MINUTE ITEM
This Calendar Item No. C24.
was approved as Item
No. 24 by the State Lands
Commission by a vote of 2
to 0 at its 8.22.79
meeting.

CALENDAR ITEM
C24.

8/79
WP 5331
Dorsey
PRC 5331

DREDGING PERMIT

APPLICANT: Tahoe Keys Property
Owners Association
P. O. Box 10470
South Lake Tahoe, California 95731

AGENT: c/o Creegan & D'Angelo
Consulting Engineers
P. O. Box X
Zephyr Cove, Nevada 89448

AREA, TYPE LAND AND LOCATION:
Submerged lands in the bed of Lake Tahoe at Tahoe Keys West Channel, South Lake Tahoe, El Dorado County.

LAND USE: Dredge 3,000 cubic yards of material to clear west entrance channel to Tahoe Keys Lagoon.

TERMS OF PROPOSED PERMIT:
Initial period: 1 year from August 1, 1979.

BASIS FOR CONSIDERATION:
$0.25 royalty per cubic yard for dredge spoils placed on private property.

PREREQUISITE TERMS, FEES AND EXPENSES:

Applicant is owner of upland.

Filing fee and processing costs have been received.

STATUTORY AND OTHER REFERENCES:
A. P.R.C.: Div. 6, Parts 1 & 2.

B. Cal. Adm. Code: Title 2, Div. 3.

OTHER PERTINENT INFORMATION:
1. This project is situated on State land identified as possessing significant environmental values pursuant to P.R.C.

A 7
S 13

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(Rev. 8/22/79)

6370.1, and is classified in a use category, Class B, which authorizes Limited Use.

Staff review indicates that there will be no significant effect upon the identified environmental values.

2. A negative declaration was prepared by the Commission's staff pursuant to CEQA and implementing regulations.

APPROVALS OBTAINED:
California Regional Water Quality Control Board, Lahontan Region; California Department of Fish & Game, Tahoe Regional Planning Agency.

FURTHER APPROVALS REQUIRED:
United States Army Corps of Engineers.

EXHIBITS: A. Land Description. B. Location Map.
C. Negative Declaration.

IT IS RECOMMENDED THAT THE COMMISSION:

1. DETERMINE THAT AN EIR HAS NOT BEEN PREPARED FOR THIS PROJECT BUT THAT A NEGATIVE DECLARATION HAS BEEN PREPARED BY THE COMMISSION'S STAFF.

2. CERTIFY THAT THE NEGATIVE DECLARATION NO. 246 HAS BEEN COMPLETED IN COMPLIANCE WITH THE CEQA OF 1970, AS AMENDED, AND THE STATE EIR GUIDELINES, AND THAT THE COMMISSION HAS REVIEWED AND CONSIDERED THE INFORMATION CONTAINED THEREIN.

3. DETERMINE THAT THE PROJECT WILL NOT HAVE A SIGNIFICANT EFFECT ON THE ENVIRONMENT BECAUSE OF MITIGATION MEASURES INCLUDED IN THE PROJECT.

4. FIND THAT GRANTING OF THE PERMIT WILL HAVE NO SIGNIFICANT EFFECT UPON ENVIRONMENTAL CHARACTERISTICS IDENTIFIED PURSUANT TO SECTION 6370.1 OF THE P.R.C., SUBJECT TO THE CONDITION THAT REPORTS BE MADE TO THE EXECUTIVE OFFICER IN COMPLIANCE OF THE BEACH MONITORING PLAN

AND THAT IN THE EVENT THE PROJECT IS FOUND TO CAUSE SUBSTANTIAL BEACH EROSION THE COMMISSION RETAINS JURISDICTION AND HEREBY DELEGATES TO THE EXECUTIVE OFFICER THE AUTHORITY TO MODIFY THE TERMS OF THE PERMIT AS HE MAY FIND NECESSARY IN ORDER TO PREVENT SUCH EROSION.

5. AUTHORIZE ISSUANCE TO TAHOE KEYS PROPERTY OWNERS ASSOCIATION OF A 1-YEAR DREDGING PERMIT FROM AUGUST 1, 1979, FROM THE LAND DESCRIBED AS EXHIBIT "A" ATTACHED AND BY REFERENCE MADE A PART HEREOF IN CONSIDERATION OF PAYMENT OF $0.25 PER CUBIC YARD ROYALTY FOR DREDGED MATERIAL REMOVED FROM STATE LANDS AND DEPOSITED ON PRIVATE LANDS ADJACENT TO THE DREDGING SITE.

EXHIBIT "A"

WP 5331

LAND DESCRIPTION

A strip of land 100 feet wide, in the bed of Lake Tahoe, El Dorado County, California, said strip being 50 feet on each side of the following described centerline:

BEGINNING at the intersection of the centerline of an existing dredged channel, known as Tahoe Keys West Entrance Channel, with the ordinary high water mark of Lake Tahoe, said intersection located in Lot 3, Section 5, T12N, R18E, MDM, as shown on the Official Township Plat, dated July 8, 1875, thence in a northerly direction approximately 900 feet to a point on the 6217 foot elevation contour and the end of the herein described centerline.

