

OPERATING AND SITE DEVELOPMENT AGREEMENT

BETWEEN THE

CALIFORNIA INSTITUTE OF TECHNOLOGY

AND THE

UNIVERSITY OF HAWAII

CONCERNING THE

CONSTRUCTION AND OPERATION

OF THE

CALTECH SUBMILLIMETER TELESCOPE FACILITY

ON

MAUNA KEA, HAWAII

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THIS AGREEMENT, made this 20 day of DECEMBER, 1983, by and between the California Institute of Technology, hereinafter Caltech, and the University of Hawaii, hereinafter UH;

WITNESSETH:

WHEREAS, the far-infrared and millimeter regions of the electromagnetic spectrum have shown great scientific potential for contributing to our understanding of the astronomical universe;

WHEREAS, the summit area of Mauna Kea is exceptionally well-endowed as a site for observations in these wavelengths;

WHEREAS, Caltech has correspondingly initiated a program to construct a 10.4-meter-aperture telescope dedicated to observations at these wavelengths and is desirous of locating the Telescope on Mauna Kea;

WHEREAS, Caltech and UH believe that the best interests of both parties are to be served through a program of close scientific cooperation centered around the Telescope; and

WHEREAS the academic program of UH will benefit significantly from the establishment in Hawaii of a major facility dedicated to far-infrared and millimeter-wave astronomy;

WHEREAS, Caltech and UH have executed a Memorandum of Understanding on October 29, 1981 to proceed with the arrangements necessary for Caltech to construct and operate the Telescope on land leased by UH on Mauna Kea;

NOW, THEREFORE, in consideration of the mutual accommodations and agreements herein contained, the parties hereto agree as follows:

I. DEFINITIONS:

The Telescope is a parabolic reflecting telescope, having a diameter of approximately 10.4 meters. Its principal use will be at far-infrared, submillimeter, and millimeter wavelengths.

"Facilities" include the Telescope, its housing, instruments and associated installations for the Telescope;

"Instruments" include receivers, detectors, test equipment, and tools required to equip the Telescope.

"Associated Installations" include all other facilities associated with the Telescope on the subleased property, such as electrical and telephone conductors, cableways and tunnels, driveways and parking lots, and access roads from the border of the subleased property.

"Mauna Kea Science Reserve" (Science Reserve) is that area on the summit of Mauna Kea consisting generally of the area higher than 12,000 feet above sea level and specifically of that area leased by UH from the State of Hawaii, Board of Land and Natural Resources, under General Lease S-4191.

II. LOCATION OF FACILITIES:

Sublease No. H09176, attached hereto as Attachment A and specifically incorporated herein by reference, specifies the proposed location on Mauna Kea of the Telescope.

III. PARTIES TO THE AGREEMENT:

A. Principal Parties:

1. California Institute of Technology

The California Institute of Technology (Caltech), incorporated in 1891 under the laws of the State of California, is a privately endowed nonprofit educational institution of university rank devoted to undergraduate and graduate instruction and research in science, engineering and the humanities and social sciences. The governing body of Caltech is a Board of Trustees, which has the ultimate responsibility for the conduct of Caltech's affairs.

2. University of Hawaii

The University of Hawaii (UH) is the public university of the State of Hawaii. The University system comprises the Manoa, Hilo and West Oahu campuses, and seven Community Colleges. The Manoa campus of UH is responsible for graduate education in the UH system. The governing body of UH is a Board of Regents, which has ultimate authority for the conduct of UH affairs.

B. Parties by Reference

1. Institute for Astronomy

The Institute for Astronomy (IFA) is an organized research unit within the Manoa campus of UH which has responsibility within UH for the conduct of a research program in astronomy and

for representing the interests of UH on UH-owned or UH-leased land on Haleakala and Mauna Kea.

2. Division of Physics, Math and Astronomy

The Division of Physics, Math and Astronomy (PMA) is the research organization within Caltech which has responsibility for the conduct of astronomy research programs.

C. Interaction Between Parties:

While this Agreement is between Caltech and UH, the functional interaction between these parties will usually be carried out for UH by the IFA and for Caltech by the PMA.

IV. RESPONSIBILITIES:

A. Caltech:

1. Design and Construction of Facilities

Caltech shall be solely responsible for the design, fabrication and installation of the Facilities on Mauna Kea. Caltech shall obtain such funds for design and construction and associated work connected with the Facilities as shall be needed. Caltech shall conform to uniform regulations established by UH, by the State of Hawaii, and by the United States of America for the preservation of the environmental quality and the scientific integrity of the summit area.

2. Operation and Maintenance of the Facilities

Funds for operating and maintaining the Facilities shall be obtained by Caltech.

3. Permanent Mid-Level Facilities

If Caltech elects to participate in the expansion of the permanent Mid-Level Facilities at Hale Pohaku, this participation will be governed by the terms of a separate Agreement to be negotiated between Caltech and UH. In order to facilitate the planning effort if Caltech makes such election, Caltech agrees to negotiate this separate agreement in conjunction with at least one other major astronomy-related future project on Mauna Kea at the first opportunity presented for such expansion (see also IV.B.3.).

4. Base Support Facilities

If Caltech elects to participate in construction of base support facilities in Hilo on the Big Island (Island of Hawaii), it will give first consideration to doing so on land provided by UH in Hilo, and in cooperation with users of other telescope facilities on Mauna Kea. If Caltech elects to rent base support accommodation in Hilo, it will give first consideration to any accommodation available on the UH Hilo campus (see also VI.C.2.).

5. Installation of Individually Metered Electrical Service Connection and Telephone Lines

Caltech will be responsible for the installation and maintenance of power and telephone lines from central terminals to the subleased property. Caltech may coordinate and fund this effort in conjunction with other users of those same lines.

6. Research Environment

Recognizing that Caltech is part of a community of research organizations using the Science Reserve, Caltech shall ensure that its activities are compatible with activities of other telescope facilities located there.

B. UH:

1. Sublease

Subject to the approval of the Board of Land and Natural Resources, UH shall execute a Sublease with Caltech to cover the land and necessary easements for the construction and operation of the Telescope.

2. Access

UH shall ensure right-of-access to Caltech to the subleased property over the existing road, extended as necessary to reach the property, and shall ensure Caltech's right to have access to a handhole for the permanent power described in IV.B.7. under the conditions described therein, and to the proposed power line described in IV.B.8. UH shall submit on behalf of Caltech such applications as are required and have been prepared by Caltech or its agent for construction and operation of the Facilities, and shall grant to or obtain for Caltech (at no cost to UH) such other rights-of-access as may be necessary for utilities and cableways.

