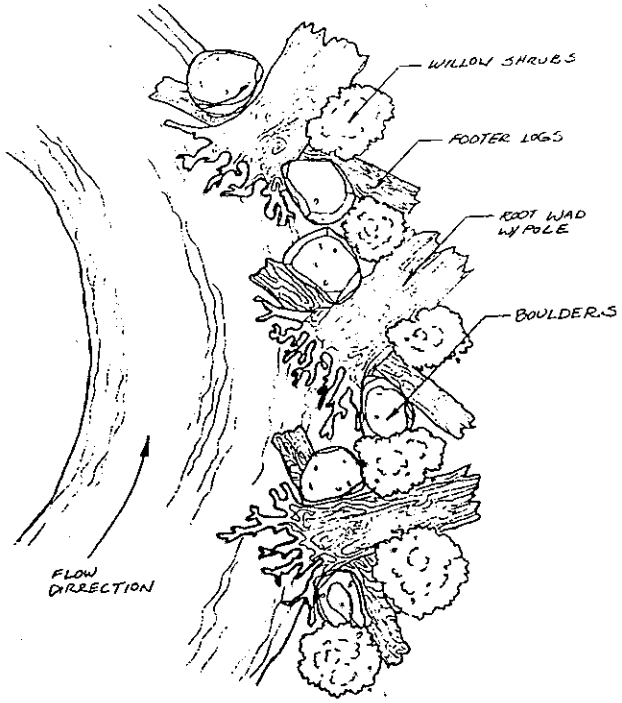


PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Clearwater Hydrology	BOULDER STEP HEAD-CUT REPAIR SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999 SHEET: 20 OF 26 FIGURE: A-20

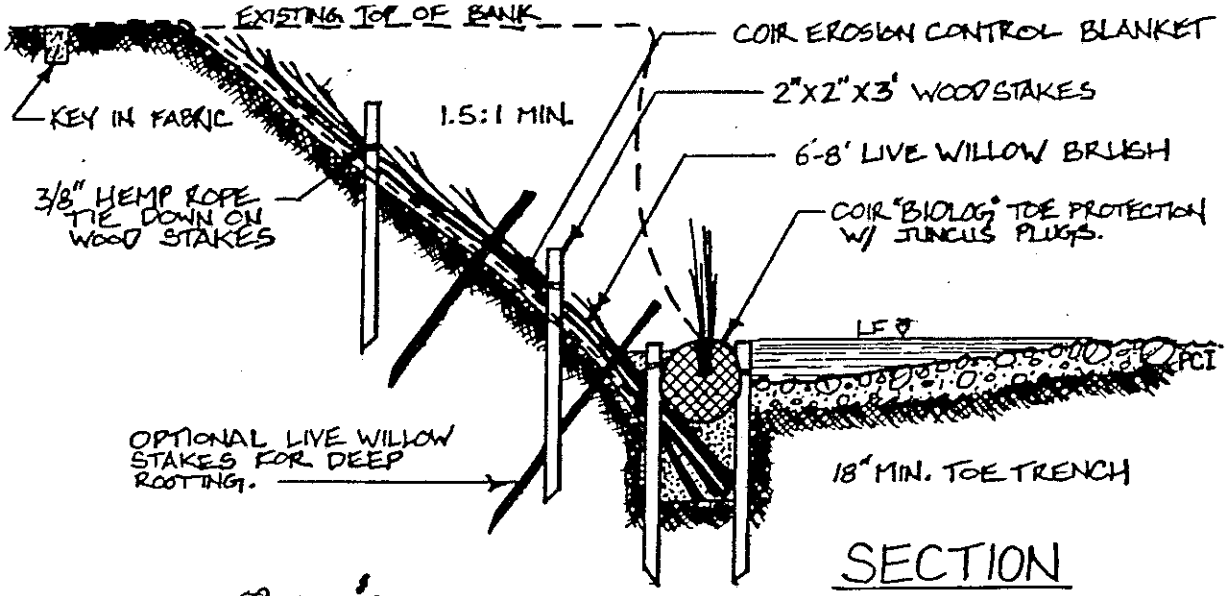


PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Prunuske Chatham Inc.	ROCK REVETMENT WITH LIVE WILLOW STAKES SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin DATE: July 29, 1999 APPLICATION BY: Lucasfilm Inc. SHEET: 21 OF 26 FIGURE: A-21

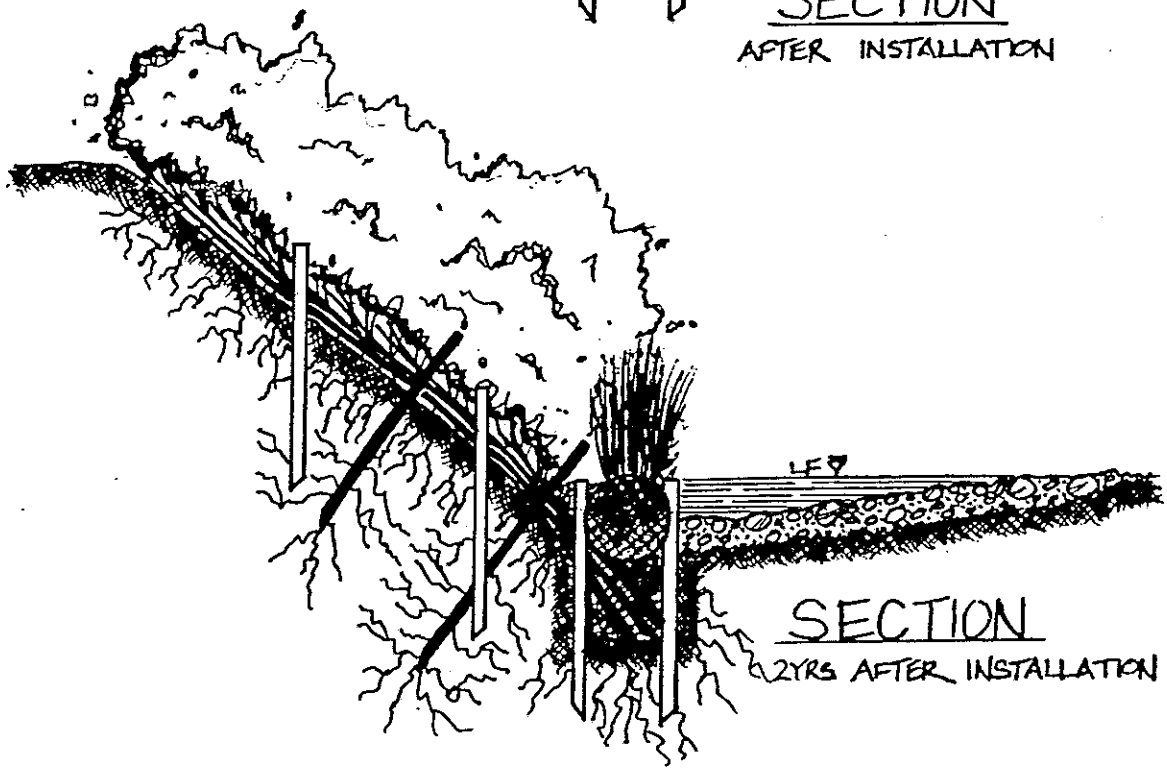




PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Clearwater Hydrology	NATIVE MATERIAL REVETMENT SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin DATE: July 29, 1999 APPLICATION BY: Lucasfilm Ltd. SHEET: 22 OF 26 FIGURE: A-22



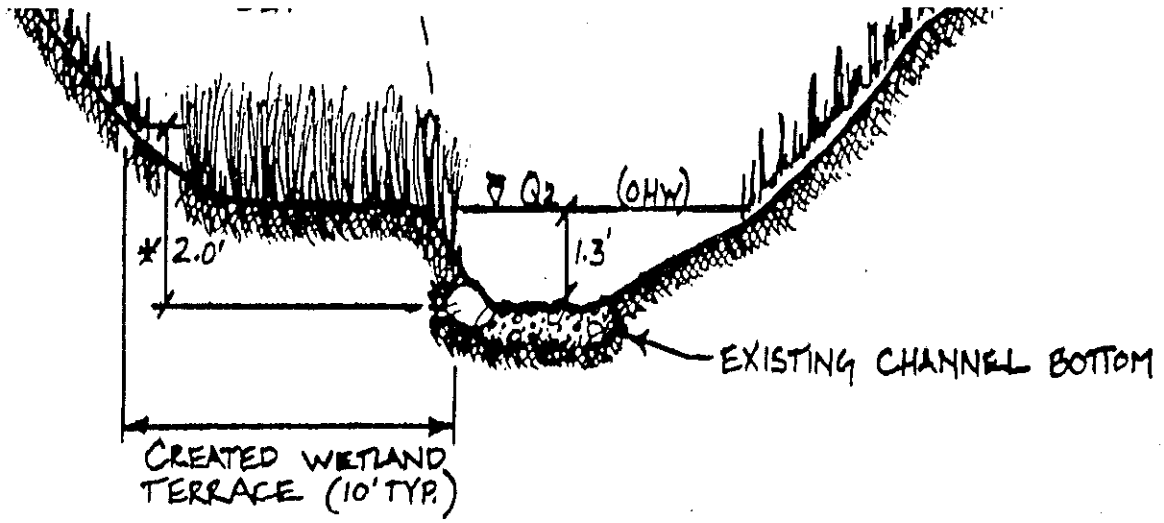
SECTION
AFTER INSTALLATION



SECTION
2YRS AFTER INSTALLATION

PURPOSE: Mitigation	BRUSH MATTRESS BANK STABILIZATION	BIG ROCK RANCH
	SCALE: NOT TO SCALE	LOCATION: Lucas Valley Road
DATUM: NGVD		COUNTY: Marin DATE: July 29, 1999
	Lucasfilm Ltd.	APPLICATION BY: Lucasfilm Ltd.
MAP SOURCE: Prunuske Chatham Inc.	PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	SHEET: 23 OF 26 FIGURE: A-23

PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Prunuske Chatham Inc.	TYPICAL PROFILE AND SECTIONS FOR NABOO CREEK SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. DATE: July 29,1999 SHEET: 26 OF 26 FIGURE: A-26



PURPOSE: Mitigation DATUM: NGVD MAP SOURCE: Clearwater Hydrology	BANK GRADING WITH WETLAND TERRACE CREATION SCALE: NOT TO SCALE Lucasfilm Ltd. PO BOX 2009 San Rafael, CA 94912 (415) 662-1800	BIG ROCK RANCH LOCATION: Lucas Valley Road COUNTY: Marin APPLICATION BY: Lucasfilm Ltd. DATE: July 29, 1999 SHEET: 24 OF 26 FIGURE: A-24

Table B-3. Stream Restoration for Drainage 8

Symbol	Length	Description	Priority	Figure
S1	161	W. bank - grade down to OHW and transition to adjacent wetland pond	H	A-9
S2	172	E. bank - grade down to OHW and transition to adjacent wetland pond	H	A-9
S3	0	Construct in stream boulder weir + west side channel weir diversion to upper wetland pond	H	A-7,A-8
S4	0	Construct in stream boulder weir + east side channel weir diversion to upper wetland pond	H	A-7,A-8
S5	8	Construct native material revetment; grade w. bank	H	A-22
S6	31	Construct native material revetment; grade e. bank	H	A-22
S7	34	Grade down point bar on w. bank - inside of bend	L	A-24
S8	10	Grade down e. bank in approach to bend	H	A-24
S9	27	Grade down w. bank to create low wetland terrace	M	A-24
S10	55	Grade down w. bank + construct low native material revetment	H	A-22
S11	38	Grade down east bank + construct low native material revetment	H	A-22
S12	72	Grade down west bank and construct native material revetment	H	A-22
S13	31	Construct low native material revetment at confluence outlet-east bank	H	A-22
S14	55	Grade down over steepened east bank	H	A-24
S15	0	Construct in-stream weir + side-channel weir diversion to upper wetland pond	H	A-7,A-8
S16	63	Construct native material revetment on e. bank, along outside of bend radius	H	A-22
S17	39	Construct in-stream boulder weirs @ 10-ft. Spacing to stabilize channel grade in steep reach	H	A-20
S18	47	Construct boulder step head-cut repair to stabilize grade thru/below culvert crossing	H	A-20
S19	112	Construct 2 boulder steps at 1-ft. Rise each for grade stability	H	A-20
S20	30	Construct boulder step head-cut repair to stabilize channel grade	H	A-20

Table B-4. Stream Restoration for Drainage 9

Symbol	Length	Description	Priority	Figure
S2	7	Headcut in south fork below junction with north fork. Vegetated biolog headcut repair with rock toe.	M	A-18
S3	13.5	Headcut. Repair with vegetated reinforced earth fill and rock toe.	H	A-17
S4	13.5	Headcut. Repair with loose rock headcut repair. Requires 2-foot toe.	H	A-19
S5	7	Headcut. Repair with vegetated biologs and rock toe.	H	A-18
S6&S7	44	Multiple headcuts. Install rock headcut repair at top, line channel section with rock. Install rushes in rock interstices.	H	A-19
S8	4.5	Headcut. Repair with vegetated biolog and rock toe. May need to excavate sediment from mid channel below to establish channel shape. Install blanket and vegetation in excavated area.	H	A-18
S9	9	Headcut. Repair with vegetated biolog headcut repair including rock toe.	H	A-18
S10	7	Headcut. Install biolog headcut repair.	M	A-18
S11	25	Headcut with existing hand-placed rock and 3 old iron pipes. Probably side hill bore. Stair steps upslope. Repair with loose rock headcut repair.Use very porous fabric to allow for seeps. Install rushes in rock interstices.	H	A-19
S12	27	Headcut. Repair with vegetated reinforced earth fill headcut repair. Requires 2-foot rock toe. Install rushes in rock interstices.	H	A-17
S13	25	Headcut. Repair with vegetated reinforced earth fill headcut repair. Requires two-foot rock toe. Install rushes in rock interstices.	H	A-17
S14	30	Series of 1' to 2' deep up to 3' wide headcuts. Repair with biolog headcut repairs.	M	A-18

Table B-5. Plant material for mitigation seasonal wetlands at Big Rock Ranch

Scientific Name	Common Name	Size and Spacing	Comments
Juncus balticus	Baltic rush	bare root, 6" o.c.	available on site for field collection
Juncus phaeocephalus	brown-head rush	bare root, 1' o.c.	available on site for field collection
Juncus xiphioides	iris-leaved rush	bare root, 1' o.c.	available on site for field collection
Lasthenia glabrata	gold fields	seed; 5 lbs./acre	obtain from a commercial source
Mimulus guttatus	monkeyflower	seed; 2 lbs./acre	obtain from a commercial source

Table B-6. Size and spacing requirements for arroyo willow used in a variety of bio-technical stream enhancement measures at Big Rock Ranch

Size and Spacing	Bio-technical Stream Enhancement Measure
4'-5', ½-1 ½" dia., live willow stakes, 5' o.c.	rock revetment w/live willow stakes
3' live willow stakes, 3' o.c.	live fascine & blanket stream bank repair
8"-10" dia. live fascine, from 1/8"-½" dia. brush	live fascine & blanket stream bank repair
densely packed willow brush from pole trimmings	willow wall revetment
8' live willow pole, 3"-4" dia., 3' o.c.	willow wall revetment
10'-15' long, ½"-1 ½" dia., woven willow branches	willow wall revetment
3'-4' live willow stakes, 3' o.c.	willow wall revetment
6'-10' live willow brush	brush mattress
3'-4' live willow stakes, 5' o.c.	brush mattress
4'-5' live willow stakes, 5' o.c., sides only	loose rock head-cut repair w/vegetation
8"-10" dia. live fascine, from 1/8"-½" dia. brush	brush check dam
2"-4" x 5'-6' live willow post	brush check dam
6'-10' densely packed brush	brush check dam
3'-4' live willow cuttings, 5' o.c.	brush check dam
Note: Arroyo willow is available for field collection on local lands owned by applicant.	

Table B-7. Plant material for stream mitigation sites at Big Rock Ranch

Botanical Name	Common Name	Size and Spacing	Comments
Aesculus californica	California buckeye	'CITRUSPOT' or 'DEEPOT'	provide irrigation for two years
		seed, 4 seeds per cluster, 10' o.c.	seed collection possible on site, protect w/collar & screen or 24" tall 'Tubex'
Baccharis pilularis	coyote bush	'DEEPOT', 8' o.c.	provide irrigation for two years
Carex barbarae	sedge	3" plugs, 1' o.c.	available on site for field collection
Juncus balticus	Baltic rush	3" plugs, 1' o.c.	available on site for field collection
Juncus phaeocephalus	brown-head rush	3" plugs, 1' o.c.	available on site for field collection
Juncus xiphioides	iris-leaved rush	3" plugs, 1' o.c.	available on site for field collection
Quercus agrifolia	coast live oak	'TREEPOT'	provide irrigation for two years
		'DEEPOT', 3 plants per cluster, 12' o.c.	provide irrigation for two years
Ribes californicum spp. californicum	California gooseberry	'DEEPOT', 5' o.c.	provide irrigation for two years, protect w/collar & screen or 24" tall 'Tubex'
Rosa californica	California wild rose	'DEEPOT', 6' o.c.	available on site for field collection
Sambucus mexicana	blue elderberry	1 gallon, 4' o.c.	provide irrigation for two years
Salix lasiolepis	arroyo willow	10" cuttings or 'TREEPOT', 10' o.c.	revegetation applications, protect 35" 'VEXAR' tube, available on site for field collection
		see Table 6	bio-technical applications, available on site for field collection
Symphoricarpos albus var. laevigatus	snowberry	'DEEPOT', 4' o.c.	provide irrigation for two years
Umbellularia californica	California bay	'CITRUSPOT', 12' o.c.	provide irrigation for two years
		'TREEPOT', 2 per cluster, 12' o.c.	provide irrigation for two years, protect 36" 'VEXAR' tube

Mitigation Plan Appendix C
Engineering Hydrologic Design for Channel Stabilization and Habitat Enhancement
Tributary 8, Big Rock Ranch, Nicasio, CA

CIVIL ENGINEERING REPORT

PREPARED FOR

LOCASFILM LTD.

PREPARED BY

BOOKMAN-EDMONSTON
ENGINEERING, INC.

October 29, 1999

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APPENDICES

HYDROLOGIC ANALYSIS FOR BIG ROCK PROJECT

WATER BALANCE ANALYSIS FOR BIG ROCK RANCH RESERVOIR

STORM DRAIN DESIGN CALCULATIONS: BIG ROCK RANCH

SECTION 1 CIVIL DESIGN DESCRIPTION

PROJECT SITE DESCRIPTION

Big Rock Ranch is located in Marin County within Lucas Valley on the southwest slope of Big Rock Ridge. The property is the former Big Rock Ranch dairy farm and encompasses 1,117 acres. Within the site property, a development area has been identified for the location of Lucasfilm Ltd. facilities. The development area is located at the confluence of two small tributaries, Big Rock Creek and Dairy Creek, which form the upper extent of Nicasio Creek. Nicasio Creek flows northwest through Lucas Valley to Nicasio Reservoir. The Big Rock Ranch site is the upper extent of the Nicasio watershed, which is a main water supply for Marin Municipal Water District (MMWD). Nicasio Creek flows to Nicasio Reservoir and eventually outlets to Laganitas Creek, which terminates at Tamales Bay in the western portion of Marin County.

The property is composed of steep slopes, ranging from over 30 percent at the upper portions of the watershed near the top of Big Rock Ridge to more gently rolling slopes within the development area. Big Rock Ridge is comprised mostly of sandstone. Within the development area, several other soil and rock types are found, including Franciscan melange and serpentine outcroppings. Of the 1,117 acres of the property, only about 56 acres are within the development area. Of those 56 acres, only 43~~7~~ acres are proposed for disturbance and construction for~~of~~ facilities. Within the development area, and mostly clustered within the banks of the named creeks, are the wooded areas. The moderate slopes of the development area are grass and have been heavily grazed. All of the creekbeds within the development area have seen considerable erosion and degradation from cattle grazing.

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At the confluence of Dairy Creek and Big Rock Creek is a small stockpond that impounds approximately 40 acre-feet of water. The stockpond is created by a small dam approximately 25 feet high and 200 feet along its crest. The outlet of the dam is comprised of three 30-inch-diameter concrete pipes, which outlet to the top of Nicasio Creek. The stockpond is filled from winter runoff and appears to hold water throughout normal water years. The stockpond appears to have received significant siltation and its original volume is unknown.

Big Rock Creek, Dairy Creek, and Nicasio Creek within the property are dry in the summertime, except for intermittent groundwater seepage to short segments of Big Rock Creek. From observation of a wet year (1997-98 winter), it appeared that all three creeks

also dry up in this year type except for the intermittent groundwater seepage along a portion of Big Rock Creek.