END OF DESCRIPTION

Prepared Karl Kuszmaul Checked Gary A. Weldon

Reviewed [signature] Date May 24 '79

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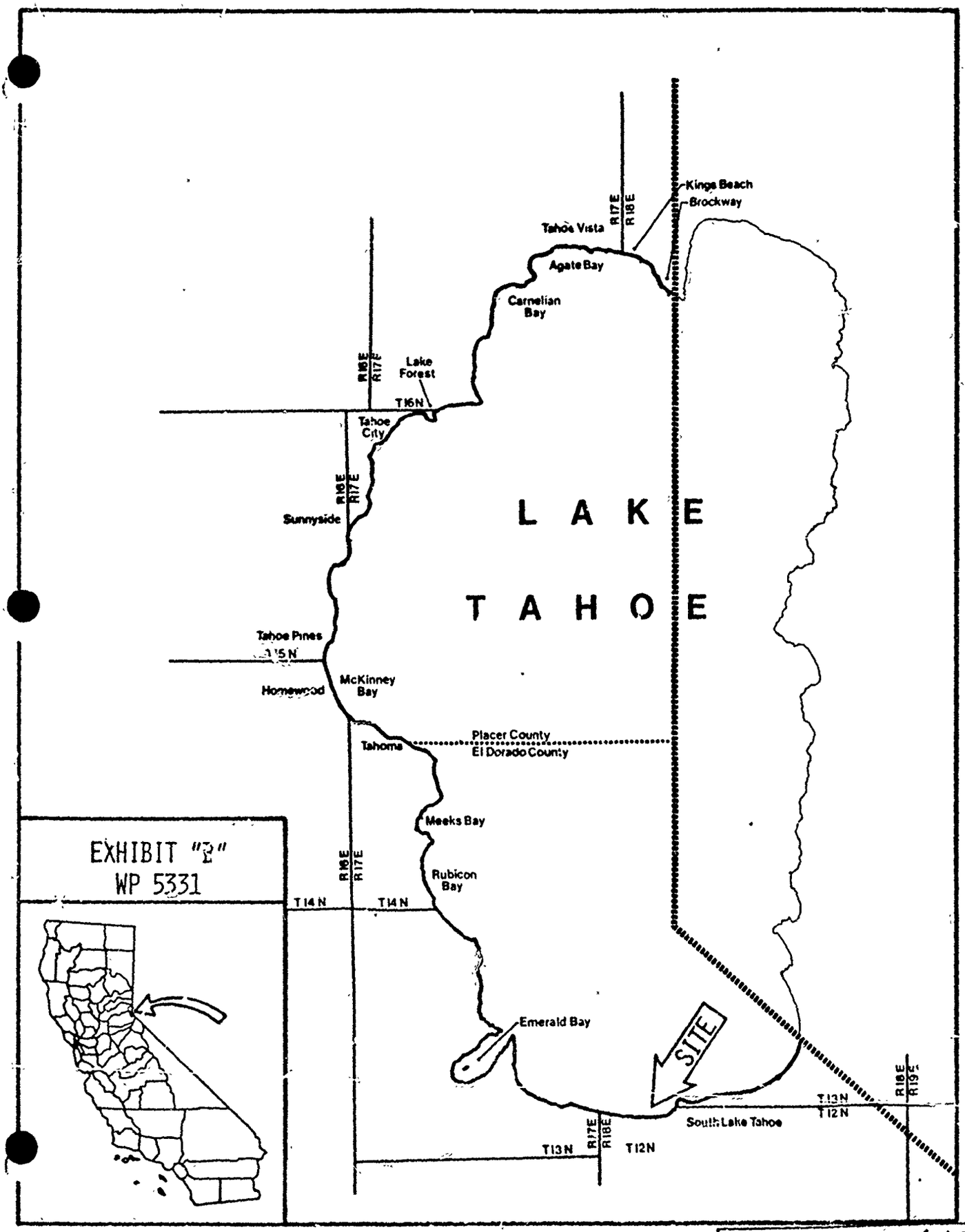


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EXHIBIT "C"

STATE OF CALIFORNIA
STATE LANDS COMMISSION

KENNETH CORY, Controller
LEO McCARTHY, Lieutenant Governor
RICHARD T. SILBERMAN, Director of Finance

EDMUND G. BROWN JR., Governor

EXECUTIVE OFFICE
1807 - 13th Street
Sacramento, California 95814

WILLIAM F. NORTHROP
Executive Officer

EIR ND 246

File Ref.: WP 5031

# NEGATIVE DECLARATION

Project Applicant: Tahoe Keys Homeowner's Association
P. O. Box 10470
South Lake Tahoe, CA 95731

Project Location: South Lake Tahoe, California
(Tahoe Keys)

Project Description: Proposal to dredge approximately 3,000 cubic yards of material from the bed of Lake Tahoe to form a 900 foot long entrance channel. The purpose of this action is to allow the passage of deep draft vessels (6' or 7') into Tahoe Keys.

This NEGATIVE DECLARATION is prepared pursuant to the requirements of the California Environmental Quality Act(Section 21000 et.seq. of the Public Resources Code), the State EIR Guidelines(Title 14, Section 15000 et. seq. of California Administrative Code), and the State Lands Commission regulations (Section 2901 et.seq. of California Administrative Code).

Based upon the attached Initial Study, the Commission finds that:

☐ the project will not have a significant effect on the environment.

☒ the mitigation measures included in the project will avoid potentially significant effects.

Contact Person: Randall L. Moory
State Lands Commission
1807-13th Street
Sacramento, CA 95814
(916) 322-7828

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## PERSONS CONTACTED

Roy Hampson, Lahontan Regional Water Quality Control Board

Bob Mapes, California Department of Fish and Game

Harry Gibson, California Tahoe Regional Planning Agency

Ron Schunk, Corps of Engineers

Gordon Barret, Tahoe Regional Planning Agency

Niel Walton, City of South Lake Tahoe

Virginia Huber, County of El Dorado

Diane Winerick, U. S. Fish and Wildlife Service

John Huddleson, Water Resources Control Board

## Mitigation Measures

Certain mitigation measures are proposed to alleviate potential environmental problems. In addition to the Waste Discharge Requirements, the applicant will institute a beach monitoring program to evaluate the conclusions developed by Dr. Wayne Engstrom in regards to littoral sediment transport. The beach monitoring program is attached.

Some Recommendations for a Simple Beach Monitoring Plan at Tahoe Keys

I would like to urge that a plan to monitor beach dimensions and beach processes at Tahoe Keys be developed for several reasons. First, the lack of accurate data was a handicap to the present analysis. Second, but more importantly, a beach monitoring system can provide information on whether the beach is eroding or advancing. Perhaps later when some data on beach processes has been collected, it may be possible to anticipate an episode of beach erosion. In what follows, I am going to suggest some inexpensive means of beach monitoring in the hope that they will prove suitable for the purposes at hand.

Information should be available on the beach material. In particular, an estimate of the amount of material dredged and removed in any operation should be recorded in order to anticipate the magnitude of any possible erosion resulting from the operation. The steps involved in arriving at the total loss of beach sediment over the life of the dredged channel are discussed in the present analysis. Also, the volume/area ratio for the beach should be determined by immediately repairing any beach erosion. This ratio could be then used to estimate the number of cubic yards needed to replace each square foot of beach. Details on the proper selection of borrow material are available in the Shore Protection Manual.