3. Permanent Mid-Level Facilities

Until such time as an opportunity to participate in the construction or permanent use of additional space at the permanent Mid-Level Facilities at Hale Pohaku is presented, UH will rent to Caltech space in the form of four bedrooms from its share of the Mid-Level Facilities. This provision will apply for no more than five (5) years from the execution of this Agreement, unless both parties elect to extend or renegotiate this provision. If Caltech elects to participate in the permanent Mid-Level Facilities, UH shall negotiate a separate Agreement with Caltech detailing the conditions of that participation.

4. Management

UH shall provide a forum to allow Caltech and other astronomy-related organizations using the Science Reserve to discuss, on an equal footing, aspects of the management of the Science Reserve. However, since UH is the primary lessee with the State of Hawaii, it is recognized that the final responsibility for management of the Science Reserve resides with UH.

5. Mauna Kea Support Services

a. UH shall provide services on a basis of no profit, no loss, to all the astronomical facilities in the Science Reserve through Mauna Kea Support Services (MKSS). Such services shall include, but shall not be limited to, food and lodging, transportation and library services, road maintenance, snow removal, utilities, access control and public information services, and general administration. Caltech shall reimburse UH for such services provided for its benefit; reimbursement is referred to here as a User's fee and shall be made on the basis of invoices distributed periodically by MKSS.

b. Annually UH shall provide Caltech with a statement setting forth UH's cost of the services described in the immediately preceding section. Such statement shall describe separately the services rendered exclusively for the benefit of Caltech and the cost thereof and the services rendered for the common benefit of all of the astronomical facilities in the Science Reserve and the cost thereof. Caltech shall reimburse UH for its actual cost of all such services rendered for the exclusive benefit of Caltech and shall reimburse UH for a share of the services rendered for the common benefit of all of the astronomical facilities in the Science Reserve, which share shall not exceed a fraction, the numerator of which is one, and

the denominator of which is the number of subleases, including the Caltech Sublease, which have been executed for land within the Science Reserve for separately identified telescope facilities. If the number of such subleases in the Science Reserve changed during the year for which the statement is rendered, the allocation of costs shall be prorated appropriately. In the event that services are provided for the benefit of a subgroup of all such facilities, the terms of reimbursement will be negotiated prior to the initiation of this service.

c. Caltech shall be represented on the MKSS Oversight Committee which reviews existing activities and recommends changes to the activities of the MKSS.

6. Research Environment

Recognizing that Caltech is part of a community of research organizations using the Science Reserve, UH shall ensure that activities in the Science Reserve are compatible with the research or potential research related to the Telescope. UH shall determine which activities are compatible with such research in consultation with all astronomy-related organizations using the Science Reserve.

7. Electrical Power and Roads

UH plans to construct an electric power line in the Mauna Kea summit area and to grant to the Telescope access to this power to a peak capacity of 150 kW. The location of the hand-hole where connection may be made will be within approximately 2000 feet of the subleased property.

Pending the installation of permanent power, Caltech will be entitled to connect to an existing 850-kW generator and to draw a peak load of 60 kW, conditional on payment to UH of the sum of \$19,907.12, this being its share of the capital cost of the generator. The costs of connection from the Telescope to the terminal, and of electric power, are to be paid by Caltech.

UH shall also provide a road to within approximately 20 feet of the subleased property.

8. Infrastructure Improvements

In an effort to provide a more reliable, economical and environmentally acceptable source of power at Hale Pohaku and to the telescopes in the Science Reserve, UH intends to construct a power line for the benefit of existing and future users and intends to improve and to pave the road in whole or in part from

the summit to Hale Pohaku, but, in any case, including the spur road from the Telescope to the main access road. Both of these improvements (hereinafter Infrastructure Improvements) are subject to State and County permits and approvals, and to appropriate amendment of the 1977 DLNR Mauna Kea Plan, and to the UH's obtaining the agreements of the existing and future users to paying a negotiated share of the costs. The power line shall provide Caltech with at least 150 kW of electrical power at a handhole described in IV.B.7. Funds available to UH for Infrastructure Improvements shall be used in order of priority as follows: First, for the construction of said power line; and second, for the improving and paving, in whole or in part, of said road (including safety devices), including the spur road from the Telescope to the main access road, beginning at the boundary of the subleased properties of all facilities existing, under construction, or which are the subject of a completed Operating and Site Development Agreement.

C. Responsibilities Shared by Caltech and UH

1. Operating and Maintenance Costs:

a. Caltech shall be responsible for payment of an annual User's fee as prescribed in IV.B.5.

b. Caltech shall be responsible for operation and maintenance costs of the permanent power line from the handhole described in IV.B.7. to the Caltech Telescope, together with any other parties who may share the line.

2. Infrastructure Improvements:

a. In recognition of benefits to Caltech accruing from the Infrastructure Improvements referenced in IV.B.8, Caltech agrees to pay additions to its annual User's fee. Any such additions to the User's fee are to commence at the time that the contract for the improvement construction is let. The basis for determining the additions to the User's fee are set out below.

b. It is the intention of UH to spend a total of \$7 million on Infrastructure Improvements. Approximately \$5 million will be set aside for the power line, and any funds remaining will be given to improving the safety features of the road and to paving, beginning at the boundary of the subleased properties of all facilities existing, under construction, or which are the subject of a completed Operating and Site Development Agreement SIX (6) months before the contract for road improvement and paving is let. UH intends to fund the infrastructure improvements on behalf of existing and future non-UH Users with revenue bonds.

c. UH has developed a scheme for assessing the additional User fees which each telescope sponsor at Mauna Kea should pay for the availability and use of a permanent power line and an improved road. Consistent with this, Caltech will undertake to pay over a period of FIVE (5) years, an additional annual User's fee for use of the permanent power line and the road improvements. The added User's fee will be set at a sum sufficient to compensate UH for providing a fraction (0.06840) of the total cost that UH has assumed on behalf of Caltech. If the rate on the loan taken out by UH to finance the power line and road improvements exceeds 12% per annum, this User's fee will be subject to approval by Caltech. In return for payment of the additional annual User's fee discussed above, Caltech will be entitled to the use of the power line and road throughout the tenure of the Sublease.