SITE DEVELOPMENT DESCRIPTION

The facility portion of the Project consists of the construction of five buildings distributed throughout the development area. Central to the development area and to the buildings will be the construction of a 100-acre-foot reservoir created by construction of a 48-foot-high, 550-foot-long earthen dam just downstream of the existing stockpond dam. The five buildings consist of a gatehouse (about 270 square feet), a day-care facility and fitness center (about 8,000 square feet), a main office building (approximately 120,000 square feet), a commons building that will house dining facilities and a small theater (18,000 square feet), and an archive/maintenance building (35,000 square feet).

The day-care and fitness center, main office building, and commons building will be located in close proximity to the reservoir. Portions of the commons building and the main office building will form segments of the shoreline. The reservoir has a total surface area of 7.02 acres, which includes two smaller upper impoundments at the upstream extent of the reservoir at the location of inflow of Dairy Creek and at the inflow of Big Rock Creek. Both upper impoundments are created by small spillway/weirs, creating a two-foot increase in water surface elevation for these ponds. The two small upper ponds provide a variety of functions. They are primarily designed for aesthetics and to enhance water quality. Because they are the points of inflow for both creeks, they will receive a high degree of siltation from winter flows, capturing most of the silt into these two small impoundments and buffering the main reservoir~~, in the summertime~~. Both small impoundments will receive water pumped back from the main reservoir to maintain constant water elevations and flow over the small spillway/weirs. This constant recirculation and aeration should provide additional enhancement to water quality.

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By providing the pumped back feature and maintaining a constant water surface elevation in these upper ponds, the shorelines will remain at a constant location and saturation state, thereby providing for continuous maintenance of wetland and riparian habitat. The two-foot differential between the water surface of the upper ponds and the main reservoir body will provide a two-foot waterfall feature for aesthetic enhancement.

The main reservoir body will have a normal water surface and spillway crest elevation of 654 feet above mean sea level. The two upper smaller impoundments will have a normal water surface elevation and spillway/weir crest elevation of 656 feet. The main reservoir body will see annual surface evaporation of about 3 feet per year and an expected seepage loss of 2 to 3 feet per year. The total summertime water level drop of is estimated at about

3 feet below the normal water surface elevation. In order to limit the seepage, a liner is planned for the reservoir bottom. This liner will not extend to the shoreline to allow the riparian vegetation along the perimeter of the reservoir to develop. The average annual volume of evaporation and seepage loss from the reservoir ~~is about~~ will be limited to less than 30 acre-feet per year.

Rev. 1

The reservoir provides several functions. The primary function is the impoundment of winter runoff for use as a fire protection supply. This supply is a backup to the primary sprinkler supply, which will be developed from an on-site well and stored in an on-site storage tank. The reservoir will also be used for aesthetic purposes, recreation, and fish and wildlife enhancement. A state water right has been applied for to construct a reservoir and for diversion of winter flow storage. The beneficial uses of the reservoir, identified in the water right application, are fire protection, recreation, and fish and wildlife enhancement.

The reservoir spillway is designed to handle normal winter runoff and to convey a flood flow from a 1,000-year event. The spillway has also been analyzed for passage of a probable maximum flood, which is an event that encompasses all probable storms that could develop within the watershed. The spillway is a concrete-lined rectangular structure, which is controlled at the top by an overflow spillway weir. The spillway terminates at a 6-foot drop into an energy-dissipation splash pool, which is lined with rock. The splash pool is just offstream from Nicasio Creek. Due to the size of the reservoir and the expected normal drawdown because of evaporation and seepage, it is anticipated that the spillway will flow each winter except for the most critically dry years. The spillway is approximately 600 feet long at an average slope of 14 percent.

Another feature of the reservoir is a low-level outlet. The low-level outlet consists of an intake structure and slide gate for outflow control, which leads to a 12-inch-diameter outflow pipe leading from the bottom of the reservoir at elevation 635 to just ~~about~~ above the splash pool adjacent to Nicasio Creek.

The low-level outlet provides several functions. Its primary purpose is to provide a way to deliver the impoundment of stored water to Nicasio Creek and thus to Nicasio Reservoir in dry or critical years when called for by Marin Municipal Water District. This delivery would be at times when there is a critical shortage of MMWD drinking water supply. The low-level outlet will not entirely drain the reservoir; a reserve will be kept for the fire protection requirements. Approximately 10 to 15 acre-feet of water will remain in the reservoir, even when drained using the low-level outlet so that the fire protection system can still function. The low-level outlet can also be used to drain the reservoir for maintenance of the dam, reservoir liner, or bottom.

SITE GRADING CONCEPT

The approach taken to shape the site was to repeat the form and function of the surrounding hills. As an example, rather than identifying slopes as straight 2:1 or 3:1, all slopes are receiving a constantly varying grading pattern so that there are no straight-graded slopes. Many of the graded features, knolls, hollows, and swales are taken from the form of shapes of the surrounding hillsides. The roadway was designed to fit in and around the graded and contoured site, while still maintaining safe geometry for traffic flow. Long, sweeping curves are used to navigate the roadway through the different graded features.

Another important aspect of the grading was to create a site environment that clustered the three main buildings (the commons, the main building, and the day care/fitness center) while visually isolating the maintenance and archive functions.

Two natural breaks define the site and form a visual barrier from Lucas Valley Road. The first is a berm located just in front of the gatehouse, which runs from an existing serpentine rock outcropping at the confluence of a small, unnamed drainage and Nicasio Creek, and runs eastward, connecting into the eastern slope that defines the eastern boundary of the development area. The second natural screening feature is the knoll behind the gatehouse, which connects into the dam. The dam and the knoll feature have been shaped to create a naturally contoured form disguising the structural aspect of the dam. Both the left and right abutments of the downslope face of the dam have been significantly curved and contoured so that there are no long straight lines to catch the eye. This, together with the tree mass on the right abutment of the dam and a serpentine outcropping that has been left in the downstream face of the dam on the lower right-hand abutment, tends to visually hide the dam structural shape.

WATER SYSTEM DESCRIPTION

The water system for Big Rock Ranch services three primary needs: (1) potable water for the five buildings of the site, (2) the fire protection of buildings and the site, and (3) irrigation of landscape vegetation and agricultural water demands. The primary supply for all of these needs is a well located on Big Rock Ridge, within the property boundary. A secondary or supplemental supply for fire protection is the lake created by a new dam and reservoir that replaces the existing stockpond. This secondary supply provides supplemental fire flows for site fire protection and a backup supply to the building fire protection systems as required by Life Safety code.

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The water system is separated into two, unconnected systems, the potable system and fire/irrigation system. This separation ensures a safe, secure water system for the drinking water supply. The potable system consists of the well supply, a 45,000 gallon water storage tank at elevation 900, and distribution piping to the five site buildings. The potable system is gravity-fed except for the well pump, which pumps water out of the well to the storage tank.

Rev. 1

Water delivered in the potable system is treated by three methods. Initial disinfection is accomplished with ultraviolet light. Storage quality assurance and residual disinfection are done with chlorination; water softening, which provides for removal of bicarbonate (CACO3) and other minerals, is done at each building with softening tanks.

The fire protection system consists of water pumped from the Ridge well to an 85,000-gallon steel water tank at elevation 900, about 160 feet above the highest roof peak, a distribution pipe system that ranges from 6- to 10-inch-diameter pipe and a fire pump and drafting line that pumps water from the lake.

The fire protection water demands are comprised of two volumes, the building sprinkler supply required under NFPA 13, which is about 35,000 gallons, and a supplemental fire flow that will be provided by the lake supply. The remaining volume of the tank will be used to store irrigation water. Controls will be installed in the system so that the required volume for fire protection is available at the water tank.

The fire protection system design will incorporate several features to ensure reliability. The water tanks will be designed to withstand seismic forces as outlined in the geotechnical report. The piping connection to the tanks will be designed to withstand potential differential movement of the piping system and tank under seismic conditions and the piping system will incorporate flexibility to withstand some differential earth movement from seismic events.

SECTION 2 STORMWATER MANAGEMENT

Stormwater management is an integral part of the contour and configuration of the Big Rock Ranch site design. The property contains drainages, creeks, streams and impoundments that have been utilized as a part of conveying natural overland runoff and for treating hardscape runoff. The approach to conveying runoff has been to utilize open swales and overland areas to the greatest extent possible in order to provide for the greatest amount of treatment prior to delivery to the main flow channel exiting the site which is Nicasio Creek. This approach is consistent with a Best Management Practices (BMP) implementation for stormwater management.

BMP Implementation for the site can be divided into two categories; those areas that consist of natural runoff processes, where the main purpose of the system is to convey this runoff through the site while reducing sedimentation and erosion, and the areas of hardscape such as roads, walks, and paved areas that require pollutant treatment and filtration while providing for a stable non-erodable system.

BEST MANAGEMENT PRACTICES

Within the 56 acre development area the site development only includes 3.5 acres of roof, 3 acres of pavement for roadway and parking and less than an acre of miscellaneous hardscape such as concrete walks, a portion of the internal courtyard and patio area. The miscellaneous areas provide no significant increase in runoff and will be drained to the surrounding landscaping. Roof drainage will be collected and conveyed away from the buildings to ensure that this runoff does not adversely affect building foundations. Roof drainage will be delivered to either the drainage swales located at several points within the development area or to the reservoir in the case of the main and commons building roof areas adjacent to the reservoir.

For paved areas all drainage will receive overland or grass swale treatment prior to entering any of the established natural creeks on the site or the created ponds or reservoir. Parking areas will have the additional protective measure of containing in-basin (installed within catch basins) filters for the removal of oil/grease and sediment. Runoff from paved areas will be treated further by conveying collected runoff to grassed swales of a minimum prescribed length for nutrient uptake and sediment removal prior to entering a natural water body. Naboo Creek, which is a created drainage, is an example of the integration of stormwater BMP's with the site landscape architecture. The Creek will receive runoff from the vegetated areas as well as roof runoff and roadway runoff. The Creek will contain vegetation as well as riprap for erosion control, but these elements will be emplaced as a natural creek reconstruction.

Although the project site only occupies a very small portion of the 1,000-plus acres of the property, the plan has an abundance of natural and native grass areas (to be replanted within the grading limits) that will be utilized for overland flow of paved surface runoff. Dispersion of the majority of roadway runoff to the adjacent grass areas is preferable to centrally collecting runoff and then having to develop BMP's for dealing with the concentrated drainage. Where appropriate, such as on mild slopes, the roadway shoulders and adjacent aprons are used to disperse runoff as is typical for rural roadways. Shoulders will be stabilized to prevent the development of erosion rills.

The overwhelming majority of parking will be underground within the parking garage beneath the main building. Any drains within this area will only receive water that drips off vehicles entering the garage and any fluid spills. To ensure that this area does not have the potential for pollutant release, no outside plumbed drains will be installed within the garage. For the entry to the garage, a grated trench drain will be used to intercept runoff on the garage entry road. This drain will lead to a sump, which will be pumped back to the normal roadway drainage system described above.

SECTION 3 VISUAL IMPACT ANALYSIS - CIVIL

Three site plan elements have been analyzed, and exhibits produced to demonstrate the insignificant visual of these elements in response to conditions of approval for the Master Plan for Big Rock Ranch. The three elements are: 1) the view of buildings from Lucas Valley Road with varying levels of maturity for plantings; 2) views of the water tanks from Lucas Valley Road and Big Rock Ridge (trails) and 3) night lighting visual impacts as seen from Lucas Valley Road. Item 1, the view of buildings from vantage points on Lucas Valley Road, is addressed by Ralph Alexander and Associates plans and associated descriptions and is not addressed in this analysis.

WATER TANK SCREENING

Two water tanks are to be located on the hillside above the buildings site along the fire road which accesses Big Rock Ridge. The tank locations are north west of the development area and are at a base elevation of about 900 feet. One tank, which will be used for potable/domestic supply is 45,000 gallons, 30 feet in diameter and 10 feet tall. The second tank is for the irrigation and fire protection systems, is 85,000 gallons and 32 feet in diameter and 15 feet tall. The tank site is located at a bend in the fire road and is encompassed by a substantial grove of oak trees. The tanks are to be located within the grove. The location is ideal from a hydraulics standpoint as the elevation provides more than adequate pressure for water distribution. It is also ideal from a visual impact standpoint, as the existing natural oak grove will provide excellent screening of the tanks from view, both from the building locations and from Lucas Valley Road.

In order to demonstrate the visual screening of the oak grove a digital representation of the site contour and grove screening has been compiled. Figure 1 contains two photos of the existing site, one from the existing Ranch to the tank site and the second from Lucas Valley Road. Figure 2 is a view from Lucas Valley road looking across the development site to the tank location. In the foreground, the buildings have been located for reference. It should be noted that the trees seen in the foreground are included for reference and do not include the full compliment of plantings as shown in the landscape plans. In addition, the closer (to the viewer) plantings have been omitted in this digital rendering to allow for an unobstructed view of the tank site. All of the trees shown on the hillside are existing and are accurately represented from the topographic survey. As the tanks are completely hidden, a second figure (Figure 3) has been developed, showing the tank site from above (heading towards Big Rock Ridge) to demonstrate that in fact the tanks are part of the rendering.

NIGHT LIGHTING IMPACT

As part of the visual impacts analysis site lighting has been reviewed to assess the night view of the site from Lucas Valley Road. The main concern with site lighting is any direct visual line of sight to site lighting and any ambient night sky lighting. Ambient night sky lighting would be of concern if a significant quantity and intensity of sight lighting were to be part of the plan. However, the site lighting plan calls for a minimal amount of lighting for mainly safety purposes. Site lighting mostly consists of very low intensity hooded lights at the roadway edge, some footpath lighting and surface parking area lighting and building entry area lighting. All of these lighting schemes will utilize low intensity lights to minimize onsite and offsite adverse visual impacts. In addition, the layered screening of the site from grading and plantings will obscure the site from Lucas Valley Road, with only the potential for "through the trees" glimpses of lights at the entry kiosk area. There will also be a minor amount of lighting at the entry, essentially identical to the existing lighting at the Skywalker Ranch entry.

Figure 2 is a digital rendering of the site, without any of the foreground screening and only a small portion of the mid-site berm tree plantings represented. Still, this rendering demonstrates that the roadway and all of the parking/building entry area lighting will not be in view. Foreground plantings and tree/shrubbery plantings at and in front of the entry kiosk will screen this area from view.

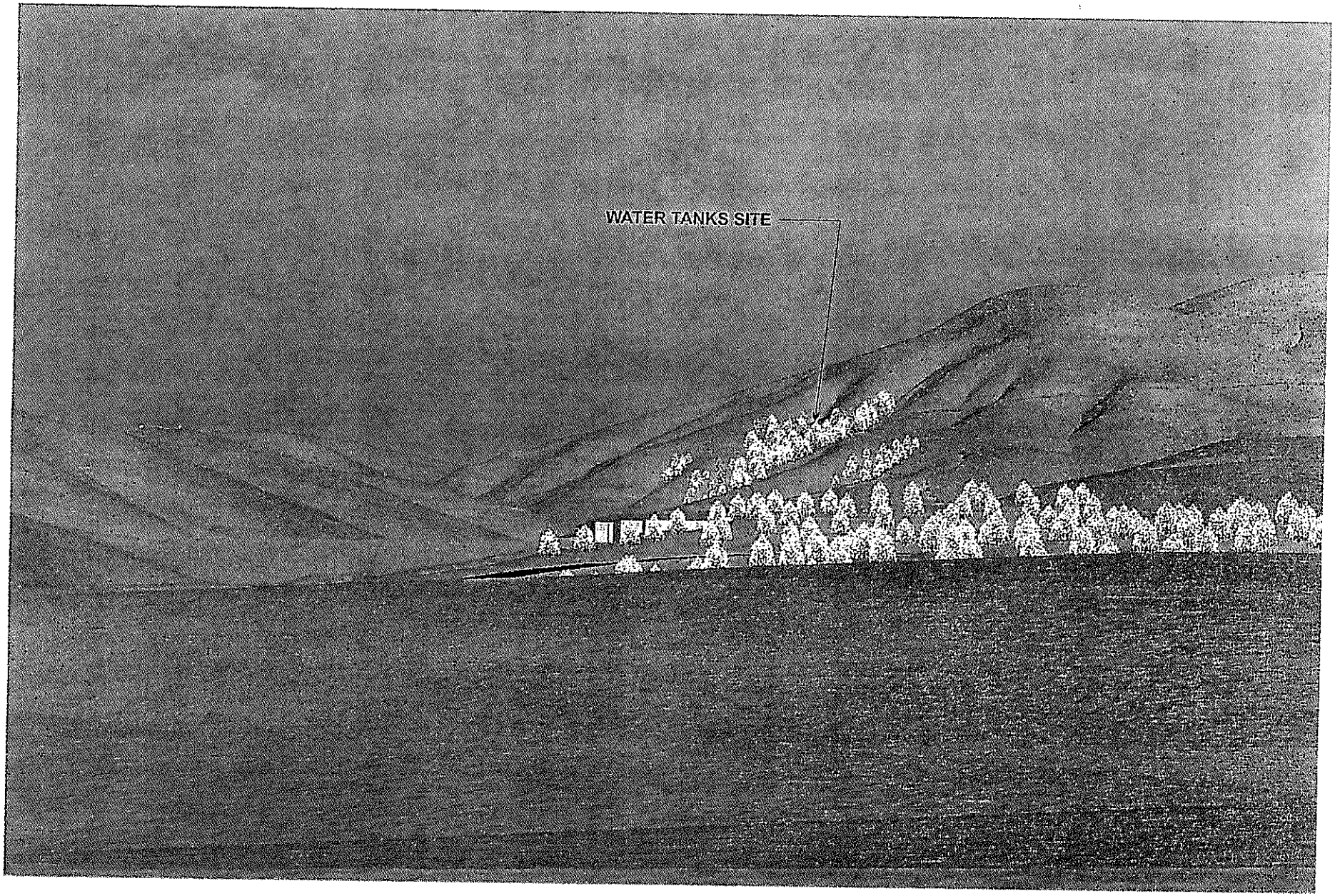
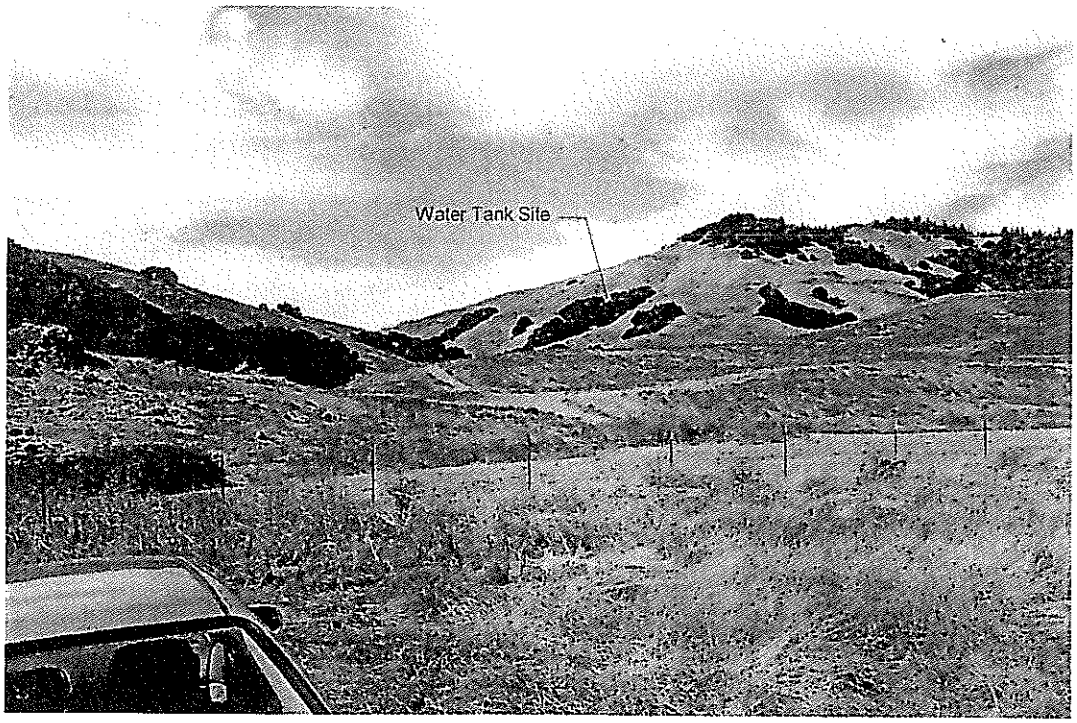
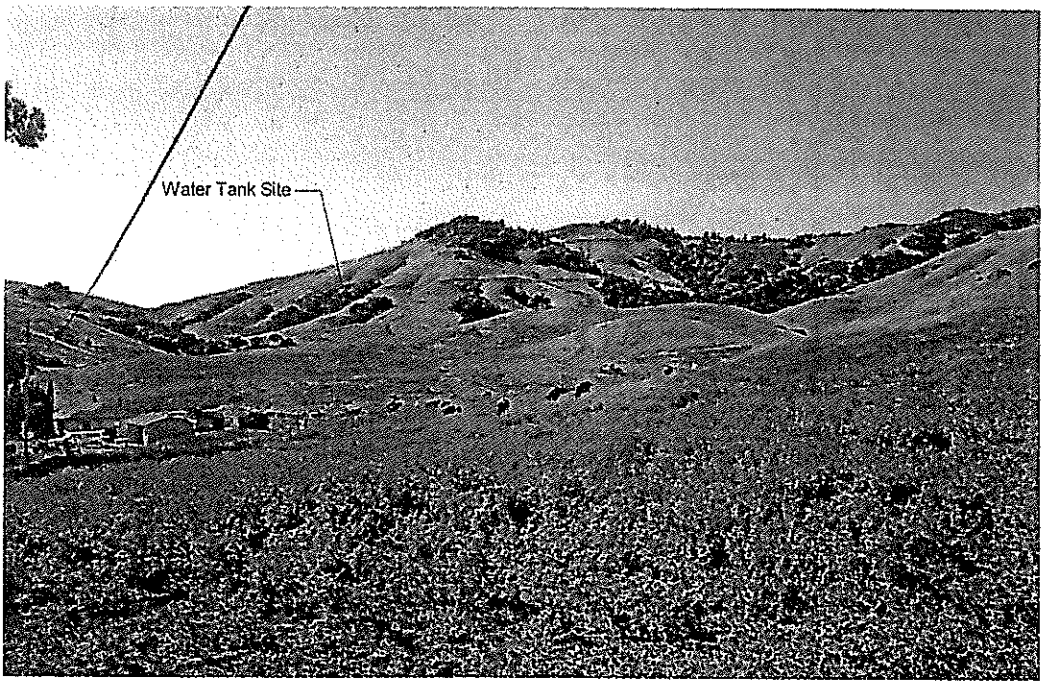