A record should be kept of the variations in beach width. Beach width should be periodically measured with a tape, perhaps at weekly intervals. Beach width can be measured from survey stakes placed well beyond the reach of erosion at roughly 200' intervals. It may be possible to employ trees or other permanently fixed objects instead of survey stakes in some parts of the Keys. Measurements made from Budlong's Burton Tree (see Figure 26, p. 63 in his thesis for the location of the tree) would be particularly useful since a series of beach width measurements have already been made from the tree by Budlong. Particularly critical would be those measurements of beach width taken within 200-400' on both sides of the east and west channels where the maximum erosion is most likely to occur. Also, beach width measurements might be taken at more frequent intervals during stormy periods when the lake level is high.

In order to anticipate beach erosion at Tahoe Keys, it would be useful to monitor beach processes at the same time the beach width was being measured. Lake level and the characteristics of the waves are the critical variables. A graduated rod could be attached to the pier in order to estimate wave height and the water level. The wave height is given by the vertical distance from the wave crest to the wave trough while the water level is given by a plane midway between wave crest and wave trough. The direction of wave approach should also be noted. Another possibly useful wave characteristic is the wave period, the time it takes for two successive wave crests to pass a point. The wave period may be estimated, for example, by counting the number of waves passing a pier piling in a minute and then dividing that figure into 60 seconds. By graphing the relations between beach width and lake level and between beach width and the several wave characteristics, the variable(s) showing the strongest correlation with beach width can be identified and then be more closely monitored. Variables showing a weak correlation with beach width may then be discarded from the monitoring program. We can expect beach erosion to be associated with high lake levels and high, frequent waves while beach advance usually occurs when the lake level is low and the waves are low and infrequent.

In closing, I would like to note that it is desirable to standardize the beach monitoring operation as much as possible. This can be achieved by having only a single observer, insofar as possible, make the all the wave and water level observations since these subjective estimates will probably vary from individual to individual. Standardization of the beach width values can be achieved by measuring the width to the farthest inland penetration of the water brought shoreward by the waves (termed swash).

Wayne N. Engstrom

Wayne N. Engstrom, Ph.D.
Coastal Geomorphologist
June 29, 1979

File Ref.: WP 5331

# INITIAL STUDY CHECKLIST

## I. BACKGROUND INFORMATION

A. Applicant: Tahoe Keys Homeowners' Association
P. O. Box 10470
South Lake Tahoe, CA 95731

B. Checklist Date: 7 / 2 / 79 .

C. Contact Person: Randall L. Moory
Telephone: (916)322-7828

D. Purpose: To permit vessels to enter into the Tahoe Keys Marina.

E. Location: South shore of Lake Tahoe.

F. Description: The applicant proposes to dredge a maximum of 3,000 cubic yards of material from the bed of Lake Tahoe to form approximately a 900 foot channel outward from the west channel entrance to Tahoe Keys. Dredging

is to be performed by using a suction dredge mounted on a floating barge; a slurry of dredged material and water is to be pumped from the suction inlet to onshore earthen storage/percolation ponds located parallel to Beach Drive, between Beach Drive and Lake Tahoe. Waste discharge requirements have been put on the applicant by the Lahontan Regional Water Quality Control Board which place restrictions on the areas where dredging may occur, the amount of material that may be dredged, the lowest elevation to which the lake bottom may be dredged, and locations where dredged material may be stored and/or ultimately disposed. The requirements also specify that impermeable barriers shall be erected to separate dredging areas from adjacent waters of Lake Tahoe if turbidity limitations specific to given distances from the suction inlet of the dredge are violated.

G. Persons Contacted: California Tahoe Regional Planning Agency. (CTRPA)

II. ENVIRONMENTAL IMPACTS
(Explain all "yes" and "maybe" answers)

| | Yes | Maybe | No |
|---|---|---|---|
| A. Earth. Will the proposal result in: | | | |
| 1. Unstable earth conditions or in changes in geologic substructures? | ☐ | ☒ | ☐ |
| 2. Disruptions, displacements, compaction, or overcovering of the soil? | ☐ | ☐ | ☒ |
| 3. Change in topography or ground surface relief features? | ☒ | ☐ | ☐ |
| 4. The destruction, covering, or modification of any unique geologic or physical features? | ☐ | ☐ | ☒ |
| 5. Any increase in wind or water erosion of soils, either on or off the site? | ☐ | ☐ | ☒ |
| 6. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet, or lake? | ☐ | ☒ | ☐ |
| 7. Exposure of people or property to geologic hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards? | ☐ | ☐ | ☒ |
| B. Air. Will the proposal result in: | | | |
| 8. Substantial air emmissions or deterioration of ambient air quality? | ☐ | ☐ | ☒ |

| | Yes | Maybe | No |
|---|---|---|---|
| 9. The creation of objectionable odors? | ☐ | ☐ | ☒ |
| 10. Alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally? | ☐ | ☐ | ☒ |
| C. Water. Will the proposal result in: | | | |
| 11. Changes in the currents, or the course or direction of water movements, in either marine or fresh waters? | ☐ | ☐ | ☒ |
| 12. Changes in absorption rates, drainage patterns, or the rate and amount of surface water runoff? | ☐ | ☐ | ☒ |
| 13. Alterations to the course or flow of flood waters? | ☐ | ☐ | ☒ |
| 14. Change in the amount of surface water in any water body? | ☐ | ☐ | ☒ |
| 15. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity? | ☒ | ☐ | ☐ |
| 16. Alteration of the direction or rate of flow of ground waters? | ☐ | ☐ | ☒ |
| 17. Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations? | ☐ | ☐ | ☒ |
| 18. Substantial reduction in the amount of water otherwise available for public water supplies? | ☐ | ☐ | ☒ |
| 19. Exposure of people or property to water related hazards such as flooding or tidal waves? | ☐ | ☐ | ☒ |
| D. Plant Life. Will the proposal result in: | | | |
| 20. Change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, and aquatic plants) ? | ☐ | ☐ | ☒ |
| 21. Reduction of the numbers of any unique, rare or endangered species of plants? | ☐ | ☐ | ☒ |
| 22. Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species? | ☐ | ☐ | ☒ |

