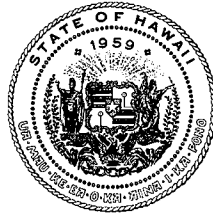
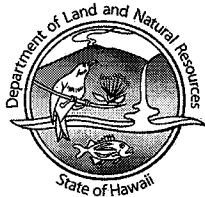


DAVID Y. IGE
GOVERNOR OF
HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

REF: OCCL: MC

CDUP HA-3568

Marcia Sakai, Interim Chancellor
University of Hawai'i at Hilo
200 West Kāwili Street
Hilo, HI 96720

JUN 19 2019

SUBJECT: NOTICE TO PROCEED: CONSERVATION DISTRICT USE PERMIT (CDUP) HA-3568
Thirty Meter Telescope (TMT)
Mauna Kea Science Reserve, Ka'ōhe Mauka, Hāmakua District, Hawai'i
TMK (3) 4-4-015:009

The Department of Land and Natural Resources (DLNR) has received and reviewed the following documents related to Conservation District Use Permit (CDUP) HA-3568 for the Thirty Meter Telescope:

1. Civil Construction Package
2. Best Management Practices for the Civil Construction Package
3. Recreation Parking Plan
4. Mitigation measure matrix for compliance with CDUP HA-3568 general and special conditions

The DLNR approved CDUP HA-3568 for TMT in a Decision and Order in October 2017. The documents were submitted in support of the following two conditions of the permit:

General Condition No. 5. Before proceeding with any work authorized by the Board, UH Hilo shall submit four copies of the construction and grading plans and specifications to the Chairperson or his authorized representative for approval for consistency with the conditions of the permit and the declarations set forth in the permit application. Three of the copies will be returned to UH Hilo. Plan approval by the Chairperson does not constitute approval required from other agencies.

Special Condition No. 32: Construction can be initiated once the permittee demonstrates compliance with the preconstruction conditions and mitigation measures contained in the Decision. The Department is required to review the construction and grading plans for consistency with the permit. Once the construction and grading plans

have been signed and the preconstruction conditions have been met the Department will issue a Notice to Proceed to TMT.

The Civil Construction Package was submitted to DLNR on February 3, 2019. The Civil Construction Package prepares the site for construction, and involved batch plant site, the access way, and the TMT site for construction. Staff from the Office of Conservation and Coastal Lands (OCCL) met with the TMT design team to review the construction documents on March 11, 2019. The plans that were submitted are consistent with the Environmental Impact Statement (EIS) and the Conservation District Use Application (CDUA).

The mitigation measures required by the CDUP include actions related to historic resources, archaeological and cultural monitoring, materials waste management and spill prevention, waste minimization, cultural and natural resources training for project employees and contractors, arthropod monitoring, safety and accident prevention, and invasive species prevention and control.

Additional mitigation measures were agreed to in the Final Environmental Impact Statement and the TMT Management Plan. These include actions related to access way paving and design, arthropod monitoring, noise pollution, noise permit and noise variance, independent construction monitors, best management practices documentation, a rock movement plan, decommissioning, site documentation, construction mitigation measures, a cultural and archaeological monitoring plan, an NPDES permit, and an oversize and overweight vehicles permitting plan.

Based upon our review of the information you provided, the TMT project has met the preconstruction requirements contained in the CDUP and associated management plan. The Department thus issues TMT a Notice to Proceed.

If you have any questions, please feel free to contact Michael Cain at the Office of Conservation and Coastal Lands (OCCL) at 808-587-0048.

Sincerely,



Suzanne D. Case, Chairperson
Board of Land and Natural Resources

c: Stephanie Nagata, Director, OMKM
Gary Sanders, Project Manager, TMT
DLNR – Land Division, Division of Forestry and Wildlife, Division of Conservation and Resource Enforcement
County Planning Department
Jim Hayes, Planning Solutions Inc.