FIGURE 2 - DIGITAL RENDERING OF WATER TANK SITE AS VIEWED FROM LUCAS VALLEY ROAD
FOREGROUND LANDSCAPING AND TREE MASS, AND COMPLETE BERM TREE MASS NOT SHOWN FOR CLARITY
TREES AT TANK SITE ARE EXISTING



VIEW FROM RANCH TO WATER TANK SITE



VIEW FROM LUCAS VALLEY ROAD TO WATER TANK SITE

FIGURE 1 - EXISTING SITE PHOTOS

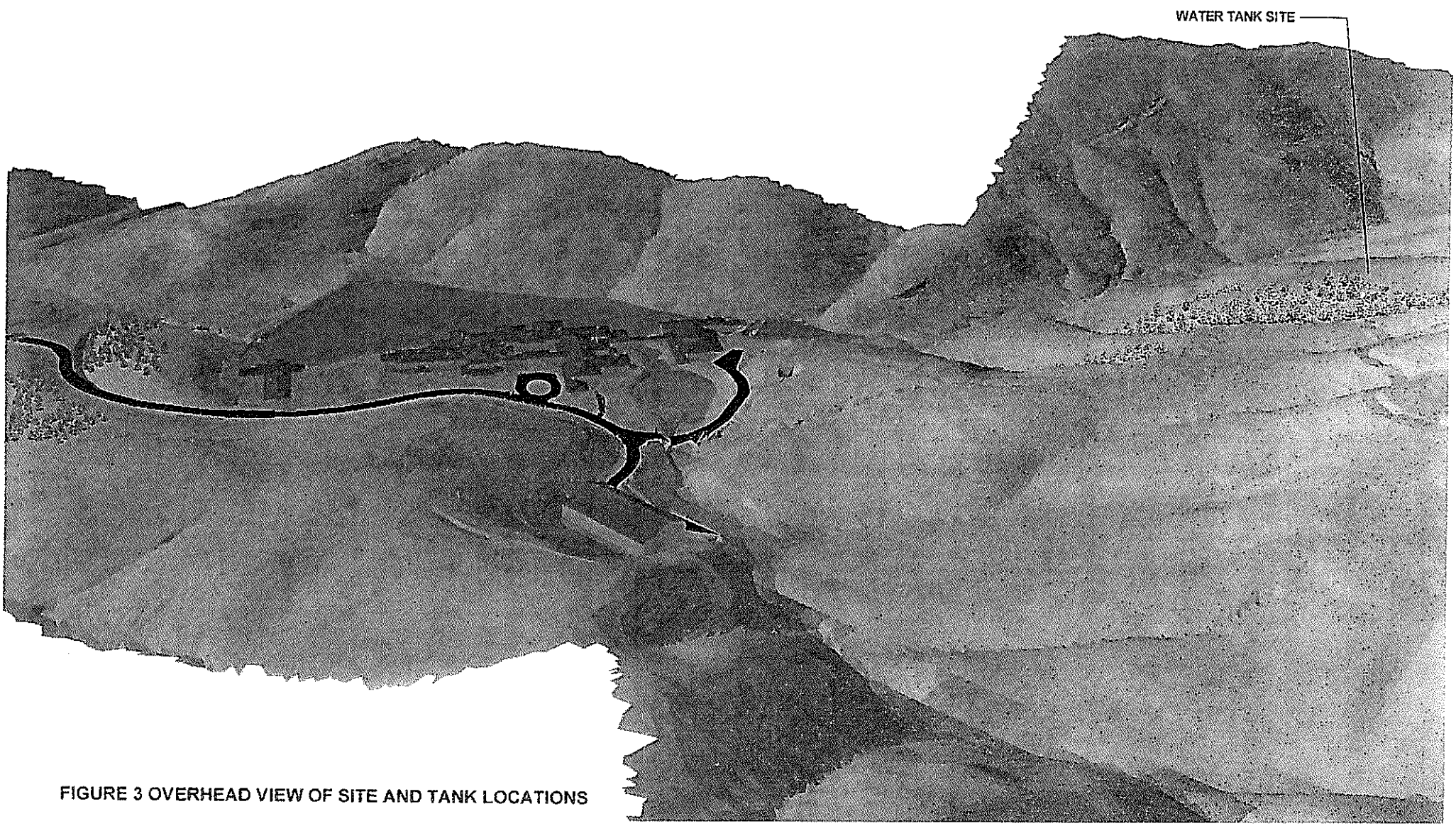


FIGURE 3 OVERHEAD VIEW OF SITE AND TANK LOCATIONS

SECTION 4 RESPONSE TO SELECTED CONDITIONS OF APPROVAL

CONDITION 1 – ITEM D

The proposed Slope Stabilization Plan reduces the extent of retaining walls on the development as compared with the Master Plan. This has been accomplished by the change in location of the Archives Building from the original location above the Commons Building to the open, bowl-shaped area upslope of the Main Office Building. For the proposed plan, retaining walls are limited to (1) protecting the existing oak trees adjacent to the roadway leading to the Archives Building, (2) forming several surface parking spaces at the Main Office Building, and (3) forming the bridge approach abutments for the crossing over Big Rock Creek leading to the Commons Building.

CONDITION 2 – ITEMS D AND E

The approach taken to shape the site as seen in the Detailed Grading Plan was to repeat the form and function of the surrounding hills. As an example, rather than identifying slopes as straight-lined 2:1 or 3:1 grades, all slopes are receiving a constantly varying grading pattern to avoid straight-graded slopes. Many of the graded features, knolls, hollows, and swales are taken from the form of shapes of the surrounding hillsides. The roadway was designed to fit in and around the graded and contoured site, while still maintaining safe geometry for traffic flow. Long, sweeping curves are used to navigate the roadway through the different graded features.

Another important aspect of the grading was to create a site environment that clustered the three main buildings (the Commons Building, the Main Office Building, and the Daycare/Fitness Center) while visually isolating the maintenance and archive functions.

Two natural breaks define the site and form a visual barrier from Lucas Valley Road. The first is a berm located just in front of the gatehouse, which runs from an existing serpentine rock outcropping at the confluence of a small, unnamed drainage and Nicasio Creek. It runs eastward, connecting into the eastern slope that defines the eastern boundary of the development area. The second natural screening feature is the knoll behind the gatehouse, which connects into the dam. The dam and the knoll feature have been shaped to create a naturally contoured form disguising the structural aspect of the dam. Both the left and right abutments of the downslope face of the dam have been significantly curved and contoured so that there are no long straight lines to catch the eye. This, together with the on the tree mass right abutment of the dam and a serpentine outcropping that has been left

HYDROLOGIC ANALYSIS FOR BIG ROCK PROJECT

PREPARED FOR

LUCASFILM, LTD.

PREPARED BY

BOOKMAN-EDMONSTON
ENGINEERING, INC.

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Figure 2. Daily Rainfall Intensity of 10-year Return Period near Project Site (inches)

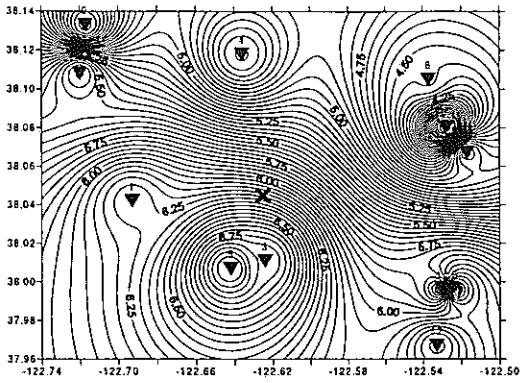


Figure 3. Hourly Precipitation by Return Period

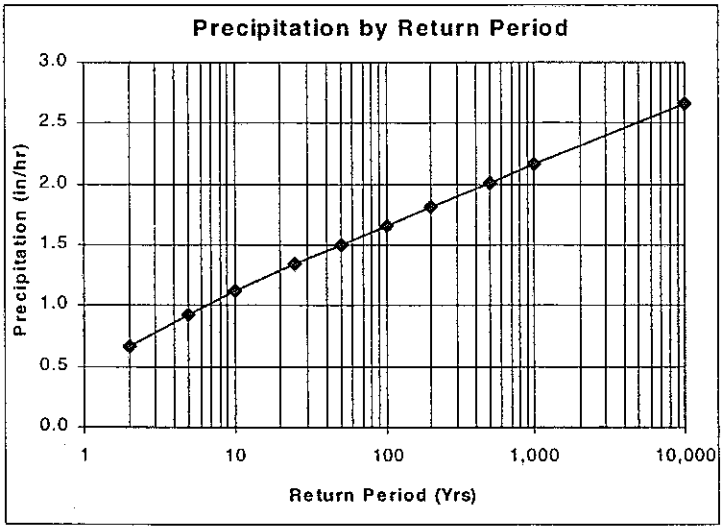
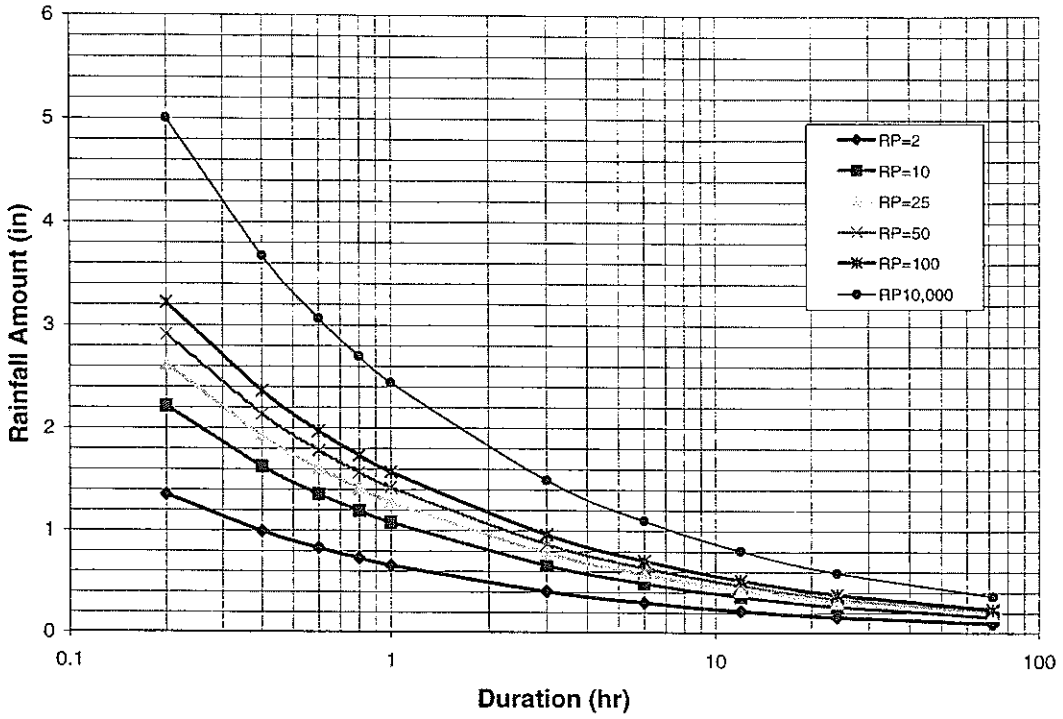


Figure 4. Rainfall Intensity-Duration-Frequency Curves at Project Site



In general, the difference between the estimated rainfall intensities based on the CalTrans program and DWR's study is small. For example, the 10-year/1-day flow estimate from IDF curves is 0.26 inches per hour (i.e., 6.24 inches per day), which is close to the estimate based on the DWR study, 6.19 inches per day. The CalTrans program incorporates an adjustment for elevation difference; however, the adjustment may not provide a significant benefit because the changes in elevation from the project sites to the nearby stations are small.

PROBABLE MAXIMUM PRECIPITATION

The probable maximum precipitation (PMP) was computed based on the methodology described in the Hydrometeorological Report No. 36 (HMR 36), which was published by US Department of Commerce in 1961 and revised in 1969. Depending on the locations and weather patterns, the PMP may be mainly caused by orographic precipitation or convergence precipitation. Orographic precipitation is the precipitation falling as a result of the lifting effect of a topographic feature on a flow of air passing over it. The induced vertical motions in the flow are primarily due to the slope of the ground, but may also be related to the narrowing of the terrain. On the other hand, convergence precipitation includes all precipitation resulting from lifting induced by atmospheric processes other than orographic. These are mainly horizontal convergence, frontal lifting, and instability.

These two processes often occur simultaneously during a storm, especially in mountainous areas. Therefore, two types of PMPs (the orographic plus restricted convergence PMP and the unrestricted convergence PMP) are usually computed and compared. The maximum values of these two are taken as the final version of the PMP.

Because the hills around Lucas Valley have low elevations, it is expected that the precipitation in the first several 6-hour periods would be controlled by the unrestricted convergence PMP. That is, the orographic effect is not dominant. The details of the computational methodology can be found in HMR 36, and the resulting PMP at the project site is shown in Table 2.

Table 2. Cumulative Probable Maximum Precipitation at Project Site

Month	1 hour	3 hours	6-Hour Period (inches)											
	(in)	(in)	1	2	3	4	5	6	7	8	9	10	11	12
Oct.	4.18	6.90	9.57	13.59	16.78	19.38	21.63	23.60	25.35	26.89	28.24	29.48	30.56	31.55
Nov.	3.73	4.88	9.03	13.33	16.69	19.50	21.87	23.95	25.82	27.42	28.84	30.14	31.32	32.41
Dec.	3.28	4.67	8.65	13.13	16.71	19.61	22.14	24.37	26.29	27.98	29.48	30.86	32.08	33.20
Jan.-Feb.	3.11	4.54	8.41	13.03	16.71	19.73	22.34	24.60	26.59	28.35	29.91	31.31	32.58	33.76
Mar.	3.17	4.53	8.39	12.96	16.51	19.43	21.95	24.13	26.01	27.63	29.05	30.36	31.51	32.57
Apr.	3.28	4.49	8.31	12.54	15.86	18.62	20.99	22.96	24.69	26.16	27.46	28.65	29.70	30.66

The reliability of the PMP estimates presented in Table 2 has been discussed with Mr. Douglas Fenn in the Hydrometeorological Design Studies Center (HDSC) of the National Weather Service. HDSC is responsible for publishing HMR 36. Mr. Fenn confirmed the methodology used in the analysis and performed a rough analysis on the PMP computation based on their recently revised methodology, which has been included in the unpublished HMR 58 (the updated version of HMR 36). His results show minor differences from the previously presented results, but within a reasonable range.

UNIT HYDROGRAPH SYNTHESIS

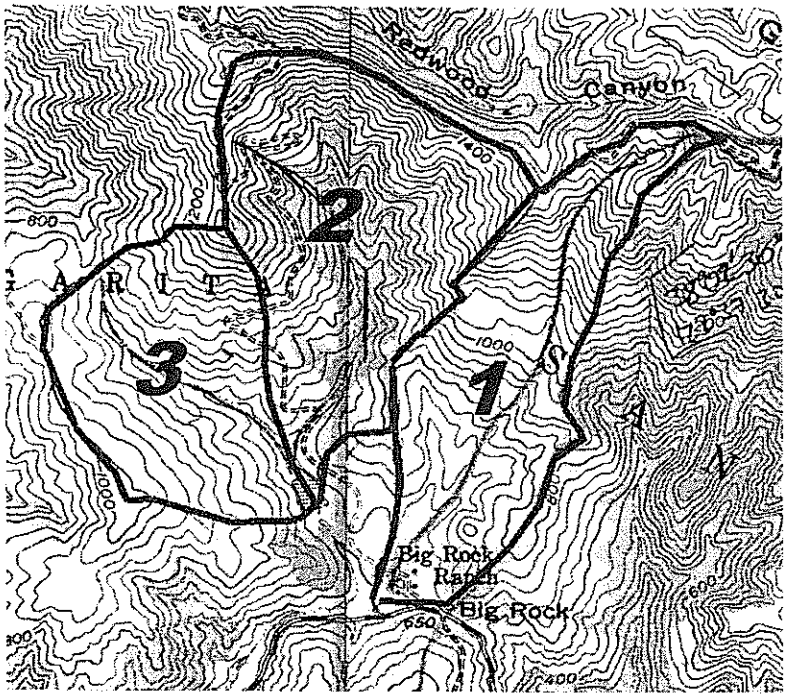
Figure 5 shows the locations of three watersheds for which a unit hydrograph is required to simulate potential floods. Watersheds 2 and 3 contribute runoff into the reservoir, and the outflow of the reservoir merges with the runoff from watershed 1 at the Big Rock Ranch. Table 3 shows the basic characteristics for these three watersheds.

Table 3. Basic Characteristics of Watersheds

Watershed	L (ft)	Lc (ft)	Area (ft^2)	Average Slope
1	6,442	2,883	7,437,349	12.4%
2	4,408	2,272	8,386,403	18.2%
3	3,239	1,879	5,896,489	7.7%

L: the channel length from the outlet to the divide.
Lc: the channel length from the outlet to the point closest to the centroid of the basin.

Figure 5. Locations of Three Watersheds

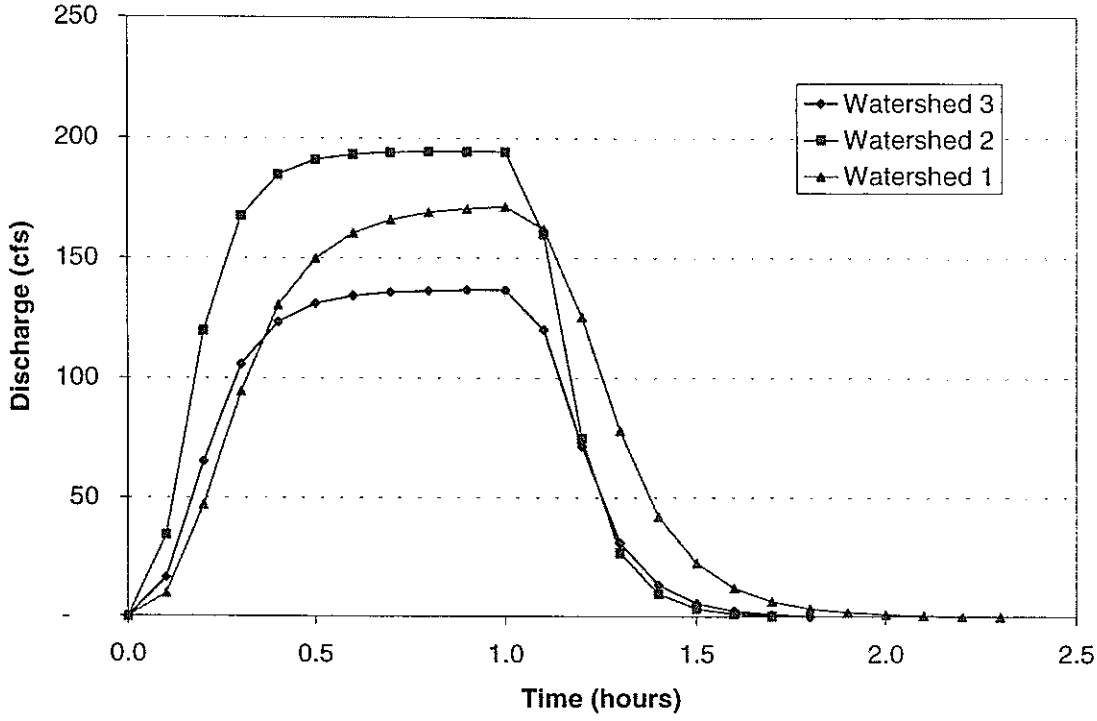


The selected method for preparing a unit hydrograph is the SCS method. Snyder's method has been investigated; however, it is fairly difficult to determine proper coefficients needed for the computation, given such a small drainage area.