| | Yes | Maybe | No |
|---|---|---|---|
| 23. Reduction in acreage of any agricultural crop? | ☐ | ☐ | ☒ |
| **E. Animal Life. Will the proposal result in:** | | | |
| 24. Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, or insects)? | ☐ | ☐ | ☒ |
| 25. Reduction of the numbers of any unique, rare or endangered species of animals? | ☐ | ☐ | ☒ |
| 26. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals? | ☐ | ☐ | ☒ |
| 27. Deterioration to existing fish or wildlife habitat? | ☐ | ☐ | ☒ |
| **F. Noise. Will the proposal result in:** | | | |
| 28. Increase in existing noise levels | ☐ | ☒ | ☐ |
| 29. Exposure of people to severe noise levels? | ☐ | ☐ | ☒ |
| **G. Light and Glare. Will the proposal result in:** | | | |
| 30. The production of new light or glare? | ☐ | ☐ | ☒ |
| **H. Land Use. Will the proposal result in:** | | | |
| 31. A substantial alteration of the present or planned land use of an area? | ☐ | ☐ | ☒ |
| **I. Natural Resources. Will the proposal result in:** | | | |
| 32. Increase in the rate of use of any natural resources? | ☐ | ☐ | ☒ |
| 33. Substantial depletion of any nonrenewable resources? | ☐ | ☐ | ☒ |
| **J. Risk of Upset. Will the proposal result in:** | | | |
| 34. The involvement of a risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals, or radiation) in the event of an accident or upset conditions? | ☐ | ☐ | ☒ |
| **K. Population. Will the proposal result in:** | | | |
| 35. The alteration, distribution, density, or or growth rate of the human population of the area? | ☐ | ☐ | ☒ |

| | Yes | Maybe | No |
|---|---|---|---|
| L. Housing. Will the proposal result in: | | | |
| 36. Affecting existing housing, or create a demand for additional housing? | ☐ | ☐ | ☒ |
| M. Transportation/Circulation. Will the proposal result in: | | | |
| 37. Generation of substantial additional vehicular movement? | ☐ | ☐ | ☒ |
| 38. Affecting existing parking facilities, or create a demand for new parking? | ☐ | ☐ | ☒ |
| 39. Substantial impact upon existing transportation systems? | ☐ | ☐ | ☒ |
| 40. Alterations to present patterns of circulation or movement of people and/or goods? | ☐ | ☐ | ☒ |
| 41. Alterations to waterborne, rail, or air traffic? | ☐ | ☐ | ☒ |
| 42. Increase in traffic hazards to motor vehicles, bicyclists, or pedestrians ? | ☐ | ☐ | ☒ |
| N. Public Services. Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas: | | | |
| 43. Fire protection? | ☐ | ☐ | ☒ |
| 44. Police protection? | ☐ | ☐ | ☒ |
| 45. Schools? | ☐ | ☐ | ☒ |
| 46. Parks and other recreational fasilities? | ☐ | ☐ | ☒ |
| 47. Maintenance of public facilities, including roads? | ☐ | ☐ | ☒ |
| 48. Other governmental services? | ☐ | ☐ | ☒ |
| O. Energy. Will the proposal result in: | | | |
| 49. Use of substantial amounts of fuel or energy? | ☐ | ☐ | ☒ |
| 50. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy? | ☐ | ☐ | ☒ |

| | Yes | Maybe | No |
|---|---|---|---|
| P. Utilities. Will the proposal result in a need for new systems, or substantial alterations to the following utilities: | ☐ | ☐ | ☒ |
| 51. Power or natural gas? | ☐ | ☐ | ☒ |
| 52. Communication systems? | ☐ | ☐ | ☒ |
| 53. Water? | ☐ | ☐ | ☒ |
| 54. Sewer or septic tanks? | ☐ | ☐ | ☒ |
| 55. Storm water drainage? | ☐ | ☐ | ☒ |
| 56. Solid waste and disposal? | ☐ | ☐ | ☒ |
| Q. Human Health. Will the proposal result in: | | | |
| 57. Creation of any health hazard or potential health hazard (excluding mental health)? | ☐ | ☐ | ☒ |
| 58. Exposure of people to potential health hazards? | ☐ | ☐ | ☒ |
| R. Aesthics. Will the proposal result in: | | | |
| 59. The obstruction of any scenic vista or view open to the public, or will the proposal result in the creation of an aesthetically offensive site open to public view? | ☐ | ☐ | ☒ |
| S. Recreation. Will the proposal result in: | | | |
| 60. An impact upon the quality or quantity of existing recreational opportunities? | ☒ | ☐ | ☐ |
| T. Archeological/Historical. Will the proposal result in: | | | |
| 61. An alteration of a significant archeological or historical site, structure, object, or building? | ☐ | ☐ | ☒ |
| U. Mandatory Findings of Significance. | | | |
| 62. Does the project have the potential to degrade the quality of the environment reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory? | ☐ | ☐ | ☒ |

| | Yes | Maybe | No |
|---|---|---|---|
| 63. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? | ☐ | ☐ | ☒ |
| 64. Does the project have impacts which are individually limited, but cumulatively considerable? | ☐ | ☐ | ☒ |
| 65. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly? | ☐ | ☐ | ☒ |

## III. DISCUSSION OF ENVIRONMENTAL EVALUATION

Item

A.1 Certain questions regarding shorezone stability have been raised by CTRPA. A copy of the questions and answers provided by the applicant's consultant are included.

A.3 The project will create a channel in a gently sloping shelf.

A.6 See A.1.

B.15 The project could generate substantial turbidity, but is mitigated by the applicant's acceptance of the Waste Discharge Requirements.

F.28 The applicant's equipment will create some noise from compressor and other equipment associated with a suction dredge. Such noise may disturb some people on beaches or boating on the lake.

S.60 The proposed project will allow the mooring of large-deep draft vessels which will be able to use Lake Tahoe for boating.

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# CALIFORNIA TAHOE REGIONAL PLANNING AGENCY



June 21, 1979

Members of the Board
Lahontan Regional Water Quality Control Board
P. O. Box 14367
South Lake Tahoe, California 95702

Ref.: Tahoe Keys Dredging

Dear Board Members:

At today's meeting you will consider Board Order 6-79-34 to dredge a 900' long channel at Tahoe Keys. Attached is a CTRPA letter dated June 8, 1979 which addresses specific concerns about the physical impacts of this channel. The Board Order addresses the water quality aspects of the project in the findings and makes the finding that the project is catagorically exempt.

As an interested agency, the CTRPA staff requests the Board to address these specific questions during this meeting:

1. Have all environmental impacts of this project been addressed including the physical impacts addressed in our letter of June 8, 1979?