d. If the capital amounts spent by UH on either the road or power line are less than stated in IV.C.1.b. above, the additional User's fees charged to Caltech shall be proportionately reduced. If it appears that UH will be unable to complete the Infrastructure Improvements for \$7 million, UH shall so notify Caltech. Caltech shall thereupon consider in good faith its ability to pay additional User's fees to help defray the additional cost.

e. If UH receives funds from future users buying into the infrastructure, or from the power company for repayment of the construction advance, these amounts will be used to (1) retire the Revenue bond portion of the University's investment in the infrastructure which will have been made for the benefit of future users, and (2) defray the common costs of supporting astronomy-related activities on the mountaintop.

f. If for any reason this Agreement is terminated after Caltech has obtained the funds necessary to construct and install the Facilities, and before the additional User's fees have been paid for the number of years indicated in IV.C.1.c. above, then Caltech shall be obligated to continue to pay the additional User's fees until the total amounts indicated in c. above have been paid, or to pay the balance of such amounts in a lump sum. Caltech shall have the right to transfer this obligation to any party to whom the Sublease is reassigned according to its terms. If this Agreement is terminated before Caltech has obtained the funds necessary to construct and install the Facilities, then Caltech shall not be obligated to pay any additional User's fees.

V. OTHER UTILITIES AND SERVICES

If the principal parties mutually agree that UH should construct other improvements necessary or desirable for the

operation of the facilities in the Science Reserve, they shall negotiate in good faith to determine Caltech's fair share of the cost of such improvements.

VI. SCIENTIFIC COOPERATION:

In recognition of the potential for scientific interaction between Caltech and UH which the Telescope offers, and of the contribution of UH in making the site available to Caltech, Caltech and UH agree on the following matters with regard to the operational phase of the Telescope.

A. UH Access to the Telescope

Scientists sponsored by UH will compete on an equal footing with Caltech colleagues for observing time on the Telescope up to a maximum allocation of 10 percent of the total time scheduled for observing. UH anticipates that the growth in its new program in the area will result in observing proposals of sufficient merit to match this allocation. UH shall receive technical support whilst at the Telescope and access to the Telescope and its instrumentation on the same basis as Caltech scientists.

B. Participation in Caltech Committee Structure

In order to encourage productive interaction between UH and Caltech, UH shall be represented by one voting member on the Caltech Submillimeter Observatory Advisory Committee (CSOAC).

In order to facilitate UH/Caltech interaction during the design and construction phases at both the engineering and scientific levels, the UH member shall be represented on the CSOAC as soon as possible after the signing of this Agreement. The UH member shall be appointed by the Director of the IFA upon consultation with the Chairman of the CSOAC.

A Time Allocation Committee (TAC) shall be formed by the CSOAC and shall include a voting member of UH.

C. Interaction with UH Academic Program

It is the expressed policy of UH, and consistent with past practice, that new astronomical facilities in the Science Reserve should provide some specific benefit to the academic program of UH. UH wishes to implement this policy in such a manner as to bring a parallel benefit to the sponsoring institutions. To this end, UH is seeking specific interaction with Caltech staff, both at its UH Manoa headquarters and at its Hilo campus. Details of this interaction are set out below.

1. Joint Scientific Programs

Caltech and UH intend to encourage interaction among their staff members and graduate students, in submillimeter astronomy. This would be expected to include some joint scientific investigations, development of some communal instrumentation and visits of UH staff to Pasadena and vice versa. To further such collaboration and to insure the full advantage to UH of the presence of the Telescope in Hawaii, UH expects to appoint a faculty member in the field of submillimeter-wave astronomy. That person would be eligible for a Caltech visiting appointment, subject to the usual Caltech regulations.

Collaborative proposals between Caltech and UH faculty would be encouraged. Such proposals from Caltech to funding agencies could contain requests for salary funds for the UH faculty member.

2. UH Hilo

Caltech expects to place its base support facility in Hilo, on UH property (see IV.A.4.) and under conditions which will be negotiated at the time that Caltech wishes to proceed. It is specifically envisaged that Caltech staff members based in Hilo, or visiting for an extended period, will interact academically and professionally with UH Hilo staff and students.

VII. GENERAL LIABILITY

Caltech will indemnify, defend and hold harmless UH, its officers, agents, employees or any person acting on its behalf from and against any claim or demand for loss, liability or damages (including, but not limited to, claims for property damage, personal injury or death, based upon any accident, fire, or other incident on the demised premises and roadways adjacent thereto) which arises from any act or omission of Caltech, its officers, agents, employees, or invitees, or occasioned by any failure on the part of Caltech to maintain the premises in a safe condition, or to observe or perform any of the terms and conditions herein or any regulations, ordinances and laws of the Federal, State, Municipal or County Governments.

Additionally, Caltech shall, during the period of this Agreement, at its own cost and expense, maintain liability insurance for personal injury or death in the minimum amounts of \$300,000 per person, \$1,000,000 per occurrence, and \$50,000 property damage, subject to revision, every FIVE (5) years, in writing. Said policies shall name UH and the State of Hawaii as additional insureds, and a copy shall be deposited with the Director of Procurement and Property Management, UH.

VIII. TERMINATION

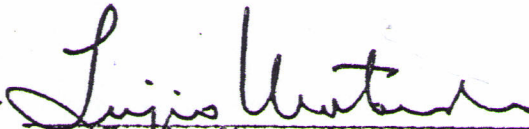
This Agreement shall be dissolved upon any of the following events:

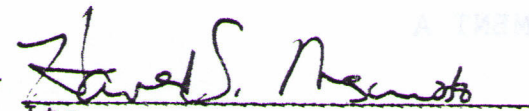
1. Termination of Sublease No. H09176 between Caltech and UH. One or both of the parties may wish to extend, renew, or renegotiate the Sublease prior to its termination and, if so, the parties will give consideration to a simultaneous extension, renewal, or renegotiation of this Agreement.
2. Failure of Caltech to obtain, by December 31, 1985, the funds necessary to construct and install the Facilities.
3. Failure of Caltech to observe or comply with any of the terms and conditions herein within THIRTY (30) days after being notified in writing by UH of such failure. In the event that more than THIRTY (30) days are reasonably required to observe or perform, Caltech shall in good faith, and within said THIRTY (30) days, initiate action and provide a plan for observance or performance, and shall diligently prosecute the same to completion.
4. Expiration of General Lease No. S-4191 on 31 December 2033, unless said Lease is renewed, extended, or renegotiated.
5. Mutual agreement in writing between Caltech and UH.

Disposition of property and improvements shall be conducted under the provisions of Sublease No. H09176 referenced above.