The SCS method was developed by the Soil Conservation Service to construct synthetic unit hydrographs based on a dimensionless hydrograph. These watersheds produce runoff during excess rainfall conditions. There is no channel with constant flows. Because the slopes are steep, infiltration may not be significant. To be conservative, the unit hydrograph is constructed so that little infiltration loss occurs. In other words, a high antecedent moisture condition is simulated. All rainfalls are considered excess and contribute to the direct runoff.

Based on the definitions provided by the Soil Conservation Service, the soils at the project sites can be classified as pasture or range with a good hydrologic condition. Hydrologic Soil Group D with antecedent moisture condition Level III were applied to result in a curve number of 94, implying high potential of surface runoff. Adjusting the excess rainfall duration to 1 hour produces the unit hydrographs for the three watersheds presented in Figure 6. The differences in watershed slope and shape result in a different hydrograph shape, time of concentration, and peak. It should be also noted that since these drainage areas are small, the time needed for a drop of water to travel through the entire basin is short. The time of concentration is 23, 14, and 17 minutes for watersheds 1, 2, and 3, respectively. Therefore, the unit hydrographs level around one-half hour after the rainfall starts.

Figure 6. Synthesized Unit Hydrographs for Watersheds at Project Site



FLOOD ESTIMATION

Based on the PMP and the unit hydrographs, the probable maximum flood (PMF) can be estimated. The estimated PMF for each watershed is presented in Table 4. The combination of the PMFs from watersheds 2 and 3 is 1,384.16 cfs, which will be used in the design of the spillway. Based on the results of the precipitation frequency analysis and the synthetic unit hydrographs, the estimated peak flows of various rainfall durations and return periods are summarized in Table 5 and Figure 7.

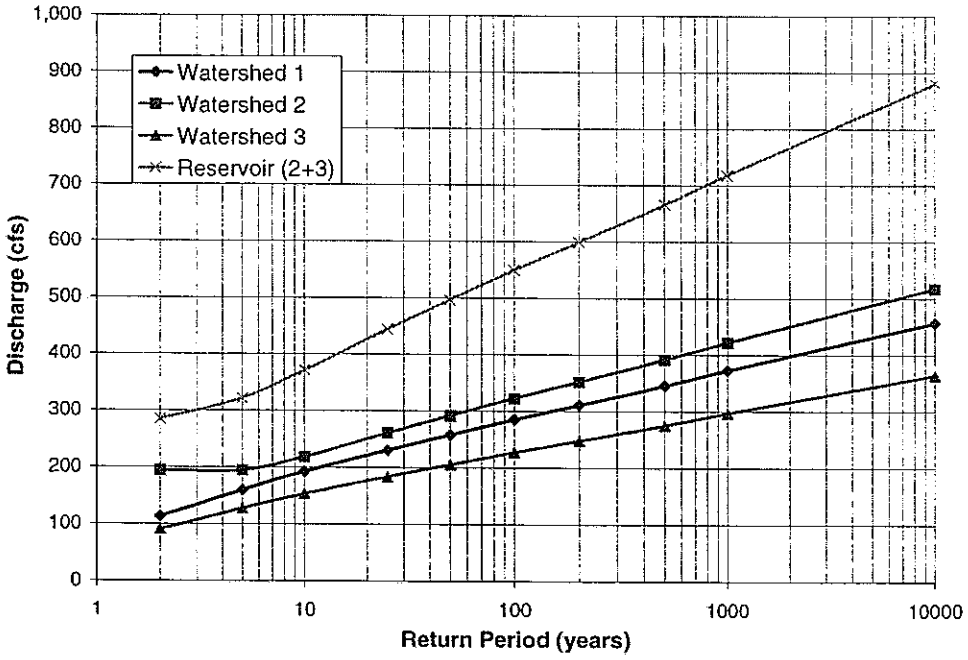
Table 4. Estimated Probable Maximum Flood and Time of Concentration

Watershed	Probable Maximum Flood (cfs)	Time of Concentration (min)
1	717.30	23
2	812.73	14
3	571.43	17

Table 5. Peak Flows of Various Rainfall Durations and Return Periods

Duration	Return Period	Watershed			Reservoir
(hours)	(years)	1	2	3	(2+3)
1	2	113	194	90	284
1	5	159	194	127	321
1	10	192	218	153	371
1	25	230	260	183	443
1	50	257	291	205	496
1	100	285	323	227	549
1	200	310	352	247	599
1	500	345	391	275	665
1	1,000	372	422	296	718
1	10,000	456	517	363	880
24	10	44	50	35	85

Figure 7. Peak Flows for 1-Hour Rainfall of Various Return Periods



WATER BALANCE ANALYSIS FOR BIG ROCK RANCH RESERVOIR

PREPARED FOR

LUCASFILM, LTD.

PREPARED BY

BOOKMAN-EDMONSTON ENGINEERING, INC.

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WATER BALANCE ANALYSIS FOR BIG ROCK RANCH RESERVOIR

This report documents the assessment of changes in the water balance computation in order to comply with the Conditions of Approval for the Big Rock Ranch Project (Project). The language in the Conditions of Approval reads as follows:

> *"The final reservoir design shall be evaluated to minimize the combined 6% net loss of water to the recharge of the alluvial stream aquifer and surface flows in Nicasio Creek that would result from expansion of the reservoir."*

Due to the lack of data, a complete water balance model for assessing the net loss of water to hydrological system recharge is not necessary or practical for this assessment. Instead, changes in the water balance introduced by the expansion of the Big Rock reservoir were identified, and the net change was compared to the total available water supply in this region. Without constructing a complete water balance model for the Project area, the ambiguities generally associated with the determination of model parameters can be avoided.

Furthermore, the analysis focuses on the long-term effect of the reservoir expansion. Temporary changes in Nicasio Creek flow and other hydrologic components during reservoir filling are not discussed in this report. The following sections detail the derivation of the total available water supply in the Project area and the net change in water loss resulting from reservoir expansion.

AVAILABLE WATER SUPPLY IN THE BIG ROCK RANCH AREA

Before Nicasio Reservoir was built, Nicasio Creek was gauged from water year 1955 to 1960. Because inflows to Nicasio Reservoir were not measured after 1960, these inflows were estimated based on reservoir operation records. The annual average Nicasio Reservoir inflow from 1955 to 1998 is around 31,513 acre-feet (AF) (see Table 1). The total drainage areas of Nicasio Reservoir and of the Project reservoir are about 22,964 and 327.9 acres, respectively. Based on the drainage area sizes, the inflow from the Project reservoir area to Nicasio Reservoir is estimated as 450 acre-feet per year (AF/yr). Therefore, the 6 percent limit of the water loss introduced by the reservoir expansion is 27 AF/yr.

Table 1
Estimated Inflow of Nicasio Reservoir (acre-feet)

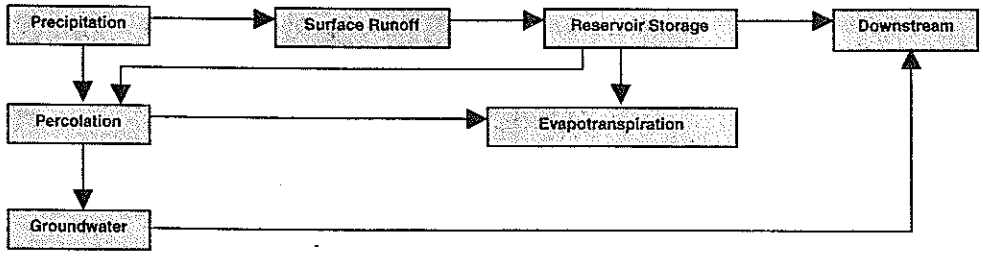
Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1955	4	270	5,280	5,210	1040	581	1,210	352	66	9	0	0	14,022
1956	0	4	31,120	19,870	12,450	1,460	425	236	38	6	0	0	65,609
1957	8	10	7	255	3,290	4,740	543	1,350	165	12	0	0	10,380
1958	535	263	2,110	9,910	28,670	8,530	14,230	331	122	26	0	0	64,727
1959	0	5	7	2,470	9,710	723	145	45	5	0	0	0	13,110
1960	0	0	1	1,560	8,570	2,050	303	134	15	0	0	0	12,633
1961	0	1,000	1,100	2,400	4,800	6,300	1,400	100	300	0	0	600	18,000
1962	0	37	881	1,157	15,983	5,088	153	0	0	0	0	0	23,299
1963	5,460	49	2,885	5,733	9,943	3,035	7,141	273	0	0	0	0	34,519
1964	0	2,114	0	7,028	255	46	0	0	368	0	0	0	9,811
1965	236	1,353	10,655	12,061	829	224	4,398	0	0	0	0	0	29,756
1966	0	798	2,968	10,499	5,868	783	43	0	0	0	0	0	20,959
1967	0	2,025	9,701	26,349	2,151	3,762	5,564	341	147	0	0	0	50,040
1968	37	43	255	7,675	5,898	5,435	0	0	0	0	0	0	19,343
1969	230	513	9,793	23,434	17,256	3,891	509	0	0	0	0	0	55,626
1970	0	157	10,419	35,903	3,259	3,241	0	0	0	0	0	0	52,979
1971	209	5,957	15,762	2,701	95	2,513	500	74	0	31	0	0	27,842
1972	101	144	3,474	1,221	3,655	264	83	0	0	0	0	58	9,000
1973	460	5,681	4,815	32,831	15,056	5,374	181	0	0	0	0	64	64,462
1974	120	11,333	3,956	11,855	832	11,094	6,236	0	0	15	0	0	45,441
1975	153	101	442	994	13,647	10,542	534	0	0	0	0	0	26,413
1976	206	6	0	18	107	285	545	0	9	37	0	0	1,213
1977	0	0	18	34	31	74	0	25	0	0	0	0	182
1978	0	21	3,643	22,498	10,816	6,454	2,394	0	353	0	0	0	46,179
1979	0	0	0	7,126	9,314	2,940	500	0	0	0	0	0	19,880
1980	37	1,068	5,662	17,039	17,852	4,530	325	0	0	0	0	0	46,513
1981	0	0	652	6,515	1,509	5,260	248	0	0	0	0	0	14,184
1982	0	3,311	12,175	20,954	6,297	11,912	10,612	6	0	0	0	0	65,267
1983	103	5,325	6,968	19,505	21,477	36,589	3,193	1,531	0	0	0	0	94,691
1984	1	3,610	14,238	962	757	750	460	115	50	20	10	1	20,974
1985	110	4,814	1,274	421	2,751	2,174	324	1	1	1	1	1	11,873
1986	1	255	1,279	6,616	32,546	12,176	336	93	1	1	1	1	53,306
1987	1	1	203	850	5,688	2,500	88	1	1	1	1	1	9,306
1988	1	1	4,212	9,476	592	117	1	89	17	1	192	1	14,700
1989	70	16	784	1,056	349	11,512	934	1	1	1	1	1	14,726
1990	82	73	23	1,723	2,457	658	143	1,167	103	1	1	1	6,432
1991	104	1	2	140	1,112	11,880	750	120	1	1	1	1	14,113
1992	81	1	518	1,209	9,661	2,162	431	1	1	1	1	1	14,068
1993	319	1	3,934	25,358	9,053	1,583	342	171	28	1	168	1	40,959
1994	275	308	1,245	592	2,193	4,961	138	316	154	298	121	1	10,602
1995	1	1,255	3,096	32,561	419	38,156	610	577	154	102	37	1	76,969
1996	1	237	6,061	14,276	16,343	6,809	2,772	985	1	27	17	1	47,530
1997	235	434	16,683	19,374	2,135	447	82	1	206	1	624	27	40,249
1998	1	2,242	3,894	17,335	26,860	1,263	1,565	1,043	381	59	1	1	54,645
Average	209	1,246	4,595	10,154	7,809	5,565	1,600	215	61	15	27	17	31,513
Median	6	197	2927	6822	5244	3138	446	16	1	1	0	0	22,137

Source: Marin Municipal Water District

Another source of information regarding available water supply in the Big Rock Ranch area is the hydrologic report produced for the Environmental Impact Report (EIR) (William B. Vandivere, *Supplemental Hydrologic Analysis for the Lucasfilm Master Plan, Big Rock Ranch, Marin Co., CA.*, 1995). In the hydrologic report, the total average annual runoff from the Project area was estimated to be around 402 AF. Based on these numbers, the net loss of water to the recharge of the alluvial stream aquifer and surface flows in Nicasio Creek is limited by 24.1 AF/yr. The difference in surface area at the maximum pool elevations for the existing and post-Project reservoir configurations was estimated as 5.4 acres. Based on a representative annual evaporation total of 1,810 millimeters measured at the Warm Springs Dam in Sonoma County and a pan coefficient of 0.7, the annual evaporation loss from the augmented reservoir surface was estimated as 22.7 AF/yr. It is the author's opinion that the bases of the estimated available water supply in the aforementioned EIR is not as precise as the estimate based on the reservoir operation data because it was based on the regional average annual runoff of the San Francisco Bay Area. The reservoir operation records provide a more direct assessment of the potential inflow to Nicasio Reservoir.

CHANGES IN WATER BALANCE DUE TO RESERVOIR EXPANSION

The following figure shows the water balance associated with the Big Rock Reservoir. As previously mentioned, the water loss analysis discussed herein includes only long-term effects of the reservoir expansion and does not include the temporary changes in the water balance during the filling of the expanded reservoir. Because the water surface area will increase, the reservoir expansion will increase evaporation from the water surface and increase percolation. However, evaporation is the only real water loss to the system; the increased percolation will result in more groundwater flow toward downstream areas.



EVAPOTRANSPIRATION LOSS

The original reservoir has a surface area of 83,142 square feet, and the proposed reservoir has a surface area of 303,071 square feet. The reservoir surface area would increase by 219,929 square feet (5.05 acres); this area is currently covered by annual grass or pastures. The closest evaporation station reported in *Evaporation from Water Surfaces in California* (DWR, *Bulletin 73-79*, November 1979) is Hamilton Air Force Base. The recorded pan evaporation and the estimated evaporations in the Project area are shown in the following

table. The estimated annual evaporation amounts before and after the reservoir expansion in the augmented area are shown in Table 2.

Table 2
Estimated Evaporation in the Project Area

Month	Hamilton AFB Pan A Evaporation (mm)	Hamilton AFB Pan A Evaporation (in)	Pan Coefficient (lake)	Post-Big Rock Reservoir Evaporation (in)	Pan Coefficient (pasture)	Pre-Big Rock Reservoir Evaporation (in)
October	130	5.12	0.93	4.76	0.76	3.89
November	83	3.27	0.97	3.17	0.73	2.39
December	56	2.20	0.95	2.09	0.71	1.57
January	51	2.01	0.82	1.65	0.72	1.45
February	54	2.13	0.63	1.34	0.74	1.57
March	126	4.96	0.68	3.37	0.76	3.77
April	158	6.22	0.66	4.11	0.78	4.85
May	206	8.11	0.68	5.51	0.78	6.33
June	265	10.43	0.77	8.03	0.78	8.14
July	260	10.24	0.74	7.57	0.78	7.98
August	239	9.41	0.78	7.34	0.78	7.34
September	182	7.17	0.87	6.23	0.78	5.59
Total				55.19		54.86

The annual average evaporations on the 5.05 acres of land before and after the reservoir expansion are very close. Therefore, the net change in evaporation depth is 0.33 feet per year; in other words, the net change in evaporation loss is 1.65 acre-feet. However, because the pan coefficient for pasture was developed for irrigated crops in the Central Valley, the estimated evaporation loss is higher than it would have been at the Project site. Therefore, a conservative estimate of the change in evaporation loss is based on lake evaporation alone. The additional evaporation from the water surface is 4.6 ft/yr, or 23.23 AF/yr. It is about 5.2 percent of the 450 AF/yr water supply. It should be emphasized that the estimated net loss is very conservative because the evaporation from the original ground cover is not deduced.

PERCOLATION

The increased reservoir surface area also introduces more percolation into the aquifer underlying the reservoir. The Big Rock Ranch is located in an upland, steeply sloped area. According to the soil survey conducted by the U.S. Department of Agriculture (1979), the soil classification at the Big Rock Ranch is a mixture of Bonnydoon Variant, Gilroy, and Gilroy Variant loams that are well drained with a moderate to moderate-slow permeability. Selected soil properties are listed in Table 3.

If the groundwater is not hydraulically connected to the reservoir, the percolation rate will be dictated by soil permeability. However, since the soil layers are thin, they will be easily saturated after the reservoir is filled, and percolation will be significantly reduced

afterward. An estimated depth of percolation of the reservoir storage at the Skywalker Ranch, a comparable example, is several feet per year. The proposed reservoir will be lined to restrict the percolation rate to below 30 AF/yr.

Table 3
Selected Soil Properties in the Project Area

	Bonnydoon Variant	Gilroy	Gilroy Variant
Location	Convex knolls and ridges	Plane side slopes	Concave, lower-lying side slopes
Permeability	Moderate (0.6-2.0 in/hr)	Moderate slow (0.2-0.6 in/hr)	Moderate slow (0.2-0.6 in/hr)
Depth to Bedrock	10 to 20 inches	20 to 40 inches	40 to 60 inches
Available Water Capacity	0.15-0.17 in/in	0.10-0.18 in/in	0.11-0.17 in/in

Although percolation to the groundwater aquifer will increase after the reservoir expansion (i.e., reduce the surface runoff), due to the shallow layers of soil above the bedrock, the percolated water will flow downhill and exit the basin of Big Rock Ranch to the downstream Nicasio watershed, and thus, the percolation cannot be considered water loss to the Nicasio watershed. Whether the percolated water will remain underground or accrete back to the river as surface runoff depends on the hydrogeological conditions downstream of Big Rock Ranch in Nicasio Creek. After the lining is installed at the reservoir, the percolation rate may be much less than it would have been in the natural state. However, the reduced percolation cannot be considered a water gain to the Nicasio watershed either for the reason stated above.

CONCLUSION

The reservoir expansion may introduce additional water loss to the system mainly by increased evaporation from the expanded water surface. A conservative estimate of the net increase in water loss is 23.23 AF/yr, 5.2 percent of the available annual water supply (450 AF) in the area contributing flow to Big Rock Ranch Reservoir. This estimate is conservative because the evapotranspiration from the original ground cover was not subtracted. Therefore, the 6 percent constraint specified in the Conditions of Approval is satisfied

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TECHNICAL MEMORANDUM

STORM DRAIN DESIGN CALCULATIONS:

BIG ROCK RANCH

PREPARED FOR

LUCASFILM LTD.

PREPARED BY

BOOKMAN-EDMONSTON
ENGINEERING, INC.

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Drainage Calculations:

The drainage areas are defined by topography and locations of the storm drain inlets. The inlets are spaced approximately 200 feet apart along an alignment parallel to the roadway centerline. The inlet locations are adjusted for specific design elements such as parking spaces and driveways. Assuming the inlet is the low spot of a particular sub-watershed, the topography was used to define the drainage area for each inlet.

With defined sub-watersheds, areas and average slopes and travel distances both along the road and down the hill can be defined. With this information, the time of concentration can be determined using the equations $T_c=T_{t1}+T_{t2}$, where T_{t1} is the sheet flow travel time and T_{t2} is the shallow concentrated flow travel time. Sheet flow is the cross-country flow before it

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}}$$

gets to the road, defined by:

Where n is Manning's roughness coefficient = 0.15 for short grass, L is the flow length in feet, P_2 is the 2-year, 24-hour rainfall in inches, and s is the average slope.