2. What length of the 900 foot long channel has been previously dredged?

3. Do the core samples go down to the bottom of the proposed channel?

4. Have all responsible agencies been contacted for their concerns?

5. The Tahoe Keys Property Owners Association has hired a consultant in shorezone geomorphology to conduct a study of the physical impacts of the proposed channel. Has his work been included in the research of the impacts of the channel?

If the answers to these previous questions raise any doubts as to the adequacy of the proposed findings, I strongly suggest that this Board Order be postponed until there is adequate information for you to make your findings on.

Sincerely,

Jim Baetge
Acting Executive Officer
Enclosure

JB:cb

| | |
|---|---|
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3053 Harrison Avenue ■ P.O. Box 14467, South Lake Tahoe, California 95702 ■ (916) 541-6770

# CALIFORNIA TAHOE REGIONAL PLANNING AGENCY



June 8, 1979

Mr. Roy Hampson
Executive Officer
Lahontan
P.O. Box 14367
South Lake Tahoe, CA 95702

RE: Tahoe Keys West Channel Dredging

Dear Mr. Hampson:

Your letter of May 24, 1979, stated that there was insufficient documentation that the proposal to dredge a 900' long channel was maintenance dredging. The letter went on to say that if additional documentation was not received, your staff would view the project as new dredging and proceed with the appropriate environmental documents.

To date, the CTRPA staff has not received any information which would indicate that the project is maintenance dredging. The staff must therefore assume that your review will take place as a new dredging project.

This Agency, acting as an interested agency, has specific concerns which we feel should be addressed in determining what form of environmental documents are required. These concerns have not been addressed in the tentative Waste Discharge requirements. The questions which we feel need to be addressed are as follows:

1. What is the direction of the prevailing drift at the channel site?
2. What is the strength of the prevailing drift?
3. Does the drift seasonally change directions?
4. Based on the surfzone approximation of the Longshore component of wave energy flux and the grain size sorting in the surfzone, what is the longshore transport rate where the channel is to go?
5. Will the proposed channel effect the longshore transport rate?
6. Will the channel effect the depositional pattern of the longshore load? If so, how and to what extent?
7. Will the proposed channel alter the refraction pattern of the waves, causing a change in the nearshore erosion and accretion patterns? If so, how and to what extent?

3053 Harrison Avenue ■ P.O. Box 14467, South Lake Tahoe, California 95702 ■ (916) 541-6770

8. Based on the information above and a lakelevel of 6,225, how long (months or years) will it take for the proposed channel to be filled in or return to the surrounding natural contours? How long to be partially filled in to the extent that the controlling depth requires additional dredging?

9. The nearest channel requiring approximately the same amount of dredging is the Tahoe Keys East Channel. This was apparently dredged in 1977. By way of comparison::

   a) What have been the effects of the East Channel's dredging?

   b) To what depth was the channel originally dredged?

   c) What is the channel's depth today?

   d) What problems were encountered during that separate operation?

   e) Were there any changes in soil classification from those originally cored?

   f) Has it been documented that the channel did not cause any changes?

   g) Were the Waste Discharge Requirements adequate to protect the waters of Lake Tahoe during the operation?

The answers to the previous questions should enable your Board to make a sound decision based on both the water quality, erosion and shorezone changes of the proposed channel.

Should you or your staff have any questions about these concerns or once these concerns have been answered, please contact Harry R. Gibson of the CTPRA staff.

Sincerely,

Jim Baetge
Acting Executive Officer

HG/mnm

cc: George Beck
Robert Dorsey, State Lands
TRPA
Ron Schenk, Corps of Engineers
Department of Public Works, South Lake Tahoe

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Responses to Questions Raised* Regarding
the Tahoe Keys West Channel Dredging

Question No. 1: The net littoral drift is clearly eastward. Geomorphic evidence to support this view is found in the four major and ten minor beach ridges on the flanks of the Truckee River delta. All of the beach ridges are oriented to face the northwest. Beaches and beach ridges are usually oriented so that they face into the direction of the dominant wave attack or, more precisely, into the direction predicted by the resultant of a wave-work vector diagram (Engstrom, 1973). In addition the western flank of the delta has prograded farther lakeward than the eastern flank as it is serving as a prominent littoral barrier. Also, the bulk of the modern Truckee River deltaic deposits are displaced east of the mouth, again indicating a net eastward drift. A review of the literature, including papers by Smith (1959), Johnson (1959), Budlong (1971), Orme (1971), and Engstrom (1978b), also supports this interpretation.

Question No. 2: According to Komar (1976), it is not generally feasible to make direct field measurements of the littoral drift since a prohibitively large number of measurements are needed and they are difficult to make. Commonly, indirect approaches are used to measure the littoral drift. One such indirect approach is to estimate the drift using wave statistics. This approach cannot be successfully applied in Lake Tahoe because the wind data required for wave hindcasting are presently unavailable in suitable form. Wind data from Tahoe City is not very useful because there is no information on wind durations nor on the frequency of a particular wind velocity coming from a particular direction. Wind data from Meyers was used by Johnson in 1959 but they are suspect because of the possible effects of topographic wind funneling in the area. Recently, data from the Tahoe WYE Meteorological Tower, which is located a short distance south of Tahoe Keys, has become available (Unger, 1978). The data is of little use in the present context, however, because none of the recorded average wind velocities

*Refer to the June 8, 1979 letter from the California Tahoe Regional Planning Agency to Lahontan which is attached.

are in excess of the critical wind velocity required to generate waves and also the record is limited to only two months. Also, the Tahoe WYE wind data indicates that easterly winds are more frequent than westerly although the bulk of the shoreline evidence points toward waves generated by westerly winds as being geomorphically dominant at Tahoe Keys.

Other indirect approaches to measure littoral drift exist. A second indirect approach requires the use of heavy mineral data which is presently unavailable. The most promising indirect approach is to measure rates of littoral accretion. At Tahoe Keys, the amount of accretion in the east channel, cut two years ago, could provide a useful estimate of the gross longshore transport rate, assuming a large share of the sediment moved into the channel is trapped. The gross longshore transport rate is the total amount of littoral sediment moved by both easterly and westerly longshore currents.