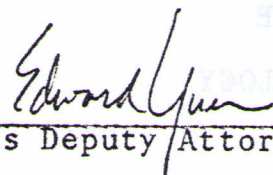
IN WITNESS WHEREOF, the parties hereto have executed these presents on the day and year first above written.

FOR THE UNIVERSITY OF HAWAII:


by  OCT 24 1983
Fujio Matsuda
President Date


by  OCT 24 1983
Its Date

APPROVED AS TO FORM:

 8/3/83
Its Deputy Attorney General Date

FOR THE CALIFORNIA INSTITUTE OF TECHNOLOGY:

by  11/15/83
Marvin L. Goldberger
President Date

by  11/15/83
David W. Morrisroe
Vice-President for
Business and Finance Date

FOR THE UNIVERSITY OF HAWAII

DATE

[Signature]
President

ATTACHMENT A

DATE

[Signature]
The

APPROVED AS TO FORM:

SUBLEASE AGREEMENT AMONG THE
CALIFORNIA INSTITUTE OF TECHNOLOGY
THE UNIVERSITY OF HAWAII

AND THE

STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES

DATE

[Signature]
President

DATE

[Signature]
Vice-President for
Business and Finance

RECORDATION REQUESTED BY:

AFTER RECORDATION, RETURN TO:

When completed: Mail ()
Pick up () Phone:

H09176

SUBLEASE AGREEMENT

THIS SUBLEASE is made this 20 day of DECEMBER, 1982, by and between the University of Hawaii, hereinafter called "SUBLESSOR," and the California Institute of Technology, Pasadena, California 91125, hereinafter called "SUBLESSEE." This Sublease is approved pursuant to General Lease S-4191, dated June 21, 1968, between Sublessor and the State of Hawaii, Board of Land and Natural Resources, hereinafter called "LESSOR." A copy of General Lease S-4191 is attached hereto as Exhibit A and incorporated herein by reference.

W I T N E S S E T H T H A T

Sublessor, in consideration of the rent hereinafter reserved and upon the conditions, covenants and agreements hereinafter express, does hereby demise and let to Sublessee the parcels of land described in Exhibit B, hereto attached and by reference made a part hereof, and Sublessee does hereby Sublease from Sublessor for the purposes of erecting a telescope facility to be constructed and operated by and at the expense of Sublessee through a contractual arrangement set forth in a separate Operating and Site Development Agreement.

The facility shall include a parabolic reflecting telescope having an approximate diameter of 10.4 meters and housed in an astrodome, data communication terminals, and associated equipment required to support the operations of the telescope, hereinafter referred to as "the Telescope."

I. GENERAL

A. Location/Area

The location/area comprises a portion of that certain land area described in General Lease S-4191, Exhibit A, and more specifically identified in Exhibit B, hereto attached and by reference made a part hereof, together with the right reserved to Sublessor to establish an access road, and power and communication lines to the above portion of land, and the right reserved to Sublessee of access to said premises over and across the common entrances and rights of way, together with others entitled thereto under such rules and regulations as may be established by and amended from time to time by Sublessor.

B. Term of Sublease

To have and to hold the demised premises unto Sublessee in strict compliance with the terms, conditions, and restraints contained in General Lease S-4191, until the 31st day of December 2033, or such earlier date as provided for in Article IV.I.

C. Rental Charge

Sublessee hereby covenants and agrees to pay rental for the demised premises at ONE DOLLAR (\$1.00) per year in legal tender of the United States of America for the duration of the Sublease. Said fee shall be paid to the Business Office, Bachman Hall, University of Hawaii, 2444 Dole Street, Honolulu, Hawaii 96822.

D. Fire or Destruction of Facilities

If all three of the following events occur: (1) the facilities are destroyed by fire or other causes rendering the same unsuitable for purposes of millimeter- and submillimeter-wave astronomy, (2) Sublessee elects not to restore the facilities, and (3) this Sublease is terminated as provided for in Section IV.G.5., Sublessee shall have such unsuitable damaged property or debris removed within ONE (1) year, after written notice to remove, and shall restore the land to its original condition. In the event Sublessee shall fail to remove such damaged property or debris and restore the land within the time specified above, such property may be removed and the land restored to its original condition by Sublessor at the expense of Sublessee.

If the facilities or a portion thereof are restored, such restoration shall be subject to approval by the Sublessor, and in keeping with Article III.I. below.

E. Controlling Lease

In the event that any term or condition contained herein is inconsistent with or contrary to General Lease S-4191, the General Lease shall be controlling.

F. Operation of Facilities

Neither Sublessee nor its successor or assigns shall operate or permit to be operated the aforementioned Telescope for purposes of research without a signed Operating and Site Development Agreement between Sublessor and Sublessee. The Telescope may be operated in the absence of an Operating and Site Development Agreement by Sublessee when necessary to ensure the safety of personnel or of the facilities.

G. Indemnity

Sublessee will indemnify, defend and hold harmless the Lessor and Sublessor, their officers, agents, employees or any person acting on their behalf from and against any claim or demand for loss, liability or damages (including, but not limited to, claims for property damage, personal injury or death, based upon any accident, fire, or other incident on the demised premises and roadways adjacent thereto) which arises from any act or omission of Sublessee, its officers, agents, employees, or invitees, or occasioned by any failure on the part of Sublessee to maintain the premises in a safe condition or to observe or perform any of the terms and conditions herein or any regulations, ordinances and laws of the Federal, State, Municipal or County Governments.

Additionally, Sublessee shall, during the period of this Sublease, at its own cost and expense, maintain liability insurance for personal injury or death in the minimum amounts of \$300,000 per person, \$1,000,000 per occurrence, and \$50,000 property damage, subject to revision, every FIVE (5) years, in writing. Said policies shall name Lessor and Sublessor as additional insureds, and a copy shall be deposited with the Director of Procurement and Property Management.

II. SUBLESSOR HEREBY COVENANTS WITH SUBLESSEE AS FOLLOWS:

A. Peaceful Enjoyment

Upon provision by Sublessee of the use rights in lieu of rent in the aforesaid Operating and Site Development Agreement and upon observance and performance of all the terms, covenants and conditions herein contained and on the part of Sublessee to be observed and performed, Sublessee shall peaceably hold and enjoy the demised premises during the term hereof without hindrance or interruption.