The second component of calculating the time of concentration for each watershed is the flow within the roadway, calculated by the shallow concentrated flow equation,

$$T_t = \frac{L}{3600V}$$

Where L is the length of overland flow and V is the average velocity as defined in a log-log table relating the slope to the velocity.

After calculating the time of concentration for each watershed, the Cal-Trans IDF (Intensity-Duration-Frequency) program was used to interpolate a formula relating the time of concentration to the rainfall intensity for a 100 year storm. This equation is interpolated from known intensity-duration-frequency curves derived from local raingage stations.

After an rainfall intensity is known for each watershed, the rational method, Q=CIA is used to calculate the peak flow rate, where C is a runoff coefficient based on soil conditions, I is the rainfall intensity in in/hr, and A is the watershed area. Each watershed's flow drains into

its inlet and is added to the flow from upstream watersheds. The pipes are sized to carry the 100 year flow. For all of the sub-watersheds a 12 inch pipe is sufficient to carry the 100 year peak flow.

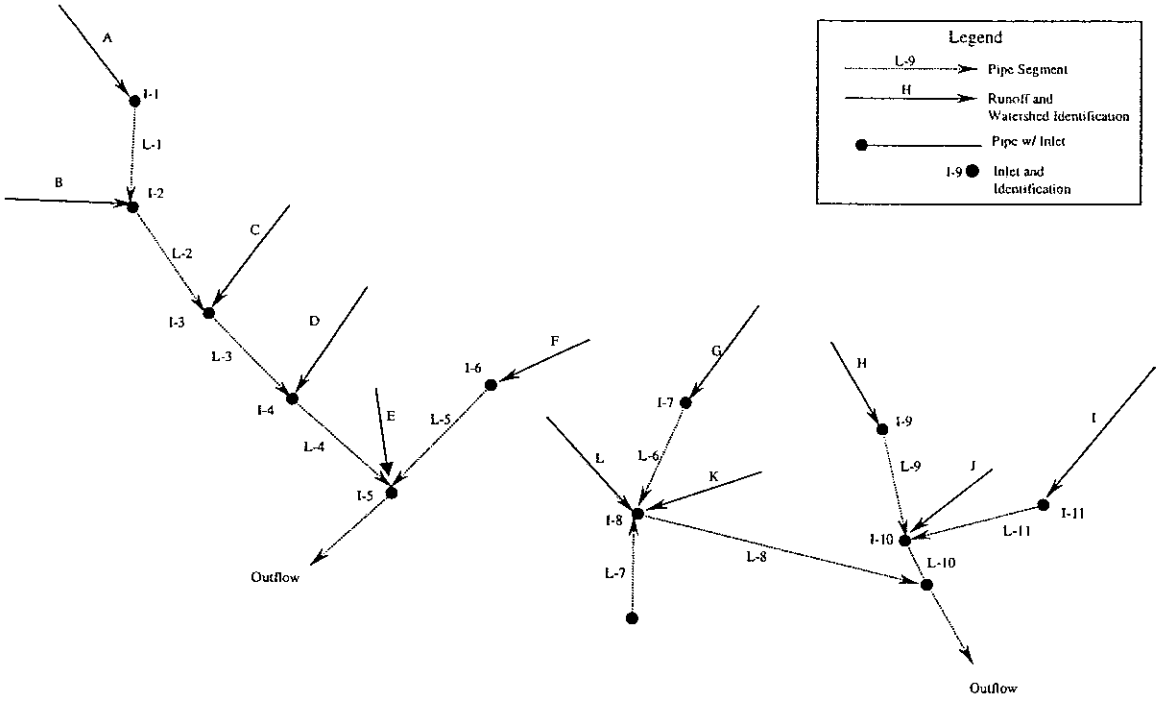
At the outlet of the three main drainage systems, the flow enters a grass-lined channel. The maximum design velocity in these channel is three to five ft/sec. The maximum velocity is determined by the erosion potential of the soil/vegatation system planned for the channel. This velocity is calculated from the flow from the outlets and the cross-sectional area, and using Manning's equation,

$$Q = \frac{1.49}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

Where n is Manning's roughness coefficient, A is the cross-sectional area, R is the hydraulic radius, and s is the channel slope. Manning's equation is used to calculate the normal depth and the corresponding cross sectional area. The channel into the upper pond is designed as a 1 foot deep channel with a five foot wide bottom and a 3:1 side slope. The slope is 5.3%, keeping the flow subcritical. The channel into the reservoir is slightly larger, with an eight foot bottom as well as the 3:1 side slope and 1 foot depth.

Results of the drainage calculations are shown in tables on page 4.

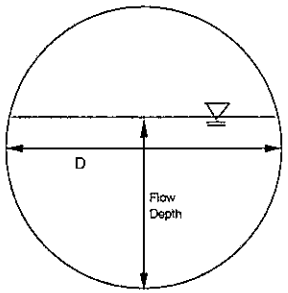
Big Rock Storm Drain Design Schematic

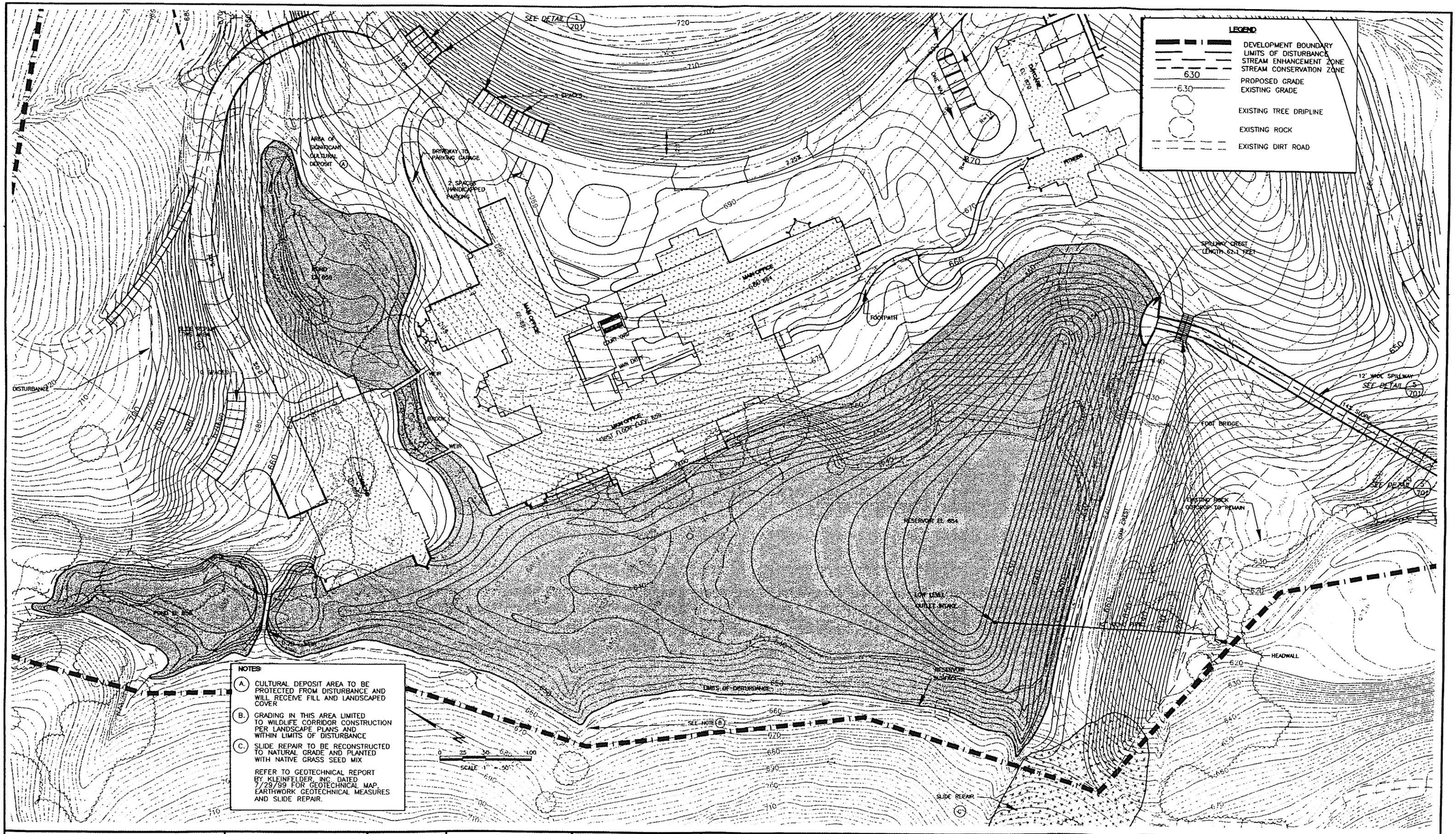


				Sheet Flow (Across Hill)					Shallow Concentrated Flow (In Street)									
Watershed	Area (ac)	Peak Elev (ft)	Inlet Elev (ft)	Manning's n	Travel Distance (ft)	Slope	2-Yr 24-Hour Rainfall (in)	Travel Time	Mode of Flow	Elev. Change (ft)	Length (ft)	Slope	Velocity (ft/sec)	Travel Time (hr)	Time of Concentration (hrs)	100 Yr. Precip (in/hr)	Runoff Coefficient	Peak Discharge (cfs)
A	1.5	816.0	770.0	0.15	160	0.29	3.70	0.08	Swale	20	485	0.04	4.0	0.0337	0.1098	4.08	0.44	2.69
B	0.8	790.0	740.0	0.15	110	0.45	3.70	0.05	Swale	2	245	0.008	1.8	0.0389	0.0859	4.54	0.44	1.60
C	1.9	814.0	700.0	0.15	540	0.21	3.70	0.23	None						0.2281	2.96	0.44	2.48
D	0.5	778.0	688.0	0.15	300	0.30	3.70	0.12	Road	12	150	0.08	5.8	0.0072	0.1311	3.77	0.44	0.83
E	0.5	778.0	670.0	0.15	300	0.36	3.70	0.12	Road	18	150	0.12	8.5	0.0049	0.1200	3.92	0.44	0.86
F	0.6	782.0	710.0	0.15	300	0.24	3.70	0.14	Swale	4	120	0.03	3.3	0.0103	0.1456	3.60	0.44	0.95
G	0.5	782.0	710.0	0.15	280	0.26	3.70	0.12	Swale	7	70	0.10	6.5	0.0030	0.1276	3.82	0.44	0.84
H	0.9	800.0	714.0	0.15	480	0.18	3.70	0.22	Swale	6	200	0.03	3.5	0.0159	0.2375	2.91	0.44	1.15
I	3.2	810.0	678.0	0.15	700	0.19	3.70	0.29	Road	4	150	0.03	3.3	0.0128	0.3065	2.60	0.44	3.66
J	0.5	720.0	672.0	0.15	100	0.48	3.70	0.04	Road	6	200	0.03	3.3	0.0171	0.0597	5.33	0.44	1.17
K	0.6	710.0	664.0	0.15	130	0.35	3.70	0.06	Road	8	260	0.03	3.3	0.0222	0.0816	4.65	0.44	1.23
L	0.6	710.0	664.0	0.15	140	0.33	3.70	0.06	Road	6	210	0.03	3.3	0.0179	0.0828	4.61	0.44	1.22

Manning's n: 0.013

Pipe Segment	Segment Length (ft)	Flow in Segment (cfs)	Slope	Diameter (in)	Radius (ft)	Flow Depth (in)	Flow Depth (ft)	Angle (rad)	Perimeter (ft)	Area (ft^2)
L1	105	2.69	0.29	12	0.5	3.04	0.25	2.09	1.06	0.16
L2	170	4.29	0.24	12	0.5	4.07	0.34	1.90	1.24	0.23
L3	150	6.77	0.08	12	0.5	7.18	0.60	1.37	1.77	0.49
L4	155	7.60	0.12	12	0.5	6.87	0.57	1.43	1.72	0.46
L5	90	0.95	0.44	12	0.5	1.64	0.14	2.38	0.76	0.06
Outflow (L12)		9.41	0.01	18	0.75	13.27	1.11	1.08	3.10	1.40
L6	135	0.84	0.34	12	0.5	1.64	0.14	2.38	0.76	0.06
L8	275	3.28	0.01	12	0.5	9.07	0.76	1.03	2.11	0.64
L9	110	1.15	0.38	12	0.5	1.86	0.16	2.33	0.81	0.08
L10	20	9.27	0.01	18	0.75	13.11	1.09	1.10	3.07	1.38
L11	200	3.66	0.03	12	0.5	6.65	0.55	1.46	1.68	0.45
Outflow (L13)		9.27	0.01	18	0.75	13.11	1.09	1.10	3.07	1.38





NOTES:

(A) CULTURAL DEPOSIT AREA TO BE PROTECTED FROM DISTURBANCE AND WILL RECEIVE FILL AND LANDSCAPED COVER

(B) GRADING IN THIS AREA LIMITED TO WILDLIFE CORRIDOR CONSTRUCTION PER LANDSCAPE PLANS AND WITHIN LIMITS OF DISTURBANCE

(C) SLIDE REPAIR TO BE RECONSTRUCTED TO NATURAL GRADE AND PLANTED WITH NATIVE GRASS SEED MIX

REFER TO GEOTECHNICAL REPORT BY KLEINFELDER, INC. DATED 7/29/99 FOR GEOTECHNICAL MAP, EARTHWORK GEOTECHNICAL MEASURES AND SLIDE REPAIR.

DESIGNED SG CHECKED JW
DRAWN JW SUBMITTED SG

REV	DATE	DESCRIPTION	SUB	APP'D
1	11-29-99	General Revisions		

CIVIL ENGINEER OF RECORD
BOOKMAN-EDMONSTON ENGINEERING, INC.
3100 ZINFANDEL DRIVE, SUITE 500
RANCHO CORDOVA, CA 95670
TEL: (916)852-5080
FAX: (916)852-6385

REGISTERED PROFESSIONAL ENGINEER STEPHEN C. GRUNERT C40729 3-31-03 CIVIL STATE OF CALIFORNIA

ARCHITECT OF RECORD
GENSLER ARCHITECTURE
DESIGN AND PLANNING
600 CALIFORNIA STREET
SAN FRANCISCO, CA 94108
TEL: (415)433-3700
FAX: (415)627-3737

GEOTECHNICAL ENGINEER
KLEINFELDER, INC.
GEOTECHNICAL ENGINEERING
35 MITCHELL BLVD, STE 5A
SAN RAFAEL, CA 94903
TEL: (415)472-6770
FAX: (415)472-6773

LANDSCAPE ARCHITECT
RALPH J. ALEXANDER AND ASSOCIATES
LANDSCAPE ARCHITECTURE
591 REDWOOD HIGHWAY
MILL VALLEY, CA 94941
TEL: (415)388-8777
FAX: (415)381-2938

ENVIRONMENTAL ENGINEER
QUESTA ENGINEERING CORP.
WASTEWATER ENGINEERING
1220 BRICKYARD COVE RD, STE 206
POINT RICHMOND, CA 94807
TEL: (510)236-6114
FAX: (510)235-2423

OWNER OF RECORD
LUCASFILM LTD.
P.O. BOX 2009
SAN RAFAEL, CA 94912
TEL: (415)662-1700
FAX: (415)662-9580

APPLICANT
LUCASFILM LTD.
P.O. BOX 2009
SAN RAFAEL, CA 94912
TEL: (415)662-1700
Fax: (415)662-9580

BIG ROCK RANCH

3800 LUCAS VALLEY ROAD
NICASIO, CA 94946
APN: 164-310-010

DETAIL GRADING PLAN

DATE: JULY 29, 1999
ORIGINAL DRAWING SCALE: 1"=50'
DRAWING NUMBER: C-101

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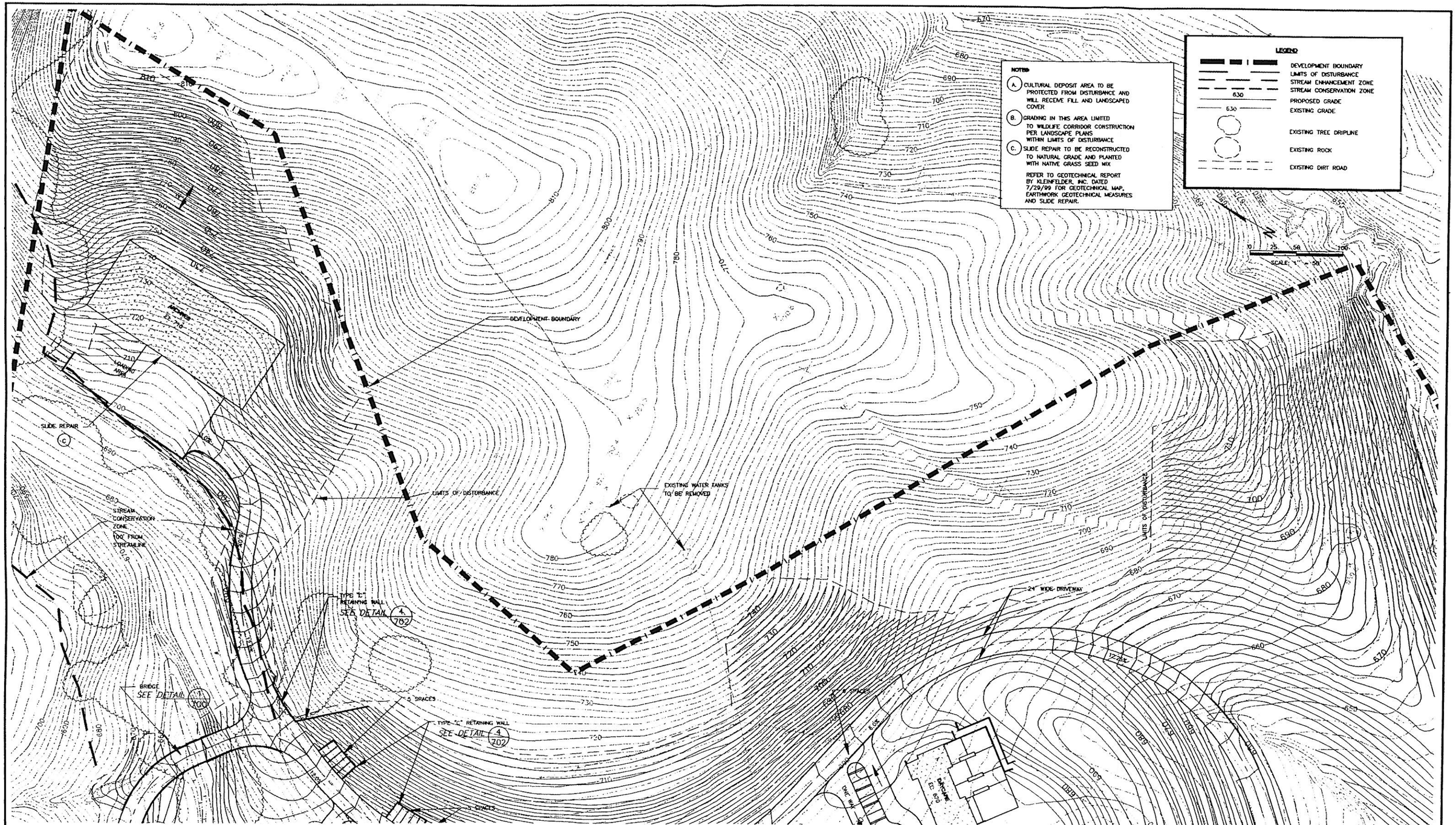

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3100 ZINFANDEL DRIVE, SUITE 500
RANCHO CORDOVA, CA 95670
TEL: (916)852-5080
FAX: (916)852-6385

REGISTERED PROFESSIONAL ENGINEER STEPHEN E. OPPERMAN No. C40729 Exp. 3-31-03 CIVIL STATE OF CALIFORNIA

ARCHITECT OF RECORD
GENSLER ARCHITECTURE
DESIGN AND PLANNING
600 CALIFORNIA STREET
SAN FRANCISCO, CA 94108
TEL: (415)433-3700
FAX: (415)627-3737

GEOTECHNICAL ENGINEER
KLEINFELDER, INC.
GEOTECHNICAL ENGINEERING
35 MITCHELL BLVD. STE 5A
SAN RAFAEL, CA 94903
TEL: (415)472-6770
FAX: (415)472-6773

LANDSCAPE ARCHITECT
RALPH J. ALEXANDER AND ASSOCIATES
LANDSCAPE ARCHITECTURE
591 REDWOOD HIGHWAY
MILL VALLEY, CA 94941
TEL: (415)388-8777
FAX: (415)381-2938

ENVIRONMENTAL ENGINEER
QUESTA ENGINEERING CORP.
WASTEWATER ENGINEERING
1220 BRICKYARD COVE RD, STE 206
POINT RICHMOND, CA 94807
TEL: (510)236-6114
FAX: (510)235-2423