Thirty-one soundings were made in the channel at ten foot intervals by Tahoe Keys staff in mid-June of 1979 in an effort to measure the amount of accretion in the channel. The lake level at the time of the soundings was 6,225' and the channel floor was originally cut to a depth of 6,217' indicating an expected depth of eight feet along the channel assuming no fill had taken place. Of the thirty-one soundings, ten indicated no fill, seven indicated a fill of 0.5', eleven indicated a fill of 1.0', and three indicated a fill of 1.5'. The channel dimensions were taken to be 310' long, 20' wide, and 8' deep. The fill or accretion recorded by the soundings amounts to a total of 141 cubic yards over the two year period or an average gross longshore transport rate of about 70 cubic yards per year.

The estimated gross longshore transport rate of 70 cubic yards per year needs to be qualified for several reasons. Some natural sand bypassing of the lakeward mouth of the channel can be expected since the channel terminates within the littoral zone. Some littoral sand is known to have migrated into the marina, in some cases in the form of cuspate sand bars (Budlong, 1971). The channel therefore is not a complete littoral barrier. Also, the amount of sand collapsing into the channel during efforts to free grounded boats is unknown. Further complicating the matter is the uncertainty about the actual amount of

material initially dredged from the channel and the corresponding uncertainty about the initial channel dimensions. It should be clear that these circumstances demand that this estimate of the gross longshore transport rate be treated with caution.

Question No. 3: The littoral drift does change seasonally although the net drift is eastward. Budlong (1971) suggests that the drift is primarily eastward in the summer and westward in the winter. Based on considerations of the frequency of westerly and easterly winds as reported in the literature, wave energy indexes for northeasterly and northwesterly waves at Tahoe Keys (Engstrom, 1978a), and the orientation of the Truckee River delta beach ridges, I would estimate that perhaps 70 per cent of the time the drift is eastward and 30 per cent of the time the drift is westward.

Question No. 4: I would anticipate that the longshore transport rate will be a little greater at the west channel site than the estimated east channel longshore transport rate (see Question No. 2), assuming that the mean grain size is the same at both localities. Deeper water prevails at the west channel site, a circumstance demanding a steeper nearshore slope and a corresponding increase in breaker height (U.S. Army Coastal Engineering Research Center or CERC, 1977). This increase in the breaker height will result in a slightly greater longshore transport rate. Also contributing to the expected increased longshore transport rate at the west channel site is the larger angle, approximately $45^{\circ}$, of wave approach for the dominant northwesterly waves. Farther east, these wave crests more nearly parallel the shoreline, reducing the angle of wave approach which in turn reduces the longshore transport rate. Figure 4-39 in the Shore Protection Manual (CERC, 1977) illustrates the relationship between the angle of deepwater wave approach and the longshore transport rate showing, for a constant deepwater wave height, that the longshore transport rate reaches a maximum when the angle of wave approach is $40^{\circ}$ and then diminishes as the angle increases or decreases from that value.

Reflecting this contrast between the eastern and western portions of the Tahoe Keys beach between the two channels is the progressive

widening of the beach eastward of the west channel. Also, the berm-lagoon beach topography is well developed just east of the pier while it is absent near the west channel. These two changes indicate that the onshore component of the sediment transport is presently relatively greater at the eastern end of the beach than at the western end of the beach where the longshore component of sediment transport is relatively greater.

Question No. 5: Yes, to some extent but only in the immediate vicinity of the channel. The channel is analogous to a short, flat-bottomed submarine canyon which leads to a deep lagoon at its shoreward end. Submarine canyons are known to cause a local decrease in wave height over the canyon and an increase in wave height on the shelves flanking the canyon because of wave refraction (Komar, 1976). We can anticipate the same effect in the case of the proposed channel. The waves actually moving up the channel suffer increasing refraction and associated stretching of the wave crest leading to a reduction in wave height. Johnson (1959) writes that waves over a dredged channel will never break since the water depth is too great for the height of the wave and so the energy is dissipated farther inshore. These changes will sharply reduce or virtually eliminate the longshore transport rate in the channel but increase it slightly along the flanks of the channel where an increase in breaker height may be expected.

Question No. 6: Yes, deposition of littoral sediment in the dredged channel is a certainty since the channel is functioning as a point sink in the littoral sand budget. The absence of breaking waves in the channel virtually eliminates the necessary turbulence to keep the littoral sediment moving downdrift and deposition in the channel will result as it has in the east channel. Complete filling seldom occurs, however, since longshore transport eventually resumes to some extent as the channel shoals. Also, currents flowing in the channel between the open lake and the marina can serve to transport littoral sand both lakeward and into the marina.

Question No. 7: See the responses to Questions 5 and 6 concerning the effect of the proposed channel on wave refraction and accretion patterns. Downdrift erosion can be anticipated since there is a loss of littoral sand in the channel and so the longshore current downdrift will be "underloaded" and begin eroding the beach. The resulting erosion will be proportional to the reduction in the rate of supply. Johnson (1959), in discussing the impact of dredging channels in the Tahoe Keys area, clearly makes this point when he writes: "If this material is removed and redeposited on the downcoast side of the channel, normal littoral transport will occur in that region and the downcoast shoreline will remain in an equilibrium condition. If, however, the channel deposits are placed elsewhere, then the supply of material to the downcoast beach is reduced and erosion and retreat of the shoreline probably will result." Since it is mandated that any dredged material be removed from the lake and deposited above the high water line for reasons of water quality, loss of sediment to the littoral sand budget will ensue.

The total loss of sediment to the littoral sand budget is difficult to assess but an estimate can be made. The proposed dredging operation will extend to a depth 6' below the low water elevation of 6,223', resulting in a channel whose floor is at an elevation of 6,217'. The entire length of the proposed channel appears to lie within the littoral zone. The Shore Protection Manual (CERC, 1977) indicates that ". . . the depth below which shore-parallel contours give way to irregular contours is assumed to mark the local transition between the nearshore zone where sands are moved by the waves in significant quantities and the offshore zone where sand is moved in lesser quantities." Inspection of charts of the shelf indicates that this depth occurs around 9 feet and may in fact, be deeper. Also, Orme (1971), writing on Lake Tahoe, states that: "Wave motion was observed to be responsible for sediment motion and ripple formation in the nearshore zone to depths of at least -12 to -15 feet."