B. Covenant Against Contingent Fees

Sublessee warrants that no person or selling agency has been employed or retained to solicit or secure this Sublease upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by Sublessee for the purpose of securing business. For breach or violation of this warranty, Sublessor shall have the right to annul this Sublease without liability or in its discretion to deduct from the Sublease price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

C. Renewal

At lease SIX (6) months prior to the expiration of General Lease S-4191 on the 31st day of December 2033, Sublessor shall seek to negotiate a renewal of the General Lease with the Board of Land and Natural Resources or its successor and, in the event of renewal, Sublessor shall renew or extend this Sublease, or shall negotiate in good faith a new Sublease with Sublessee, if so desired by Sublessee, and under such terms and conditions as may then be mutually acceptable.

III. SUBLESSEE HEREBY COVENANTS WITH SUBLESSOR AS FOLLOWS:

A. Right of Entry

Sublessee will allow Sublessor or its agent(s) known to the Sublessee or carrying suitable identification, at all reasonable times, free access to the demised premises for the purpose of examining the same and determining whether the covenants herein are being fully observed and performed.

B. Janitorial and Other Services

Sublessee shall provide janitorial, custodial and security services to the demised premises, including sewerage and sanitation facilities and services.

C. Repairs and Maintenance

At all times during the term of this Sublease, Sublessee shall, at Sublessee's own cost and expense, keep and maintain the demised premises and the buildings and improvements erected upon the demised premises, in good order and repair and in a clean condition. This obligation shall include, but not be limited to, the obligation of painting the improvements and any part thereof, when necessary, and making any modification, improvement, or alteration approved by Sublessor and made by Sublessee.

D. Utilities and Other Charges

Except as may be agreed in the Operating and Site Development Agreement, Sublessee shall pay or shall cause to be paid when due all charges associated with the Telescope and, all charges, duties and rates of every description, including electricity, water, communications, sewer, gas, refuse collection or any other similar charges, as to which said demised premises, or any part thereof, or any improvements thereon, or to which Sublessor or Sublessee in respect thereof, are now or may be assessed or become liable by authority of law during the term of this Sublease.

E. Taxes and Assessments

Sublessee shall pay or cause to be paid when due, the amount of all taxes, rates, assessments, and other outgoings of every description as to which said premises or any part thereof, or any improvements thereon, or Sublessor or Sublessee in respect thereof, are now or may be assessed or become liable by authority of law during the term of this Sublease.

F. Assignment and Subleasing

Neither Sublessee nor its successor or assigns shall, without the prior written consent of Sublessor, assign or mortgage this Sublease or any interest therein, or sublet the premises hereby demised, in whole or in part.

G. Use of Demise

Sublessee shall use the demised premises exclusively for astronomical facilities to be constructed and managed by and at the expense of Sublessee in cooperation with Sublessor through separate agreements. Sublessee shall not permit or make any waste or strip, or make any unlawful, improper or abusive use of the demised premises or any part thereof, and Sublessee shall be liable to Sublessor for all damages beyond reasonable wear and tear. As used in this Sublease, the term

"reasonable wear and tear" shall include without limitation such grading, excavation and filling of the land demised as may be reasonably required for the construction, modification or removal of the improvements contemplated by this Sublease, and such grading, excavation and filling shall not be deemed to constitute strip or waste. Sublessee shall make every reasonable effort to minimize grading, excavation and filling.

H. Liability

All goods, wares, merchandise, equipment or other property of Sublessee shall be kept on the demised premises at the sole risk of Sublessee.

I. Improvements and Alterations

Prior to the commencement of any construction, alteration, or repair of any building or other improvement which expands or changes the external structure or appearance of facilities located on the demised premises, the final location map, plans, and specifications shall be submitted to Sublessor and to the Chairman, Department of Land and Natural Resources, or to their authorized representatives, for approval, which approval shall not be arbitrarily or capriciously withheld or delayed. Sublessor and Lessor shall process any application for such alterations and additions as expeditiously as possible and subject to regulations of the Department of Land and Natural Resources.

All construction shall be in full compliance with all laws, rules, regulations of the Federal, State and County Governments applicable thereto, and also in accordance with plans and specifications submitted by Sublessee to and approved by Sublessor prior to commencement of construction.

IV. AND THE PARTIES MUTUALLY COVENANT AS FOLLOWS:

A. Service of Process

Sublessee shall designate a representative within the State of Hawaii duly authorized to accept service of process on its behalf. In the event that Sublessee fails to so designate such a representative or such designated representative is unavailable, Sublessee consents that service of any notice or process issued against it may be served upon it by filing the same with the Director of Commerce and Consumer Affairs, State of Hawaii, or in his absence with the Deputy Director. Sublessor shall forward by certified mail to Sublessee a copy of any such notice or process served on the Director of Commerce and Consumer Affairs.

B. Governing Law; Severability

The validity, construction and performances of this Sublease, and the legal relations among the parties to this Sublease shall be governed by and construed in accordance with the laws of the State of Hawaii, excluding that body of law applicable to choice of law. In the event any provision of this Sublease shall be held by a court of competent jurisdiction to be contrary to law, the remaining provisions of this Sublease shall remain in full force and effect.

C. Binding on Successors

This Sublease shall be binding on and inure to the benefit of the successors of the parties hereto.

D. Partial Invalidity.

Should any provision of this Sublease be held by a court of competent jurisdiction to be either invalid, void, or unenforceable, the remaining provisions of this Sublease shall remain in full force and effect.

E. Final Agreement

This instrument constitutes the final agreement between Sublessor and Sublessee regarding the Sublease of the demised premises to Sublessee for purposes of Sublessee's construction of the telescope herein described. All prior discussions and/or agreements between the parties concerning the subject matter addressed in this Sublease shall have no force and effect.

F. Notices

All notices required or permitted to be given hereunder by Sublessor to Sublessee or Sublessee to Sublessor shall be in writing and sent to the following people or offices at the following addresses:

If to Sublessee: Vice President for Business and
Finance
California Institute of Technology
Pasadena, CA 91125

If to Sublessor: Vice President for Administration
University of Hawaii
2444 Dole Street
Bachman Hall 201
Honolulu, Hawaii 96822

Sublessor and Sublessee may change the address of the recipient of notices by sending a written notice of each such change to the last designated address of the addressee.

G. Termination

This Sublease may be terminated by the Sublessor upon the occurrence of any of the following events:

1. If a substantial part of the planned construction as described in Exhibit C does not exist on the site by the 31st day of December 1986, unless otherwise agreed in writing between Sublessor and Sublessee.