OWNER OF RECORD
LUCASFILM LTD.
P.O. BOX 2009
SAN RAFAEL, CA 94912
TEL: (415)662-1700
FAX: (415)662-9580

APPLICANT
LUCASFILM LTD.
P.O. BOX 2009
SAN RAFAEL, CA 94912
TEL: (415)662-1700
FAX: (415)662-9580

BIG ROCK RANCH
3800 LUCAS VALLEY ROAD
NICASIO, CA 94946
APN: 164-310-010

DETAIL GRADING PLAN

DATE: JULY 29, 1999
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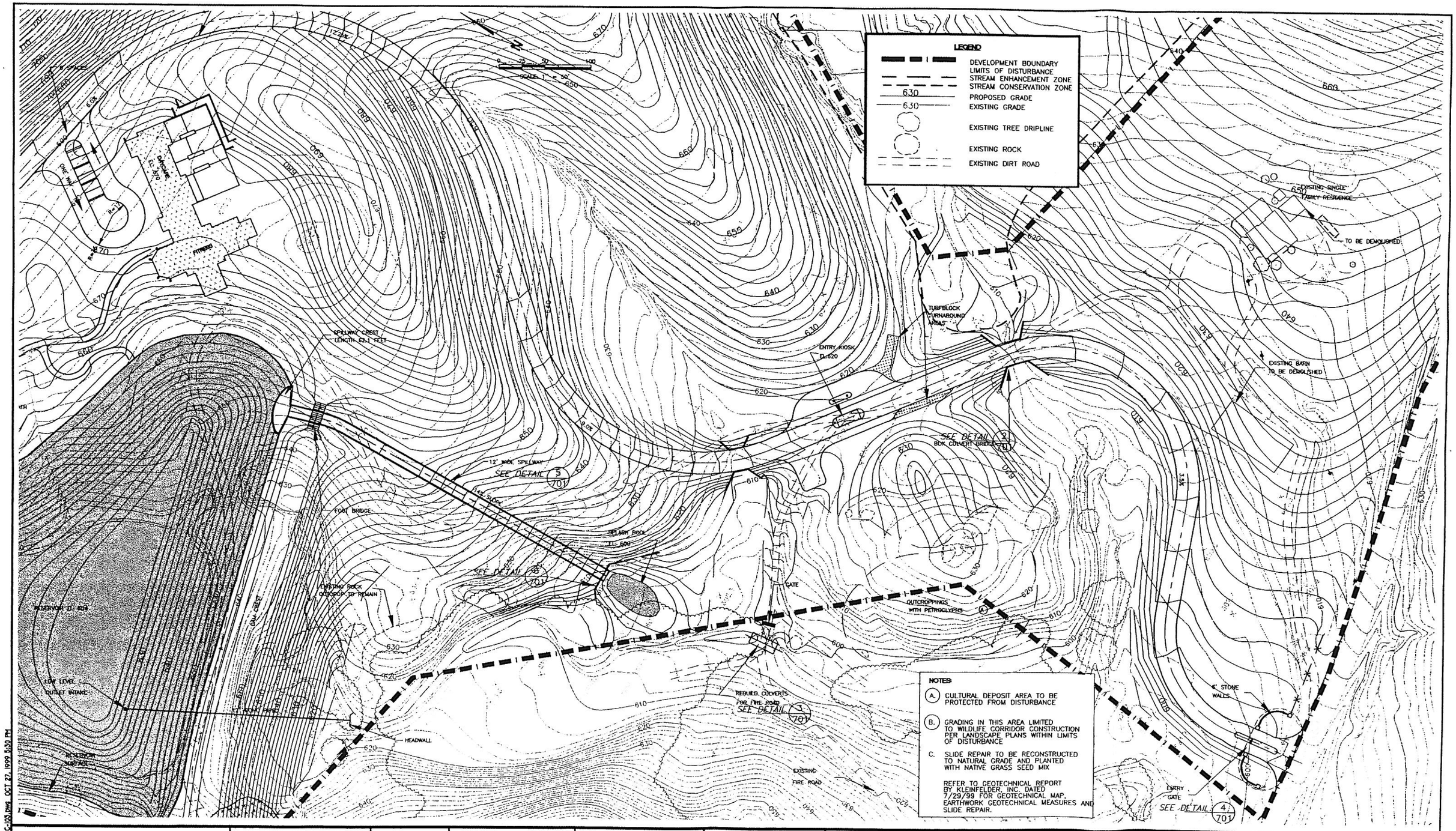

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CIVIL ENGINEER OF RECORD
BOOKMAN-EDMONSTON ENGINEERING, INC.
3100 ZINFANDEL DRIVE, SUITE 500
RANCHO CORDOVA, CA 95670
TEL: (916)852-5080
FAX: (916)852-6385

REGISTERED PROFESSIONAL ENGINEER STEPHEN E. GRINNELL XXXX 1-1-01 CIVIL STATE OF CALIFORNIA

ARCHITECT OF RECORD
GENSLER ARCHITECTURE
DESIGN AND PLANNING
600 CALIFORNIA STREET
SAN FRANCISCO, CA 94108
TEL: (415)433-3700
FAX: (415)627-3737

GEOTECHNICAL ENGINEER
KLEINFELDER, INC.
GEOTECHNICAL ENGINEERING
35 MITCHELL BLVD, STE 5A
SAN RAFAEL, CA 94903
TEL: (415)472-6770
FAX: (415)472-6773

LANDSCAPE ARCHITECT
RALPH J. ALEXANDER AND ASSOCIATES
LANDSCAPE ARCHITECTURE
591 REDWOOD HIGHWAY
MILL VALLEY, CA 94941
TEL: (415)388-8777
FAX: (415)381-2938

ENVIRONMENTAL ENGINEER
QUESTA ENGINEERING CORP.
WASTEWATER ENGINEERING
1220 BRICKYARD COVE RD, STE 206
POINT RICHMOND, CA 94807
TEL: (510)236-6114
FAX: (510)235-2423

OWNER OF RECORD
LUCASFILM LTD.
P.O. BOX 2009
SAN RAFAEL, CA 94912
TEL: (415)662-1700
FAX: (415)662-9580

APPLICANT
LUCASFILM LTD.
P.O. BOX 2009
SAN RAFAEL, CA 94912
TEL: (415)662-1700
FAX: (415)662-9580

BIG ROCK RANCH
3800 LUCAS VALLEY ROAD
NICASIO, CA 94946
APN: 164-031-002

DETAIL GRADING PLAN

DATE: JULY 29, 1999
ORIGINAL DRAWING SCALE: 1"=50'
DRAWING NUMBER: C-103

SPECIAL STATUS PLANT PROTECTION PLAN

BIG ROCK RANCH, MARIN COUNTY, CALIFORNIA

July 29, 1999

Prepared for:

Lucasfilm Ltd.
P.O. Box 2009
San Rafael, CA 94912

Prepared by:

LSA Associates, Inc.
157 Park Place
Pt. Richmond, California 94801
(510) 236-6810
LSA Project #CVA830

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EXECUTIVE SUMMARY

This *Special-status Plant Protection Plan* satisfies condition of approval 23 required by Marin County. Some aspects of the proposed project could potentially affect special-status plant species that occur on the serpentine slope west of the reservoir. This plan describes the measures necessary to protect stands of Marin western flax (*Hesperolinon congestum*), Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*), and woolly-headed lessingia (*Lessingia hololeuca*) on this slope. Background biological information is presented for each of these plant species, objectives of the plan are stated, protection measures are discussed, and monitoring protocols are mentioned.

These three special-status plant species are small annual plants that are largely restricted to serpentine soil.

The objectives of this plan are to protect the plants from construction-related impacts and protect them from cattle and human visitors.

Protection of the plants from construction-related impacts would entail flagging habitat areas, ensuring that heavy equipment and grading avoid habitat areas, presentation of information on these special-status plant species to the slide repair crew, and presence of an on-site monitor during repair of the slide.

Pedestrians will be excluded from the southern serpentine slope. A sign will convey information about the sensitivity of the southern serpentine slope and the need to stay off the slope. A fence will exclude cattle from the southern serpentine slope.

INTRODUCTION

This *Special-status Plant Protection Plan* satisfies condition of approval 23 required by Marin County. Some aspects of the proposed project could potentially affect special-status plant species that occur on the serpentine slope west of the reservoir. (See Plan G-8, Site Fencing Plan and Details, prepared by Bookman-Edmonston for the location of this slope). This plan describes the measures necessary to protect stands of Marin western flax (*Hesperolinon congestum*), Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*), and woolly-headed lessingia (*Lessingia hololeuca*) on this slope. Background biological information is presented for each of these plant species, objectives of the plan are stated, protection measures are discussed, and monitoring protocols are mentioned.

BACKGROUND BIOLOGICAL INFORMATION

Marin Western Flax

The Marin western flax is a federally threatened species. It is an herbaceous annual of the flax family with slender stems and linear leaves. It grows from 4 to 6 inches tall and flowers from May to July.

Marin western flax only occurs in serpentine soils in chaparral or grassland areas. On the southern serpentine slope, it occurs in bunchgrass. Associated plant species are purple needlegrass (*Nassella pulchra*), soap plant (*Chlorogalum pomeridianum*), Tiburon buckwheat, wooly-headed lessingia, and blue-eyed grass (*Sisyrinchium bellum*).

Tiburon Buckwheat

The Tiburon buckwheat is on the California Native Plant Society's list 3 - those species that are in need of additional information on distribution and/or threats before a determination on their endangerment can be finalized. Tiburon buckwheat is an herbaceous annual of the buckwheat family with slender, thread-like stems. The roundish leaves are mostly in a basal rosette. This species grows from 4 to 6 inches tall and flowers from June through September.

Tiburon buckwheat occurs on serpentine derived soils in chaparral and grassland areas. On the southern serpentine slope, it occurs in bunchgrass. Associated plant species are purple needlegrass, soap plant, Marin western flax, wooly-headed lessingia, and blue-eyed grass.

Wooly-headed Lessingia

The wooly-headed lessingia is on the California Native Plant Society's list 3. Wooly-headed lessingia is an herbaceous annual of the sunflower family with slender stems. The oblong leaves are mostly in a basal rosette with small leaves found along the stems. The leaves and flower heads are covered with wooly hairs. This species grows from 4 to 6 inches tall and flowers from June through October.

Wooly-headed lessingia occurs on serpentine or clay soils in grassland areas. On the southern serpentine slope, it occurs in bunchgrass. Associated plant species are purple needlegrass, soap plant, and blue-eyed grass. In some areas it also grows with Marin western flax and Tiburon buckwheat.

OBJECTIVES

There are two objectives of the *Special-status Plant Protection Plan*. The first objective is to protect the special-status plants from construction-related impacts. The second objective is to protect the plants from cattle and human visitors.

PROTECTION AND MONITORING MEASURES

SLIDE REPAIR

A landslide is located at the interface of the proposed dam and the southern serpentine slope. This slide will reduce the stability of the new dam. Repair of the slide will entail excavation and filling with recompacted material.

The special-status plant species are known from the area immediately west of the slide, but not from the slide itself. Protection and monitoring measures shall include:

- Place color coded flags at 50-foot intervals along the limits of grading.
- Ensure that heavy equipment or any other type of disturbance such as storage, disposal of excess soil, etc. does not extend into the flagged area.
- A biological monitor shall convey to the slide repair crew information about the special-status plants present on the slope west of the reservoir and the importance of avoiding the flagged area.
- The biological monitor shall be present during the initial grading operations and shall check the grading until completed.
- The biological monitor shall write a report to the County describing the success of the avoidance of rare plants during the repair of the slide.

PEDESTRIAN ACCESS

Visitors to or workers at the Big Rock Ranch have the potential to damage rare plant populations by walking on the serpentine slope west of the reservoir. These special-status species are small and can be difficult to notice. Damage could occur by trampling plant populations and compacting the soil. One or more signs shall be installed at the southeastern end of the proposed dam. These signs shall indicate:

- The presence of special-status plant populations
- Habitat of the special-status plant species
- The sensitive nature of their habitat including the sensitive nature of serpentine grassland communities
- Importance of minimizing disturbance in the general area, and
- Prohibition of visitors to the southern serpentine slope.

ACCESS BY CATTLE

Cattle have the potential to damage the populations of the special-status plant species by feeding on them, trampling them, and increasing erosion of their habitat. The *Grassland Restoration and Enhancement Plan* discusses fencing to protect the native grassland on the southern serpentine slope. (See Plan G-8, Site Fencing Plan and Details, prepared by Bookman-Edmonston). This protection measure for native grasslands will also protect special-status plant species.

REVIEW OF ARCHAEOLOGICAL RECOMMENDATIONS FOR MITIGATION OF IMPACTS

BIG ROCK RANCH
MARIN COUNTY
CALIFORNIA

March 1999

Prepared for:

Lucasfilm Ltd.
c/o Conversion Management Associates, Inc.
121 Spear Street, Suite B-10
San Francisco, CA 94105

Prepared by:

Richard E. Thompson, Jr., Principal Investigator
Archaeor, Archaeological Consultants
44371 Camellia Drive
Fremont, CA 94539

Submitted by:

LSA Associates, Inc.
157 Park Place
Point Richmond, CA 94801
(510) 236-6810

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Executive Summary

In November 1998, Mr. Roger D. Harris of LSA Associates, Inc., Point Richmond, California authorized Archaeor, Archaeological Consultants, to review all architectural, civil, and landscaping plans for the Lucasfilm Master Plan located at Big Rock Ranch, Lucas Valley Road, Marin County, California. The purpose of this review is to determine if all current development plans for this project avoid impacts to three important archaeological resources located within the project area, and to provide recommendations regarding the mitigation of impacts to these resources if avoidance is not accomplished under the current development plan.

After examination of the location of the three known archaeological sites in the Big Rock Ranch development area (CA-Mrn-464, -465, and -495), it has been determined that the redesign, relocation, and elimination of various elements of the planned development has avoided significant impacts to petroglyph sites CA-Mrn-464 and -465. Relocation of the proposed roadway and bridge across Big Rock Creek has also reduced significant impacts to midden site CA-Mrn-495. Grading and construction for the new pond to be located along Big Rock Creek will not result in significant impacts to the intact portion of midden site CA-Mrn-495 (Map 4).

A physical site inspection was performed on December 3, 1998 in order to verify the locations of these important archaeological resources and to determine if avoidance of these resources was accomplished under the current development plan. During this site inspection, an archaeological field survey was also performed in those areas which are located within the current Proposed Plan Limits of Disturbance that were not recently surveyed, including the relocated site of the new Archives and Maintenance/Management buildings (Map 6).

Except for one unifacially-worked quartzite scraper discovered in the backdirt of a geologic test trench in the area of the leach-field (Map 5), surface indicators of potential historic or prehistoric cultural deposits were not observed on the surface of the surveyed portion of the current Proposed Plan Limits of Disturbance including the relocated site of the new Archives and Maintenance/ Management buildings. This artifact represents an isolated find and the likelihood that an important prehistoric cultural resource is located in the area of the leach-field should be considered low.

Based on the current Proposed Plan Limits of Disturbance for the Big Rock Ranch development area, the impacts to the intact portion of midden site CA-Mrn-495 have been reduced to a less-than-significant level, however, the previously disturbed remainder of the site will be impacted by grading and construction of the new pond (Map 4). It should be considered likely that during grading and construction of the new pond along Big Rock Creek where midden site CA-Mrn-495 is located will result in the discovery of isolate human remains since the site is known to contain human burials.

Therefore, it has been recommended that once construction begins, all construction activities in and adjacent to CA-Mrn-495 should be monitored by a professional archaeologist and the Native American community should be consulted on all aspects of development in this area. Other recommendations for this project include the implementation of the Conditions of Approval 36, 37, and 38 of Exhibit 3 of the Marin County Community Development Agency Staff Recommendations to the Board of Supervisors for this project (County of Marin 1996).

Introduction

In November 1998, Mr. Roger D. Harris of LSA Associates, Inc., Point Richmond, California authorized Archaeor, Archaeological Consultants, to review all architectural, civil, and landscaping plans for the Lucasfilm Master Plan located at Big Rock Ranch, Lucas Valley Road, Marin County, California. The purpose of this review is to determine if all current development plans for this project avoid impacts to important archaeological resources located within the project area, and to provide recommendations regarding the mitigation of impacts to these resources if avoidance is not accomplished under the current development plan.

Plans and documents submitted to Archaeor, Archaeological Consultants for this review included:

- Environmental Impact Report (EIR) section 5.6 "Archaeological and Historical Resources" for this project;

- "Draft Technical Report on Archaeological and Historic Resources", Lucasfilm Master Environmental Impact Report, LSA Associates, Inc., 21 November 1995;

- "Exhibit 3", Marin County Conditions of Approval for this project;

- "Letter of 2/6/96 with reference to archaeological site treatments", Roger D. Harris, Principal, LSA Associates, Inc. to Tim Haddad, Environmental Coordinator, Marin County Community Development Agency;

- "Archaeological Test Excavations at CA-Mrn-464, CA-Mrn-465 and CA-Mrn-495, Big Rock Ranch, Marin County, California", prepared by David Chavez & Associates, August 1995;

- "Existing Topography" map showing project area contours, the Master Plan Limits of Disturbance and the Proposed Plan Limits of Disturbance; and,

- "Proposed Site Plan" map showing project area contours and development features.

In addition to this review, a physical site inspection was performed in order to verify the locations of these important archaeological resources and to determine if avoidance of these resources was accomplished under the current development plan. During this site inspection, an archaeological field survey was also conducted in those areas located within the current Proposed Plan Limits of Disturbance which had not been recently surveyed.

The Lucasfilm Master Plan for the Big Rock development area proposes the development and construction of several buildings, roadways, bridges, a pond, and a reservoir. Based on the results of the archaeological investigations conducted by Chavez & Associates for the Lucasfilm Master EIR (Chavez 1995), it was determined that certain elements of this proposed plan would have a significant

impact on three important cultural resources as specified under Appendix K of the California Environmental Quality Act (CEQA). In accordance with conditions 33 through 35 of "Exhibit 3" of the Marin County Conditions of Approval for this project, these elements were redesigned or eliminated so as to avoid significant impacts to these resources.

This report presents an assessment of the current development plans in regards to the avoidance of the important archaeological resources located within the Big Rock Ranch development area of the Lucasfilm Master Plan and provides recommendations regarding further mitigation of impacts to these resources. This report also describes the details and results of the archaeological field survey that was conducted in those areas within the current Proposed Plan Limits of Disturbance which had not been recently surveyed.

All work performed for this report was conducted in accordance with current professional archaeological standards as outlined by the California Office of Historic Preservation. All recommendations for mitigation of impacts to important archaeological resources contained in this report are made under the guidelines specified in Appendix K of CEQA.

Project Area Location and Description

The Big Rock Ranch development area consists of approximately 56 acres within Big Rock Ranch and is located on the north side of Lucas Valley Road, 4 to 5 miles west of Highway 101 near the city of San Rafael, Marin County, California (Map 1).

Existing structures on the project area include a 1-story residence, a barn, and other various outbuildings located near the south entrance to the parcel at Lucas Valley Road. The site is bisected by Nicasio Creek in the eastern area of the parcel and Big Rock Creek to the west. Big Rock Creek feeds an existing reservoir located in the south area of the parcel. Site topography is characterized by moderately sloping land along the creeks, existing reservoir and Lucas Valley Road which transition to moderately-steep to steep hillslopes to the north and east. Elevations within the area of planned development range from 575 to approximately 825 feet above Mean Sea Level (Chavez 1995).

Vegetation at Big Rock Ranch is composed of woodland, grassland, scrub, chaparral, and riparian communities. Woodland vegetation occurs on north-facing slopes, the lower elevations of draws and ravines, and intermittently along the reaches of Nicasio and Big Rock Creeks. The woodlands give way to a savanna of scattered trees and open grassland towards the crests of ridges and hillside slopes. Scrub and chaparral vegetation occurs on the steeper, south-facing slopes midway up Big Rock Ridge and riparian corridors occur along the main channels of the major creeks.

The varied vegetation, available surface water, restricted human access and proximity to permanent open space and other undeveloped lands, all contribute to a variety of wildlife on the ranch property (Chavez 1995). For a more detailed description of the natural setting of the Big Rock Ranch, see Chavez 1995.

Project Description

The Lucasfilm Master Plan proposes the construction of facilities devoted to the development of multimedia products in the Big Rock Ranch development area. These facilities include an Archive/ Maintenance building, Main Office building, Daycare/Fitness Center and an Entry Kiosk. Other improvements include the construction of a reservoir, dam and spillway to be located along Big Rock Creek in the location of the existing reservoir, the addition of a new pond to be located along Big Rock Creek upstream from the existing reservoir, and the installation of a septic system with associated leach-field. Additional development also includes the construction of new roadways and a bridge spanning Big Rock Creek.