Five borings in the proposed channel site indicate that on the average 15 per cent of the sediment to be dredged and removed is finer than fine sand and will therefore not function as beach material. The dredging operation will remove about 2900 cubic yards of material. Assuming the 15 per cent figure is useful, 2,465 cubic yards can be

expected to be sand-sized or coarser and is potential beach material. Assuming the channel fills with littoral sand, approximately another 2900 cubic yards of material will be unavailable to the littoral system until the dredged channel shoals sufficiently to permit resumption of littoral transport.

These considerations indicate that a maximum possible loss of 5,365 cubic yards of beach material to the littoral system over the life of the proposed channel. According to the Shore Protection Manual (CERC, 1977), "the annual volume loss may be converted to an annual loss of beach width by the general rule: loss of one cubic yard of beach material is equivalent to loss of one square foot of beach area on the berm." The berm is the fairly level main portion of the beach that lies between the foreshore and the foredune. Assuming the drift is 70 per cent eastward, about 3,756 cubic yards of material will be lost to the downdrift beach which lies between the east and west channels over the life of the dredged channel. The area of this beach is 176,000 square feet and hence it must contain 176,000 cubic yards of sand. The area was estimated by determining the average beach width (69.2') from ten individual measurements of the width of the beach made in mid-June, 1979 when the lake level was at 6,225' and then multiplying the average beach width by the estimated beach length (2,540'). The length of the beach was estimated from measurements taken from the Emerald Bay, California U.S.G.S. topographic map which is at a scale of 1:24,000. The lost 3,756 cubic yards represents about 2.1 per cent of the total beach volume and we can expect erosion of that magnitude resulting from the channel dredging operation over the expected life of the channel which is something less than 41 years.

Beach erosion patterns in the Tahoe Keys area have been described by Budlong (1974) and they may be used as a model to predict the spatial pattern in erosion that will ensue. Budlong's data compares favorably with the changes in the shoreline following development that were predicted by Johnson (1956). In general, a uniform retreat of the beach along its entire length will not occur but rather a non-uniform pattern of erosion can be expected to emerge. Assuming an easterly drift, the erosion will occur downdrift or east of the channel. The erosion will be at a minimum on the beach immediately east of the channel

where the east jetty and the channel reduces the wave energy through refraction in the case of the jetty and through the inshore dissipation of wave energy over the dredged channel. This region of limited erosion will extend perhaps 150' downdrift at which point it will grade into a region of maximum erosion where the waves have not suffered any reduction in energy. The longshore current here is receiving little littoral sand from updrift and so is underloaded and erosion of the beach intensifies. This region of maximum erosion may be about 100' in length and it will grade downdrift into a region where the rate of erosion is again reduced. This latter region of limited erosion develops because littoral sand from updrift is arriving, being just removed from the region of maximum erosion. Figure 26 in Budlong's thesis and Figure 9 in Johnson's report both illustrate this erosion pattern. The lengths of these individual erosion regions will vary depending upon wave energy, jetty length, and other factors but the general pattern of limited erosion, maximum erosion, and limited erosion will probably persist. These same erosion considerations apply to the beach west of the proposed channel which will lose the remaining 30 per cent of the 5,365 cubic yards or about 1,610 cubic yards over the life of the channel.

The estimated amount of beach loss and the 2.1 per cent figure need to be qualified for several reasons. The volume/area ratio cited applies best to ocean beaches and it is thought that the ratio is much less on protected beaches but no figure is provided. It would be useful to determine the appropriate ratio for Tahoe Keys so that an estimate of the number of cubic yards needed to replace each square foot of beach is available. Only an unspecified fraction of the dredged material originally removed is "immediate" beach material with the material at depth representing beach material for subsequent years. This is especially true at the shoreward end of the channel where the maximum six feet of material is to be removed. Material at that depth would not be eligible for deposition on the beach until the nearshore bottom was lowered to that depth by natural erosion which might require a length of time well in excess of the expected life of the channel. In addition, the same comments about natural sand bypassing and the movement of sand into the marina that were made about the east channel

apply here as well, further qualifying the estimate of the total material lost over the life of the channel. Finally, the measurement of the beach dimensions is in part arbitrary. Beach width was measured from the upper foreshore to the beginning of the foredune. It would not be illogical to include all of the foredune and a good share of the underwater sandy shelf in any calculation of beach area. Moreover, the lakeward limit of the subaerial part of the beach will migrate landward or lakeward depending upon the lake level, further affecting any calculation of beach area based on the notion that the beach is strictly subaerial.

Question No. 8: Assuming the 70 cubic yard figure is useful, the proposed west channel would fill in again completely in about 41 years or less. The rate of accretion in this channel will be somewhat more rapid than in the east channel since a slightly greater longshore transport rate is anticipated. The second part of the question may best be answered by assuming that the rate of channel filling is linear.

Question No. 9: A number of questions are raised here and several of these questions have been answered elsewhere. Accordingly, here I would like to address two related questions, 9a and 9f.

In 1977 the east channel was dredged to a depth of 6,217' and the dredged material was not reintroduced into the littoral system but was deposited elsewhere. Approximately 141 cubic yards of material have accumulated in the channel since then. The largest portion of this material was probably supplied by updrift beaches to the west since the prevailing drift is eastward. The greatest impact of the dredging would then be expected to materialize eastward of the east channel. However, no surveys of the beach were taken in that region following the dredging operation so no quantitative estimate of the impact can be made. Inspection of the area revealed no conspicuous erosional scarp is present and that a portion of the foredune is still intact as evidenced by the presence of a mantle of coarse sand which can be interpreted as aeolian lag material. In the initial 48' eastward of the east jetty, no berm-lagoon beach topography is present, suggesting that the effects of the east jetty and the channel in reducing wave energy extends that distance downdrift. From that point eastward, the berm-lagoon beach

topography appears, reflecting the increase in wave energy. Some 500' downdrift of the east jetty, the shoreline turns inland, delimiting a re-entrant several hundred feet in width that might be a consequence of erosion resulting from the loss of material in the channel. However, in a subsequent discussion with Tahoe Keys personnel, it was learned that the area eastward of the east jetty had been recently mined for beach sediment which could also account for the re-entrant.