2. Termination of the "Operating and Site Development Agreement Between the California Institute of Technology and the University of Hawaii Concerning the design, Construction and Operation of the 10.4-m Millimeter-Wave Telescope of the California Institute of Technology on Mauna Kea, Hawaii."

3. The expiration of General Lease S-4191 on December 31, 2033. If said General Lease is renewed, extended or renegotiated, this Sublease may be renewed, extended, or renegotiated at that time.

4. If Sublessee fails to observe or comply with any of the terms and conditions herein within THIRTY (30) days after being notified in writing by Sublessor of such failure. In the event that more than THIRTY (30) days are reasonably required to observe or perform, Sublessee shall in good faith, and within said THIRTY (30) days, initiate action and provide a plan for observance or performance, and shall diligently prosecute the same to completion.

5. Destruction of the improvements by fire or other causes rendering the same unsuitable for purposes of millimeter and submillimeter astronomy, unless Sublessee notifies Sublessor within SIX (6) months of the date of casualty of its intention to restore the improvements to their prior condition within a reasonable time.

6. Mutual agreement of Sublessor and Sublessee.

7. This Sublease may be terminated by Sublessee upon SIX (6) month's notice in writing, in the event Sublessee's contemplated sources of funding become unavailable and after diligent effort Sublessee is unable to procure alternate sources of funding which in Sublessee's good faith judgment are adequate; or if Sublessor or Lessor do not comply with the terms of this Sublease; or if Sublessee gives Sublessor 2 years' notice.

V. TITLE TO FACILITIES, ALTERATIONS, ADDITIONS, IMPROVEMENTS, AND EQUIPMENT, AND DISPOSITION IN EVENT OF TERMINATION

Title to all facilities, additions, improvements, alterations, and equipment (collectively referred to herein as "property") on, affixed or installed in, or placed on the premises by Sublessee shall, at all times, remain in the name of the California Institute of Technology.

However, upon the termination or expiration of this Sublease for any cause, Sublessee must select one of the following options:

1. Negotiate with Sublessor for sale of the property to Sublessor.
2. With concurrence of Sublessor, peaceably surrender the demised premises and all or part of the property in place and good repair, order, and clean condition, reasonable wear and tear excepted. In the event that part of the property is removed, Sublessee shall restore the demised premises, or any portion affected thereby, to even grade to the extent that improvements are removed, and shall repair any damage done to the improvements in the event that equipment is removed.
3. Sell the assets to a third party acceptable to Sublessor, which acceptance shall not be arbitrarily or capriciously withheld. Such sale shall be contingent upon the execution of a new Sublease and Operating and Site Development Agreement between the third party and Sublessor.
4. Remove the property at the expense of Sublessee provided such removal is completed within EIGHTEEN (18) months after termination or expiration of Sublease, unless otherwise agreed to in writing between Sublessor and Sublessee. In the event of such removal, Sublessee shall restore the property, or any portion affected thereby, to even grade to the extent that improvements are removed, and shall repair any damage done to the improvements in the event that equipment is removed. In the event Sublessee fails to remove such property or debris and restore the demised premises within the time specified above, such property may be removed and the land restored to its original condition by Sublessor at the expense of Sublessee.

If none of the first three options is satisfactorily completed within TWELVE (12) months, then Option (4) above must be exercised.

IN WITNESS WHEREOF, the parties hereto have executed these presents on the day and year first above written.

FOR THE UNIVERSITY OF HAWAII

By *Fujio Matsuda* OCT 24 1983
Fujio Matsuda Date
President

By *David S. Newton* OCT 24 1983
Date

APPROVED AS TO FORM:

By *Edward Lee* 8/3/83
Its Deputy Attorney Date
General

FOR THE CALIFORNIA INSTITUTE OF TECHNOLOGY

BY *Marvin L. Goldberger* 11/15/83
Marvin L. Goldberger Date
President

By *David W. Morrisroe* 11/15/83
David W. Morrisroe Date
Vice-President for
Business and Finance

FOR THE DEPARTMENT OF LAND AND NATURAL RESOURCES

By S. Ono / 12.20.83
Susumu Ono / Date
Chairman

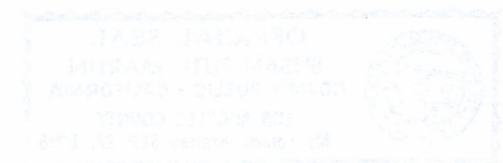
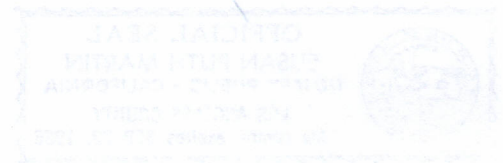
APPROVED AS TO FORM:

By David Watson / September 27, 19
Its Deputy / Date
Attorney General

By R. Higashi / 12/16/83
Member / Date

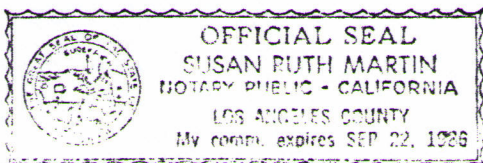
APPROVED BY THE BOARD OF
LAND AND NATURAL RESOURCES
AT ITS MEETING HELD ON

August 26, 1983



STATE OF CALIFORNIA)
CITY AND COUNTY OF LOS ANGELES) S.S.

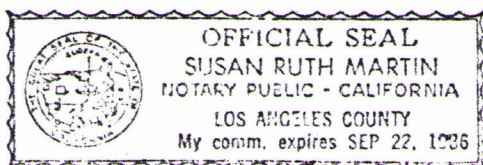
On this 15th day of November, 1983, before me appeared Marvin L. Goldberger, to me personally known who, being by me duly sworn, did say that he is President of the CALIFORNIA INSTITUTE OF TECHNOLOGY, a California corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was signed and sealed in behalf of said corporation by the authority of its Board of Trustees; and said Marvin L. Goldberger acknowledged the instrument to be the free act and deed of said corporation.



Susan Ruth Martin
Notary Public, State of California
My commission expires: 9/22/86

STATE OF CALIFORNIA)
CITY AND COUNTY OF LOS ANGELES) S.S.

On this 15th day of November, 1983, before me appeared David W. Morisroe, to me personally known who, being by me duly sworn, did say that he is Vice-President for Business & Finance of the CALIFORNIA INSTITUTE OF TECHNOLOGY, a California corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was signed and sealed in behalf of said corporation by the authority of its Board of Trustees; and said David W. Morisroe acknowledged the instrument to be the free act and deed of said corporation.