Ground-disturbing activities involved with this development will include initial site stripping and grading, cutting and filling for finish grade and building pads, excavation and grading for the reservoir and new pond, trenching for utilities and foundations, roadway and bridge construction, creek restoration, fencing, and landscaping.

Project History

As part of the preparation of the 1992 Draft EIR for the Lucasfilm Master Plan, an archaeological and historic resources records search and field survey was conducted for the Grady Ranch and Big Rock Ranch development areas in December 1991 and January 1992 by David Chavez & Associates (Chavez and Hupman 1992). Based on those investigations, it was determined that no archaeological or historical resources exist on Grady Ranch, however, three previously-recorded prehistoric archaeological sites were located on the Big Rock Ranch development area. An intensive archaeological field survey failed to identify any additional cultural resources on Big Rock Ranch, however, a single, isolated artifact in the form of an obsidian projectile point was found adjacent to the Redwood Canyon Road at an elevation of approximately 1,600 feet.

During this field survey, the three previously-recorded prehistoric archaeological sites (CA-Mrn-464, -465, and -495) were relocated and inspected (Map 2). They are described as follows:

- CA-Mrn-464 is a petroglyph site originally recorded in 1980 which consists of 76 carved or pecked cupules located on 12 separate serpentine outcroppings.

- CA-Mrn-465 is a petroglyph site, also recorded in 1980, with over 100 pecked cupules and pecked curvilinear nucleated (PCN) forms on at least 6 chorite schist outcroppings.

- CA-Mrn-495 consists of a midden deposit, possibly a habitation site, with chert and obsidian debitage. Recorded in 1980, the site was reported as having a dirt road transecting the midden area. Field observations in early 1992 revealed that an additional road cut had further disturbed the depositional integrity of the midden deposit.

In the spring of 1995, as part of the Lucasfilm Master Plan EIR, sub-surface archaeological test excavations were conducted by David Chavez & Associates to determine if the three archaeological sites meet CEQA criteria for important cultural resources and if the resources would be subject to significant impacts based on the applicant's preliminary development plans for Big Rock Ranch (Chavez 1995). The objectives of the test excavations at the two petroglyph sites (CA-Mrn-464 and -465) were to determine if sub-surface cultural deposits were present surrounding the bedrock outcroppings that contained the petroglyphs, as well as to explore the cultural importance of the two rock art resources. The objectives of the test excavations at the midden site (CA-Mrn-495) were to define the areal boundaries and depth of the cultural deposits, explore the nature and depositional integrity of the site, and to determine if an important prehistoric resource was present (Nichols-Berman 1995).

Prior to commencing the field investigations, the California Native American Heritage Commission (NAHC) was advised of the planned excavations and local Native American consultant and Most Likely Descendant (MLD), Grant Smith, was retained to monitor the project.

Sub-surface investigations at petroglyph site CA-Mrn-464 failed to identify any sub-surface cultural materials and it was concluded that no prehistoric midden or other features are associated with this site. The boundaries of this resource include the knoll and the outcroppings where petroglyphs are located; all contained within a radius of 46 meters from the large outcropping at the top of the knoll.

Test excavations at petroglyph site CA-Mrn-465 did not locate any sub-surface cultural materials either, and it was concluded that no associated prehistoric midden or features are present at this site. The boundaries of this resources were established at an approximately 30 meter radius from the large petroglyph outcropping.

The archaeological sub-surface testing program at midden site CA-Mrn-495 consisted of the excavation of a total of 56 four-inch barrel hand-auger borings, six rapid-recovery 50x50 centimeter shovel test pits, and ten 1x1 meter formal test units, three of which were expanded shovel test pits. The 1x1 meter formal test units were placed at locations that promised data recovery results based upon the hand-auger boring and shovel test pit results.

The archaeological test excavations at midden site CA-Mrn-495 obtained sufficient information and data about the midden site to make definitive conclusions regarding the depositional integrity of the site, site boundaries and content. Much of the site appears to have been greatly disturbed as a result of the existing road cut through the center of the cultural deposit. Most of the site area southwest of the dirt road and creek juncture has been disturbed by grading and other land alteration activities. Some shell-midden is present at that location, however, it is extremely shallow and yielded no cultural artifacts or evidence of archaeological features. Site boundaries have been defined as a 60 meter (north/south) by 20 meter (east/west) area located parallel and east of Big Rock Creek.

The archaeological testing program at midden site CA-Mrn-495 revealed that the northeast area of the site contains an intact prehistoric midden deposit with at least two hearth-like features and human

burials (Chavez 1995). This area is defined as a 25 meter (north/south) by 20 meter (east/west) portion of the site located on the east side of Big Rock Creek, south of the crossing of the existing dirt road. Excavations in this depositionally intact portion of the site resulted in the discovery of three incomplete, prehistoric human burials. These were carefully exposed, documented and removed. The remains were individually boxed for transport and turned over to Grant Smith (MLD) for reburial by the Native American community. In addition, eight obsidian projectile points and one spear point were recovered in close association with the remains. Two carbon samples were collected from the burial locations as well as one sample from a hearth feature. Obsidian and chert debitage was also retrieved within this area.

Results of the sub-surface archaeological testing of the three Big Rock Ranch archaeological sites (CA-Mrn-464, -465, and -495) by Chavez & Associates in 1995 concluded that each site meets the criteria as an important cultural resource requiring mitigation of significant impacts as specified in Appendix K of CEQA.

The 1995 Chavez & Associates report indicated that the proposed development in the Big Rock Ranch development area of the Lucasfilm Master Plan would significantly impact these three important archaeological sites (Map 3).

Impacts to petroglyph site CA-Mrn-464 would have occurred during construction of the entrance road and a proposed "cut and cover" type tunnel immediately north of the knoll where the site is located. Additionally, grading and outcropping removal during construction of the Gate House/Manager's Office and Residence would also have resulted in significant impacts to this site.

It was also determined that grading and construction of the Archives building would result in significant impacts to petroglyph site CA-Mrn-465. As planned, the location of this building would have resulted in the total removal of the outcroppings containing both cupule and PCN-style rock art.

Grading and construction of a new roadway and bridge across Big Rock Creek, to be located in the northeast portion of midden site CA-Mrn-495, would have resulted in significant impacts to the most intact and archaeologically sensitive portion of this site.

The 1995 Chavez & Associates report provided appropriate mitigation measures to reduce the impacts to these important archaeological sites to a less-than-significant level. These mitigation measures were recommended under the guidelines specified in Appendix K of CEQA. The preferred mitigation measure for reducing significant impacts to important archaeological resources, as defined by CEQA, is avoidance. This mitigation measure was recommended for each of these three archaeological sites.

As a result of the mitigation measures recommended by Chavez & Associates in 1995, each element of the Lucasfilm Master Plan in the Big Rock Ranch development area which potentially created significant impacts to important cultural resources has been redesigned, relocated, or eliminated so as to avoid significant impacts to these resources.

Field Survey Methodology

An intensive archaeological field survey of those areas within the current Proposed Plan Limits of Disturbance of the Big Rock Ranch development area, which have not been recently surveyed, was conducted on December 3, 1998 by Mr. Richard Thompson, of Archaeor, Archaeological Consultants accompanied by Mr. Clint Kellner of LSA Associates, Inc. and Mr. Gary Johnson of Conversion Management Associates, Inc.

During this site visit, the three important archaeological sites in the Big Rock Ranch development area (CA-Mrn-464, -465, and -495) were located and inspected. In addition, those areas within the current Proposed Plan Limits of Disturbance not recently surveyed, including the relocated site of the new Archives and Maintenance/Management buildings, were examined for evidence of potentially significant cultural resources (Map 6). Based on the current Lucasfilm Master Plan for the Big Rock Ranch development area, a determination was made as to whether or not avoidance of these resources was accomplished under the current development plan.

An archaeological field survey is defined as:

> Inspection of all land surfaces that can reasonably be expected to contain visible archaeological resources. Every portion of the project area whose surface can be seen without major modification of vegetation, and where it is reasonably possible that human activities that would leave traces might be carried out, is inspected in a general surface reconnaissance. Every foot of ground is not necessarily covered. A general surface reconnaissance is the functional equivalent of a complete reconnaissance (investigation of every visible portion of the project area) in areas where soil, vegetation, or other conditions make it highly likely that some kinds of archaeological phenomena would be preserved, or where conditions obscure such phenomena to a point which they could not be observed without undertaking large scale brush clearing, grading, etc. (King, Morrato, and Leonard 1973; T. King 1978; Edwards 1979).

Typically, surface and/or sub-surface indicators of historic cultural deposits consist of one or more of the following: ruins and/or foundations of historic activities with or without associated ceramic, glass metal, and/or wood artifacts; a scatter of historic artifacts and debris without structural remains; the remains of water control systems (e.g., dams, irrigation canals, aqueducts, standpipes, reservoirs); the remains of historic transportation systems (railroads, bridges, roads, trails); the remains of mining and industrial activities (mine shafts, kilns, ovens); and historic "middens" (trash areas) or features (wells, cisterns, or privies).

Surface and/or sub-surface indicators of prehistoric cultural deposits typically consist of one or more of the following: stone flakes made of chert, jaspar, quartzite, quartz, basalt, obsidian, and other rock types; shell, animal bone, and/or fish bone; groundstone tools used for grinding seeds and other plant

foods, such as manos, metates, or bedrock mortars; other artifacts, such as arrow or spear points or fragments of pottery vessels; darker soil resulting from the residue of garbage and cooking hearths, called "midden"; and circular depressions representing the ruins of houses or ceremonial structures.

Ten meter zig-zag transects were used throughout the surveyed area. All exposed soils in the surveyed area were examined for indicators of cultural resources and all rodent-hole backdirt piles encountered were carefully trowelled. Every portion of the surveyed area whose surface could be seen without major modification of vegetation, and where it was reasonably possible that human activities would have left visible traces, was inspected. Ground surface visibility was poor throughout the surveyed area due to the dense vegetation on the surface of the parcel, although ground surface visibility was reasonably good along the riparian corridor of Big Rock Creek. Recent geologic test trenching had occurred in various areas throughout the parcel and the visible backdirt from these trenchings was also examined for evidence of cultural resources.

Field Survey Results

Except for one unifacially-worked quartzite scraper discovered in the backdirt of a geologic test trench in the area of the leach-field (Map 5), surface indicators of potential historic or prehistoric cultural deposits were not observed on the surface of the surveyed portion of the current Proposed Plan Limits of Disturbance in the Big Rock Ranch development area, including the relocated site of the new Archives and Maintenance/Management buildings. Most of the surface of the area was obscured by a dense cover of grasses and weeds, making a thorough examination of the surface soils impossible.

Approximately five geologic test trenches had been previously excavated in the area of the leach-field. After discovery of the unifacial quartzite scraper, each of the trench backdirt locations and exposed soils in this vicinity were carefully re-examined and no additional cultural materials were observed in the area. This artifact represents an isolated find and the likelihood that an important prehistoric cultural resource is located in the area of the leach-field should be considered low.

After examination of the location of the three known archaeological sites in the Big Rock Ranch development area (CA-Mrn-464, -465, and -495), and careful on-site review of the current plans and documents for the Lucasfilm Master Plan for the Big Rock Ranch development area, it has been determined that the redesign, relocation, and elimination of various elements of the planned development has avoided significant impacts to cultural resources CA-Mrn-464 and -465. Relocation of the proposed roadway and bridge across Big Rock Creek has also reduced significant impacts to midden site CA-Mrn-495 (Map 6). Grading and construction for the new pond, to be located along Big Rock Creek, will not result in significant impacts to the intact portion midden site CA-Mrn-495 (Map 4).

Summary and Conclusions

The Lucasfilm Master Plan for the Big Rock development area proposes the development and construction of several buildings, roadways, bridges, a new pond and a reservoir. Based on the results of sub-surface testing of the three Big Rock Ranch archaeological sites (CA-Mrn-464, -465, and -495) by Chavez & Associates in 1995, it was determined that each archaeological site meets the criteria as an important cultural resource as specified in Appendix K of CEQA. The 1995 Chavez & Associates report also indicated that the proposed development in the Big Rock Ranch development area of the Lucasfilm Master Plan would significantly impact these three important archaeological sites (Map 3).

The 1995 Chavez & Associates report provided appropriate mitigation measures to reduce the impacts to these important archaeological sites to a less-than-significant level. These mitigation measures were recommended under the guidelines specified in Appendix K of CEQA. The preferred mitigation measure for reducing significant impacts to important archaeological resources, as defined by CEQA, is avoidance. This mitigation measure was recommended for each of these sites. In accordance with conditions 33 through 35 of "Exhibit 3" of the Marin County Conditions of Approval for this project, these elements were redesigned, relocated, or eliminated so as to avoid significant impacts to these resources.

CA-Mrn-464

Impacts to petroglyph site CA-Mrn-464 would have occurred during construction of the entrance road and a proposed "cut and cover" type tunnel immediately north of the knoll where the site is located. Additionally, grading and outcropping removal during construction of the Gate House/Manager's Office and Residence would also have resulted in significant impacts to this site.

In accordance with Condition 33(a) of the Marin County Conditions of Approval for this project, Mitigation 5.6-1(a) of the Lucasfilm Master Plan EIR has been implemented for petroglyph site CA-Mrn-464. According to the current Proposed Plan Limits of Disturbance, relocation of the entrance road, elimination of the "cut and cover" tunnel, and elimination of the Gate House/Manager's Office and Residence has avoided significant impacts to the outcroppings that contain petroglyphs by placing all grading and facilities development outside the defined site boundary radius from the large outcropping at the top of the knoll.

CA-Mrn-465

It was also determined that grading and construction of the Archives and Maintenance/Management buildings would result in significant impacts to petroglyph site CA-Mrn-465. As planned, the location of this building would have resulted in the total removal of the outcroppings containing both cupule and PCN-style rock art.

In accordance with Condition 34(a) of the Marin County Conditions of Approval for this project,

Mitigation 5.6-2(a) of the Lucasfilm Master Plan EIR has been implemented for petroglyph site CA-Mrn-465. According to the current Proposed Plan Limits of Disturbance, the location of the Archives building has been revised to avoid the petroglyph outcroppings by relocating the building site completely outside the 30-meter radius of the archaeological site boundary (Map 6).

CA-Mrn-495

Grading and construction of a new roadway and bridge across Big Rock Creek, to be located in the northeast portion of midden site CA-Mrn-495, would have resulted in significant impacts to the most intact and archaeologically sensitive portion of this site.

In accordance with Condition 35(a) of the Marin County Conditions of Approval for this project, Mitigation 5.6-3(a) of the Lucasfilm Master Plan EIR has been implemented for midden site CA-Mrn-495. According to the current Proposed Plan Limits of Disturbance, the locations of the access road and the bridge across Big Rock Creek have been altered to avoid the entire CA-Mrn-495 midden site by relocating the road alignment and bridge outside the 60 x 20 meter site boundary and completely avoiding the 25 x 20 meter location of intact, important archaeological deposits (Map 4).

After examination of the location of the three known archaeological sites in the Big Rock Ranch development area (CA-Mrn-464, -465, and -495), and careful on-site review of the current plans and documents for the Lucasfilm Master Plan for the Big Rock Ranch development area, it has been determined that the redesign, relocation, and elimination of various elements of the planned development has avoided significant impacts to petroglyph sites CA-Mrn-464 and -465. Relocation of the proposed roadway and bridge across Big Rock Creek has also reduced significant impacts to midden site CA-Mrn-495. Grading and construction for the new pond to be located along Big Rock Creek will not result in significant impacts to the intact portion of midden site CA-Mrn-495 (Map 4).

A physical site inspection was performed on December 3, 1998 in order to verify the locations of these important archaeological resources and to determine if avoidance of these resources was accomplished under the current development plan. During this site inspection, an archaeological field survey was also performed in those areas which are located within the current Proposed Plan Limits of Disturbance that were not recently surveyed, including the relocated site of the new Archives and Maintenance/Management buildings (Map 6).

Except for one unifacially-worked quartzite scraper discovered in the backdirt of a geologic test trench in the area of the leach-field, surface indicators of potential historic or prehistoric cultural deposits were not observed on the surface of the surveyed portion of the current Proposed Plan Limits of Disturbance in the Big Rock Ranch development area or in the area of the relocated site of the new Archives and Maintenance/Management buildings. After discovery of the unifacial quartzite scraper, each of the trench backdirt locations and exposed soils in this vicinity were carefully re-examined and no additional cultural materials were observed in the area. This artifact represents an isolated find and the likelihood that an important prehistoric cultural resource is located in the area of the leach-field should be considered low.

Recommendations

Significant Impacts Criteria

According to Appendix K of CEQA and Appendix N of the Marin County Environmental Impact Review Guidelines and Procedures, a project would normally have a significant effect on a cultural resource if it would:

- Disrupt a prehistoric or historic archaeological site or a property of historic or cultural significance to the community or ethic or social group or a paleontological site except as part of a scientific study.

- Affect a local landmark of local cultural/historical importance.

Under Appendix K of CEQA, if the Lead Agency determines that a project may affect an archaeological resource, the agency shall determine whether the affect may have a significant effect on the environment. If the project may cause damage to an important archaeological resource, the project may have a significant impact on the environment. A project impact is considered significant if it would result in damage to or disturbance of important archaeological and historic resources. For the purposes of CEQA, an "important archaeological resource" is one which:

A. Is associated with an event or person of:

   1. Recognized significance in California or American history, or

   2. Recognized scientific importance in prehistory.

B. Can provide information which is both of demonstrable public interest and useful in addressing scientifically consequential and reasonable or archaeological research questions;

C. Has a special or particular quality such as oldest, best example, largest, or last surviving example of its kind;

D. Is at least 100 years old and possesses substantial stratigraphic integrity; or

E. Involves important research questions that historical research has shown can be answered only with archaeological methods.

Based on the results of sub-surface testing of the three Big Rock Ranch archaeological sites (CA-Mrn-464, -465, and -495) by Chavez & Associates in 1995, it has been determined that each of these archaeological sites meet the criteria as an important cultural resource requiring mitigation of impacts as specified in Appendix K of CEQA.

Impacts and Mitigation Measures

Implementation of the Lucasfilm Master Plan for the Big Rock Ranch development area, with the redesign, relocation, and elimination of the various elements incorporated in the current Proposed Plan Limits of Disturbance reviewed for this report, has:

1. Reduced impacts to petroglyph site CA-Mrn-464 to a less-than-significant level;

2. Reduced impacts to petroglyph site CA-Mrn-465 to a less-than-significant level; and,

3. Reduced impacts to the intact portion of midden site CA-Mrn-495 to a less-than-significant level.

Recommendation 1 - Implementation of the Lucasfilm Master Plan for the Big Rock Ranch development area with the various elements incorporated in the current Proposed Plan Limits of Disturbance would result in the construction of a pond near the location of the most intact and archaeologically important portion of the site. Grading and construction activities of the pond will impact the previously disturbed area of CA-Mrn-495, near the intact area where important prehistoric archaeological features have been investigated and where prehistoric human burials have been found.

Based on the current Proposed Plan Limits of Disturbance for the Big Rock Ranch development area, the impacts to the intact portion of midden site CA-Mrn-495 have been reduced to a less-than-significant level, however, the previously disturbed remainder of the site will be impacted by grading and construction of the new pond. It should be considered likely that during grading and construction of the new pond along Big Rock Creek where midden site CA-Mrn-495 is located will result in the discovery of isolated human remains since the site is known to contain human burials.

Therefore, it is highly recommended that once construction begins, all construction activities in and adjacent to CA-Mrn-495 should be monitored by a professional archaeologist. The Native American community should be consulted on all aspects of development in this area. Should isolated human remains be encountered during construction in this area, a Native American consultant and Most Likely Descendant should be present during all archaeological activities associated with the retrieval of any human remains.

All archaeological excavation and monitoring activities should be conducted in accordance with prevailing professional standards as outlined in Appendix K of CEQA and by the California Office of Historic Preservation. Detailed technical reports should be prepared following all archaeological excavations and monitoring.

Potential Disturbance of Other Important Cultural Resources

The absence of surface evidence within the project area does not preclude the possibility that unknown cultural deposits exist below the ground surface and could be encountered during land alteration activities. This a potentially significant impact.

As per the Conditions of Approval 36, 37, and 38 of Exhibit 3 of the Marin County Community Development Agency Staff Recommendations to the Board of Supervisors for this project (County of Marin 1996), the following mitigation measures would reduce impacts to potential cultural resources to a less-than-significant level:

- A pre-construction seminar should be held in which the project archaeologist would present information about the potential for and nature of potential buried archaeological deposits in the construction areas, and how to identify cultural deposits. Participants at this seminar should minimally include: a representative of the Client, the Lead County Inspector for this project, the job-site Superintendent, and all construction Supervisors.