A similar absence of useful data also exists for the beach west of the east channel in front of the townhouses. Here the berm-lagoon beach topography is well-developed between the pier and the west jetty, a circumstance reflecting the favorable orientation of this stretch of beach as mentioned in the response to Question 4. In mid-June of 1979 with the lake level at 6225', this beach averaged some 40' wider than the beach east of the east channel with the distance from Budlong's Burton Tree to the lake shoreline being 113', for example. The greater width here probably is a consequence of a number of factors including mining on the east beach and artificial nourishment on the west beach as well as the west jetty and the east channel both functioning to trap littoral material, some of which supplies the west beach, while simultaneously starving the east beach. As a consequence, the role played by the east channel itself in causing erosion downdrift cannot be accurately assessed since other factors are clearly at work. However, whatever role the east channel is playing, the impact of the proposed west channel will be less overall because less material will be removed from the west channel as compared to that removed from the east channel.

Budlong (1971) has measured shoreline changes in the Tahoe Keys area during the 1960's and has attempted to relate them to the emplacement of jetties, dredging operations, changes in lake level, and wave conditions. However, his information on these variables is incomplete and so it is difficult to determine what portion of a given shoreline change is a consequence of a single variable.

In the case of the initial June, 1969 dredging of the east channel entrance, Budlong reports that the dredging and the associated jetties led to erosion both east and west of the entrance, depending on the direction of the littoral drift. An area of erosion developed about 150' east of the east jetty and extended to the mouth of the Truckee

River. The beach retreat here, which ranged between 27' and 56' between March, 1969 and April, 1970, can be linked to the jetties, the dredging, and perhaps also to storm waves and a rise in lake level. West of the channel, between June, 1969 and March, 1970, erosion occurred with a maximum loss of 54' in front of the townhouses despite a 1.0' drop in lake level which is usually associated with beach widening. Budlong places much of the blame for the erosion on the jetties since they act as effective littoral barriers. Strong northeast winds generating 1.0 to 2.0' high waves at the close of this period also contributed to the erosion. In both cases, we cannot separate the impact of dredging from that of the jetties and the storm waves although in the case of the west beach it is clear that high lake levels did not contribute to the erosion.

Budlong's investigation of the west channel is a little more instructive. The channel was first cut in 1958 without jetties and the material was deposited some distance inland. Erosion occurred downdrift of the channel at an average rate of -12' per year for an average reduction in beach width of 169' between 1950 and 1964. The lake was only 0.22' higher at the time of the 1964 survey and so only about 7' of the retreat can be explained by a higher lake level. (According to Budlong's profiles, nearshore slopes in the relevant elevation range average about 3.3 per cent.) The loss of the remaining 162' is either a consequence of the dredging or a consequence of erosion by storm waves or both since the jetties are not present here and a correction has been applied for lake level.

In summary, Budlong's work provides information on a number of [illegible]des of beach erosion at Tahoe Keys but it is impossible to isolate the component of erosion due solely to dredging and the removal of littoral sediment from the other causes of erosion. Moreover, the problem is further complicated because we have no knowledge of the amount of material removed in the dredging operations nor on the dimensions of the completed channels.

For comparison, shoreline changes in the Tahoe Keys area that can be attributed to natural causes since they occurred prior to the development of Tahoe Keys were measured from maps. The position of

the 6223' contour was mapped in 1918, 1950, and 1955 with Johnson (1959) providing the 1918 and 1950 positions, while the 1955 position appears on the Emerald Bay U.S.G.S. topographic map of that year. The rates of retreat and advance of this contour ranged between 2' and 8' per year between 1918 and 1950 while the corresponding rates of retreat and advance between 1950 and 1955 ranged between 23' and 43' per year. Some areas show progressive retreat of the contour over this interval while other areas show evidence of both retreat and advance of this contour and still other areas were advancing during intervals when nearby areas were retreating.

Wayne N. Engstrom, Ph.D.
Coastal Geomorphologist
June 29, 1979

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June 8, 1979

Mr. Roy Hampson
Executive Officer
Lahontan
P.O. Box 14367
South Lake Tahoe, CA 95702

RE: Tahoe Keys West Channel Dredging

Dear Mr. Hampson:

Your letter of May 24, 1979, stated that there was insufficient documentation that the proposal to dredge a 900' long channel was maintenance dredging. The letter went on to say that if additional documentation was not received, your staff would view the project as new dredging and proceed with the appropriate environmental documents.

To date, the CTRPA staff has not received any information which would indicate that the project is maintenance dredging. The staff must therefore assume that your review will take place as a new dredging project.

This Agency, acting as an interested agency, has specific concerns which we feel should be addressed in determining what form of environmental documents are required. These concerns have not been addressed in the tentative Waste Discharge requirements. The questions which we feel need to be addressed are as follows:

1. What is the direction of the prevailing drift at the channel site?

2. What is the strength of the prevailing drift?

3. Does the drift seasonally change directions?

4. Based on the surfzone approximation of the longshore component of wave energy flux and the grain size sorting in the surfzone, what is the longshore transport rate where the channel is to go?

5. Will the proposed channel effect the longshore transport rate?

6. Will the channel effect the depositional pattern of the longshore load? If so, how and to what extent?

7. Will the proposed channel alter the refraction pattern of the waves, causing a change in the nearshore erosion and accretion patterns? If so, how and to what extent?

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8. Based on the information above and a lakelevel of 6,225, how long (months or years) will it take for the proposed channel to be filled in or return to the surrounding natural contours? How long to be partially filled in to the extent that the controlling depth requires additional dredging?

9. The nearest channel requiring approximately the same amount of dredging is the Tahoe Keys East Channel. This was apparently dredged in 1977. By way of comparison:

   a) What have been the effects of the East Channel's dredging?

   b) To what depth was the channel originally dredged?

   c) What is the channel's depth today?

   d) What problems were encountered during that separate operation?

   e) Were there any changes in soil classification from those originally cored?

   f) Has it been documented that the channel did not cause any changes?

   g) Were the Waste Discharge Requirements adequate to protect the waters of Lake Tahoe during the operation?

The answers to the previous questions should enable your Board to make a sound decision based on both the water quality, erosion and shorezone changes of the proposed channel.

Should you or your staff have any questions about these concerns or once these concerns have been answered, please contact Harry R. Gibson of the CTRPA staff.

Sincerely,

Jim Baetge
Acting Executive Officer

HG/mmm

cc: George Beck
Robert Dorsey, State Lands
TRPA
Ron Schenk, Corps of Engineers
Department of Public Works, South Lake Tahoe