Susan Ruth Martin
Notary Public, State of California
My commission expires: 9/22/86

STATE OF HAWAII)
) ss.
CITY AND COUNTY OF HONOLULU)

On this 24th day of October, 1983, before me appeared Fujio Matsuda and Harold S. Masumoto, to me personally known, who, being by me duly sworn, did say that they are President and Vice President for Administration respectively, of the University of Hawaii, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was signed and sealed in behalf of said corporation by the authority of its Board of Regents; and said Fujio Matsuda and Harold S. Masumoto acknowledged the instrument to be the free act and deed of said corporation.

Ruth M. Chung
Notary Public, First Circuit
State of Hawaii

My commission expires: 9/30/86

EXHIBIT "A"

MAUNA KEA SCIENCE RESERVE

Kaohē, Hamakua, Island of Hawaii, Hawaii

Being a portion of the Government Land of Kaohē

Beginning at a point on the south boundary of this parcel of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "SUMMIT 1955" being 12,325.95 feet South and 471.84 feet West, as shown on Government Survey Registered Map 2789, thence running by azimuths measured clockwise from True South:-

1. Along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 135° 00' 18,667.62 feet;
2. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, still on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 225° 00' 18,667.62 feet;
3. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, still on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 281° 18' 04.6" 5173.56 feet;
4. 207° 49' 06.5" 841.83 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
5. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 1200.00 feet, the chord azimuth and distance being: 297° 06.5" 2400.00 feet;

6. 27° 49' 06.5" 841.83 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
7. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 306° 59' 47.4" 1824.16 feet;
8. 227° 29' 00.9" 2805.06 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
9. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 1500.00 feet, the chord azimuth and distance being: 317° 29' 00.9" 3000.00 feet;
10. 47° 29' 00.9" 2805.06 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
11. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13200.00 feet, the chord azimuth and distance being: 325° 31' 55.2" 701.87 feet;
12. 245° 46' 12.7" 2760.45 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
13. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 2000.00 feet, the chord azimuth and distance being: 335° 41' 12.7" 4000.00 feet;
14. 65° 46' 12.7" 2760.45 feet along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909;
15. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being: 314° 14' 32.9" 3563.50 feet;

16. Thence along Mauna Kea Forest Reserve, Governor's Proclamation dated June 5, 1909, still on a curve to the right with a radius of 13,200.00 feet, the chord azimuth and distance being 45' 00" 18,667.62 feet to the point of beginning and containing an AREA OF 13,321.054 ACRES.

EXCEPTING and RESERVING to the State of Hawaii and to all others entitled thereto, the Mauna Kea-Humuula and Mauna Kea-Uaikoia Trails, and all other existing trails within the above-described parcel of land, together with rights of access over and across said trails.

ALSO, EXCEPTING and RESERVING to the State of Hawaii, its successors and assigns, the waters and all riparian and other rights in and to all the streams within the above-described parcel of land.