- If any cultural deposits are encountered, all construction within 30 feet of the finds should be halted and a qualified archaeologist should be consulted. The archaeologist should conduct an independent review of the find, with authorization of and under direction of the County. Prompt evaluations should be made regarding the significance and importance of the finds and a course of action acceptable to all parties should be adopted. If mitigation is required, the first priority shall be for avoidance and preservation of the resource. If avoidance is not feasible, then an alternative plan that may include excavation should be prepared. All archaeological excavation and monitoring activities should be conducted in accordance with prevailing professional standards as outlined in Appendix K of CEQA and by the California Office of Historic Preservation.

- During initial ground-disturbing activities nearby the known midden and petroglyph sites, full-time monitoring should take place as recommended by the consulting archaeologist.

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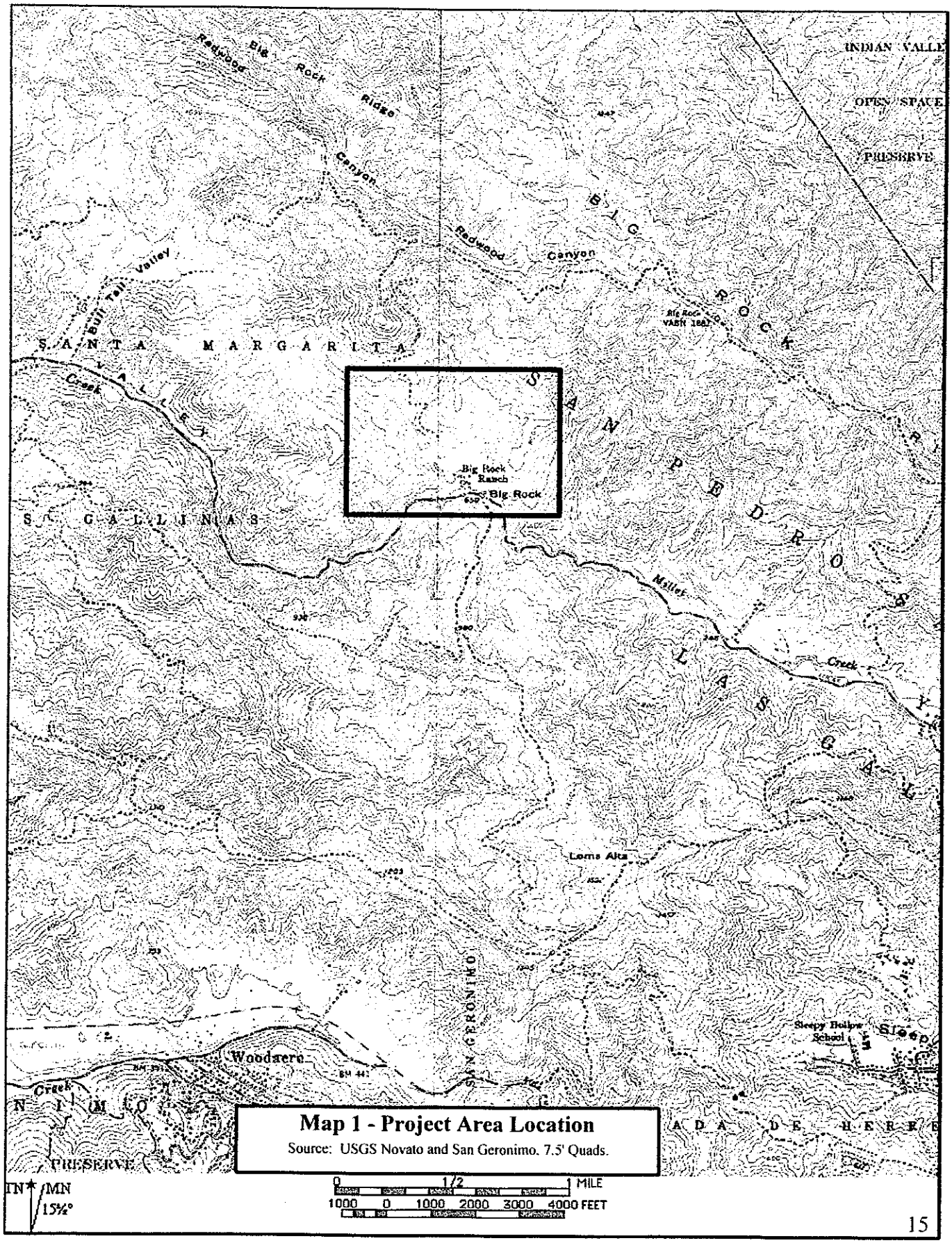
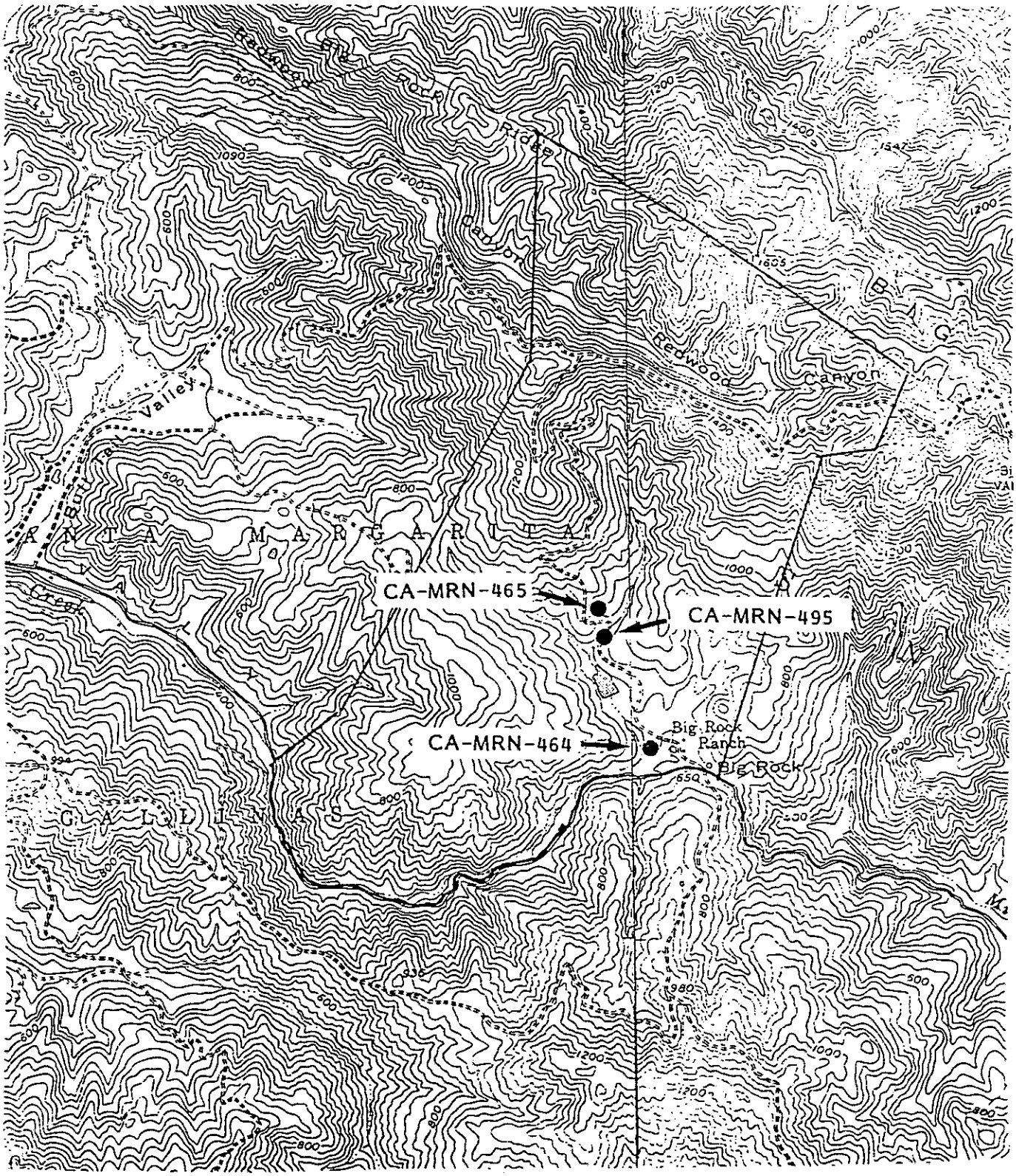


Map 1 - Project Area Location

Source: USGS Novato and San Geronimo. 7.5' Quads.



MAP 2

From: Chavez 1995

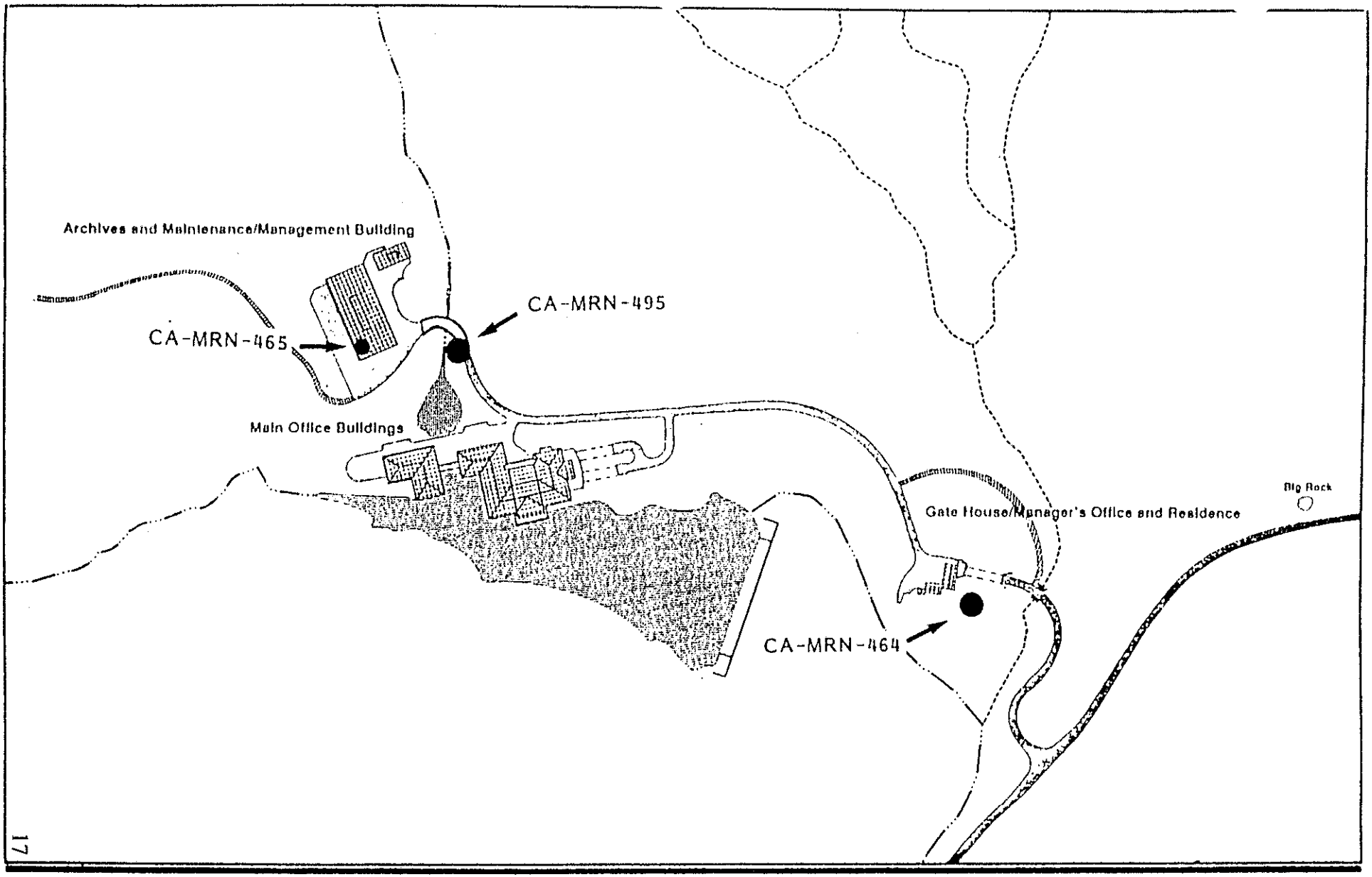
Big Rock Ranch Archaeological Sites

SOURCE: USGS Novato and San Geronimo, 7.5' Quads.

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

north



Map 3 - 1995 Big Rock Ranch Proposed Site Plan
From: Chavez 1995

0 400
Scale

Source: Lucashim Ltd. and Nichols-Berman

North

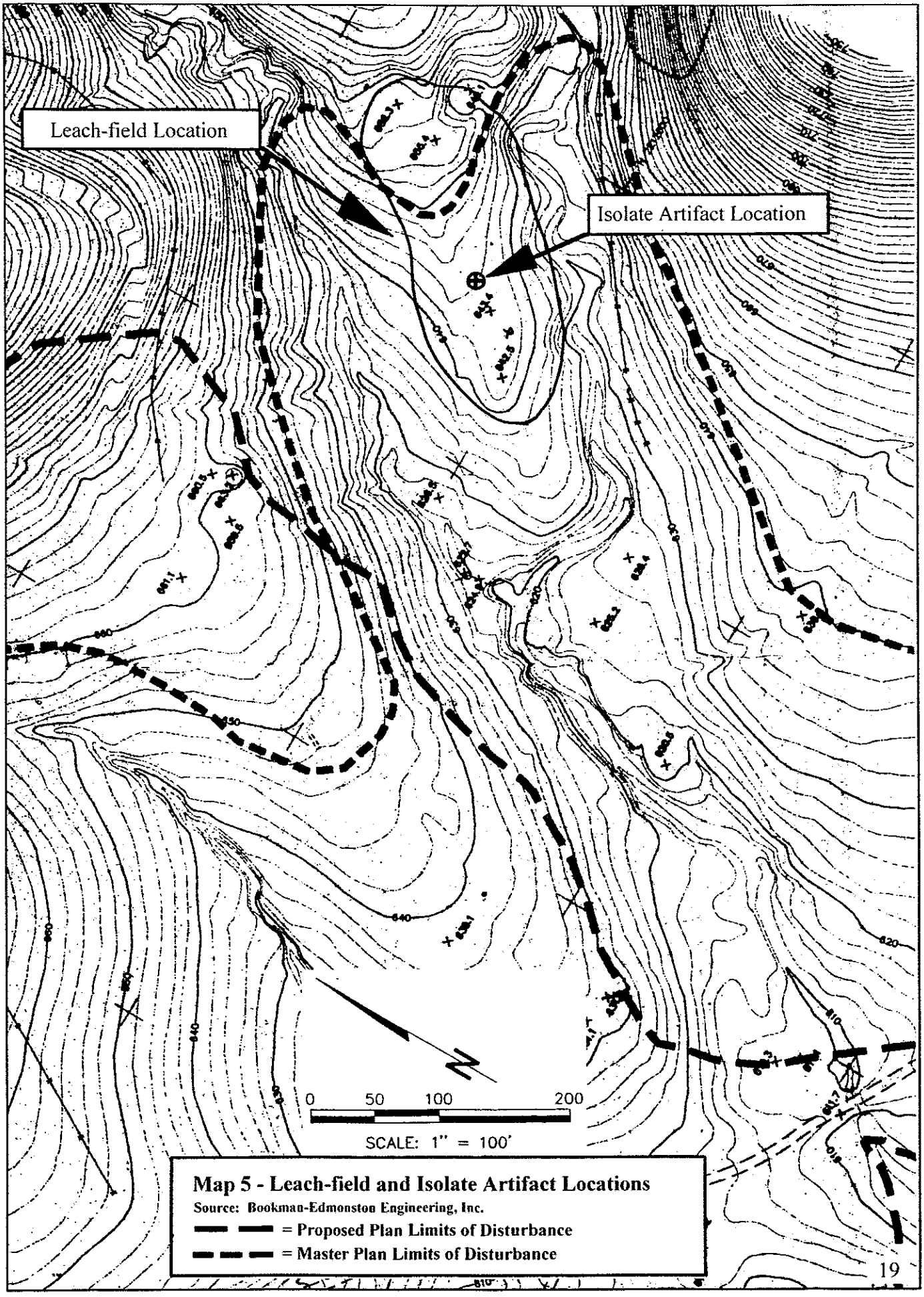
Map 4 - 12/28/98 Site Plan Showing New Pond

Source: Bookman-Edmonston Engineering, Inc.

= Boundary of midden site CA-Mrn-495

= Area of excavation for new pond

= Area of significant cultural deposit

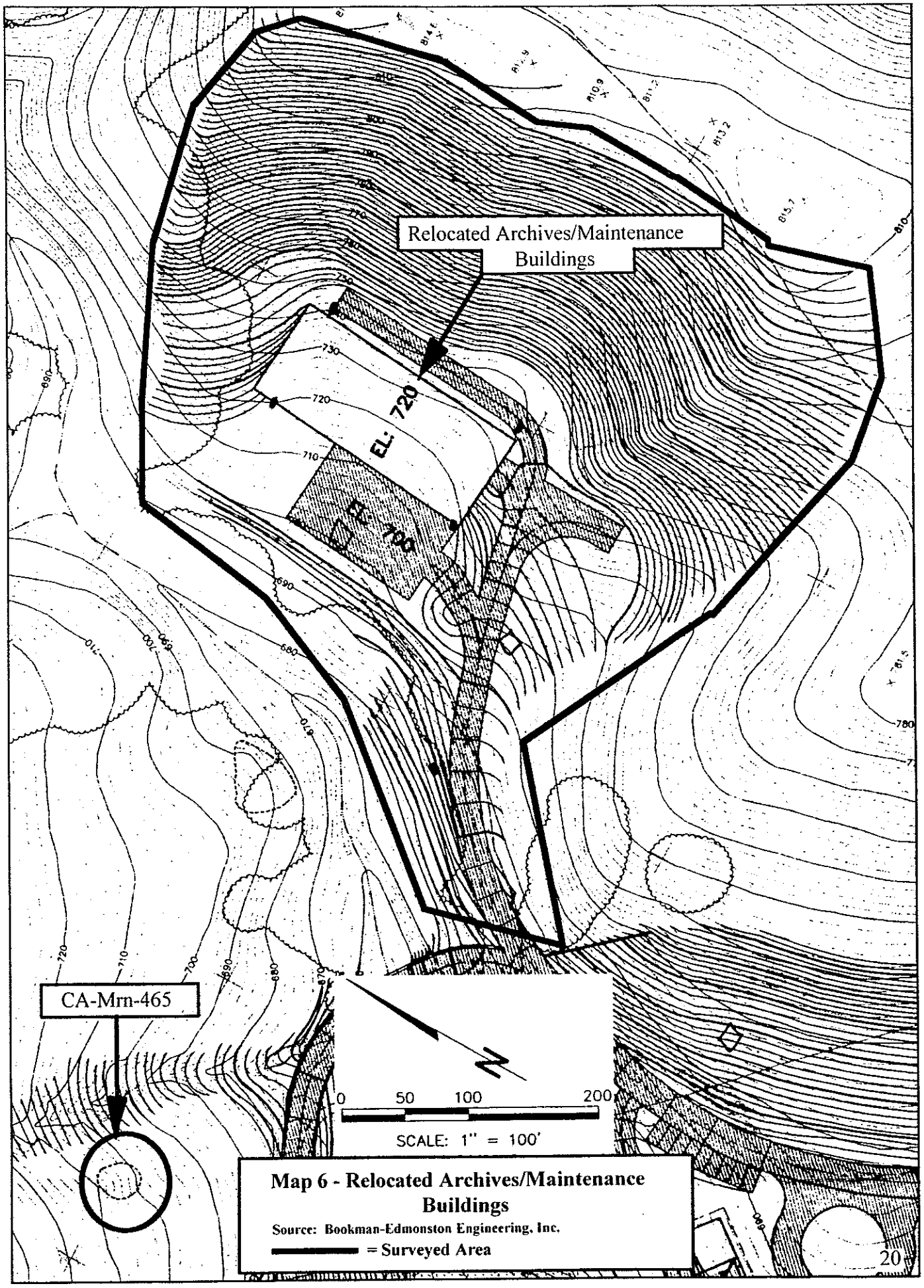


Map 5 - Leach-field and Isolate Artifact Locations

Source: Bookman-Edmonston Engineering, Inc.

= Proposed Plan Limits of Disturbance

= Master Plan Limits of Disturbance



Map 6 - Relocated Archives/Maintenance Buildings

Source: Bookman-Edmonston Engineering, Inc.

= Surveyed Area