CALTECH SUBMILLIMETER OBSERVATORY

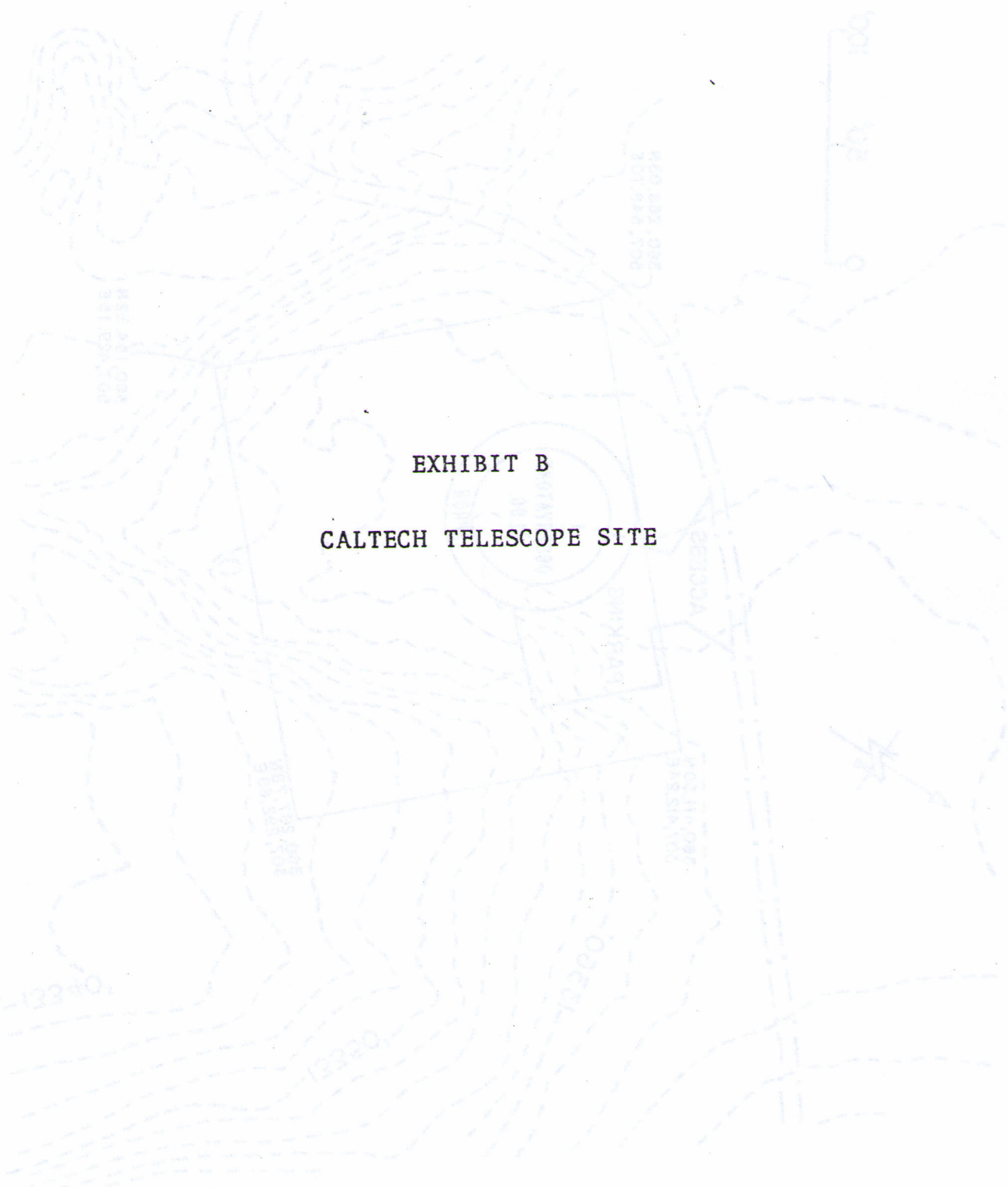
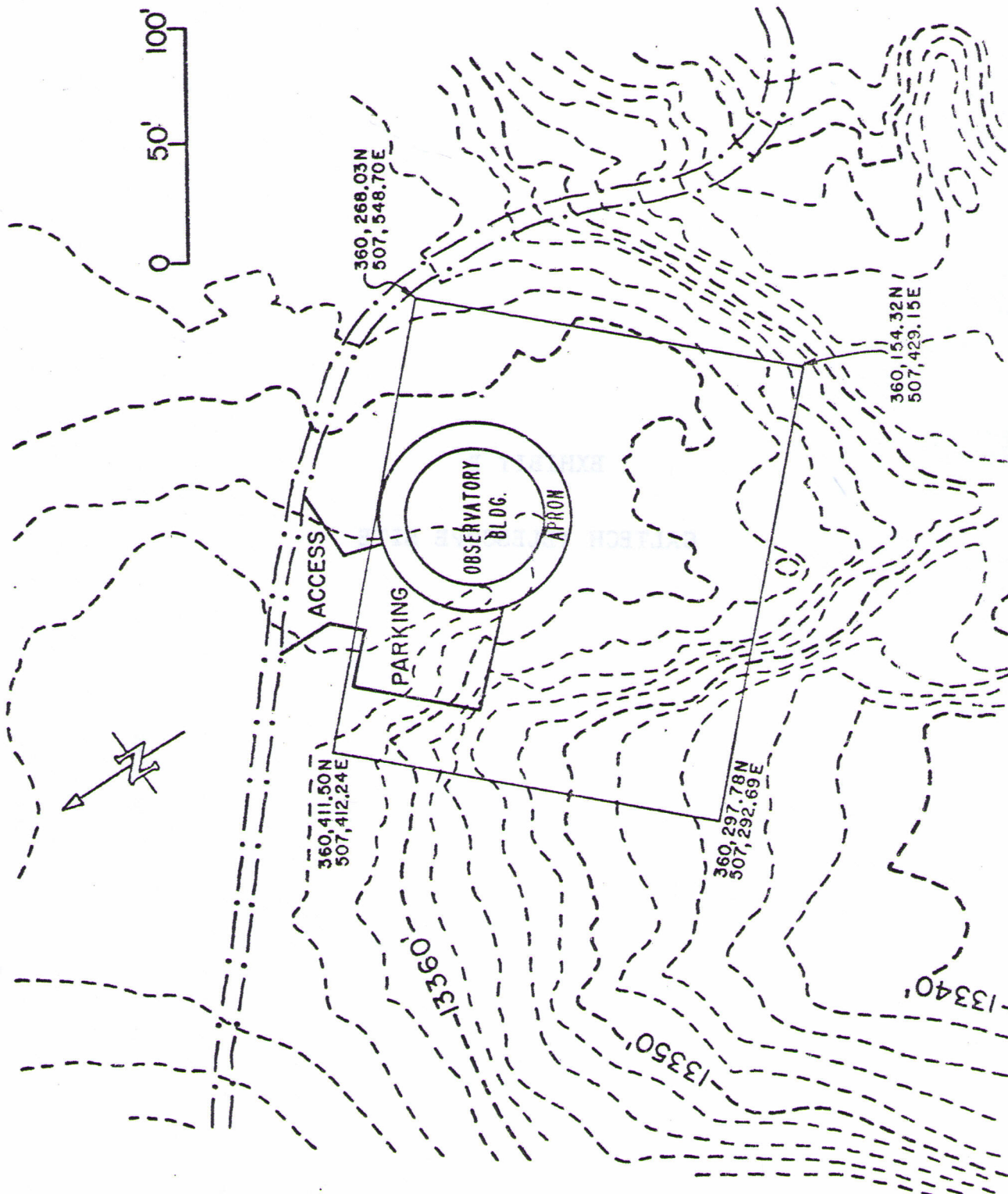


EXHIBIT B
CALTECH TELESCOPE SITE



CALTECH SUBMILLIMETER OBSERVATORY

EXHIBIT C

Description of the Caltech
Submillimeter Telescope Facility

BACKGROUND

The California Institute of Technology plans to construct a submillimeter wave telescope for astronomical research on a site of about 15,000 feet altitude in the Science Reserve on Mount San Antonio. The telescope will be used by astronomers from Caltech and the University of Hawaii in accordance with the provisions of an operating agreement.

EXHIBIT C

DESCRIPTION OF THE CONSTRUCTION

The major components of the construction are a 10.4-meter diameter primary mirror supported by an azimuth-elevation mount on a concrete foundation. The telescope is protected by a 60-foot-diameter astronomical dome with shutter doors which open for observations. The dome which rotates to follow the motion of the telescope is supported by a concrete foundation.

SITE WORK

In the vicinity of the telescope and dome the site will be leveled at an elevation of 15,380 feet over an area of about 100 x 150 feet. The concrete foundation for the telescope and dome will be approximately 30 feet in diameter and will extend about 7.5 feet above the level of the ground. A 6-inch-thick reinforced concrete apron will extend for sixteen feet outside the foundation. The access road and small parking area will be paved with asphalt.

EXHIBIT C

Description of the Caltech Submillimeter Telescope Facility

BACKGROUND

The California Institute of Technology plans to construct a submillimeter wave telescope for astronomical research, on a site at about 13,360 feet altitude in the Science Reserve on Mauna Kea. The telescope will be used by astronomers from Caltech and the University of Hawaii in accordance with the provisions of an operating and site development agreement.

The major components of the construction are a 10.4-meter diameter parabolic dish, supported by an azimuth-elevation mount on a concrete foundation. The telescope is protected by a 60-foot-diameter astronomical dome with shutter doors which open for observations. The dome, which rotates to follow the azimuth of the telescope, is supported by a concrete foundation.

SITE WORK

In the vicinity of the telescope and dome the site will be leveled at an altitude of 13,360 feet over an area of about 100 x 140 feet. The concrete foundation for the telescope and dome will be approximately 50 feet in diameter and will extend about two feet above the level of the ground. A 6-inch-thick reinforced concrete apron will extend for sixteen feet outside the foundation. The access road and small parking area will be paved with asphalt.