UNIVERSITY
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HILO

April 8, 2019

Mr. Samuel Lemmo
Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources
1151 Punchbowl Street, Room 131
Honolulu, Hawaii 96813

Subject: Request for Notice to Proceed with Construction, CDUP HA-3568 for the
Thirty Meter Telescope at the Mauna Kea Science Reserve, Ka'ohe Mauka,
Hamakua, Hawai'i TMK (3) 4-4-015:009

Dear Mr. Lemmo:

The University of Hawai'i at Hilo respectfully requests a notice to proceed with the construction of the Thirty Meter Telescope (TMT) project. This notice is a requirement of Special Condition 32 of CDUP HA-3568:

"No construction work shall be initiated until the Applicant demonstrates compliance with all preconstruction conditions and mitigation measures specifically required in this decision. Once this condition has been satisfied, the Department will issue [a] notice to proceed with construction"

The Office of Maunakea Management received a notice from TMT International Observatory LLC (TIO) indicating its intent to start construction. The Office reviewed the conditions of the CDUP and is satisfied that the TMT project has complied with all the pre-construction conditions and mitigation measures related to the start of construction for the Phase I, Civil Package. A table containing all the CDUP conditions and compliance actions is attached. The table also indicates whether the CDUP condition is a pre-construction requirement. Also attached is a matrix listing all mitigation measures and management actions required in the documents identified in General Conditions 6, 7, 8 and 9, and the project's fulfillment of the pre-construction measures. Enclosed is a copy of the TMT project's *Best Management Practices for the Civil Construction Package* the overarching policy manual for this phase of construction.

200 W. Kāwili St.
Hilo, Hawai'i 96720-4091
Telephone: (808) 932-7348
Fax: (808) 932-7338
hilo.hawaii.edu

An Equal Opportunity/Affirmative Action Institution

Mr. Samuel Lemmo
April 8, 2019
Page 2

The TIO has not yet determined when it plans to start construction, but intends to commence construction before the expiration of the two-year limit specified in General Condition 4 of the subject CDUP which was issued on September 27, 2017.

We look forward to receiving a notice to proceed. Should you have any questions or require additional information, please contact Stephanie Nagata, Director, Office of Maunakea Management at (808) 933-0734 or by email at nagatas@hawaii.edu.

Sincerely yours,



Marcia Sakai
Interim Chancellor

Attachments

c: Stephanie Nagata, Director, OMKM
Gary Sanders, Project Manager, TMT

CONDITIONS
TMT CDUP HA-3568

ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
GENERAL CONDITIONS			
GC1	UH Hilo shall comply with all applicable statutes, ordinances, rules, regulations, and conditions of the Federal, State, and County governments, and applicable parts of the HAR § 13-5 et seq.	X	UH Hilo acknowledges and concurs to the best of its knowledge that it has complied with and will continue to comply with all applicable statutes, ordinances, rules, regulations, and conditions, including HAR Chapter 13-5.
GC2	UH Hilo shall obtain appropriate authorization from the Department for the occupancy of state lands, if applicable.	X	UH was granted General Lease S-4191 for the Mauna Kea Science Reserve in 1968.
GC3	UH Hilo shall comply with all applicable Department of Health administrative rules.	X	UH Hilo acknowledges and concurs. TMT has obtained a National Pollutant Discharge Elimination System (NPDES) permit. TMT has also obtained a Community Noise permit, which is required for normal work hours. Even though TMT does not plan on working outside normal work hours during the civil construction phase, it has obtained a Community Noise Variance.
GC4	Any work done or construction to be done on the land shall be initiated within two (2) years of the approval of such use, in accordance with construction plans that have been signed by the Chairperson, and, unless otherwise authorized, shall be completed within twelve (12) years of the approval. The UH Hilo shall notify the Department in writing when construction activity is initiated and when it is completed.	X	Any work done or construction shall comply with the 2-year and 12-year requirements in consultation with DLNR. UH Hilo shall notify DLNR in writing when TMT starts construction and when it is completed.
GC5	Before proceeding with any work authorized by the Board, UH Hilo shall submit four copies of the construction and grading plans and specifications to the Chairperson or his authorized representative for approval for consistency with the conditions of the permit and the declarations set forth in the permit application. Three of the copies will be returned to UH Hilo. Plan approval by the Chairperson does not constitute approval required from other agencies.	X	The four copies of the construction drawings and construction specifications were submitted to DLNR on February 4, 2019.
GC6	All representations relative to mitigation set forth in the Environmental Impact Statement and Conservation District Use Application are incorporated and adopted as conditions of the permit.	X	UH Hilo and TMT acknowledges and concurs.
GC7	All mitigation measures and management actions contained in the Historic Preservation Mitigation	X	UH Hilo and TMT acknowledge and concur. These plans were all attachments to the

CONDITIONS
TMT CDUP HA-3568

ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
	Plan, Construction Plan, Historical & Archaeological Site Plan, Maintenance Plan, and Arthropod Monitoring Plan, are incorporated as conditions of this permit.		CDUA.
GC8	The TMT Project will comply with any terms and conditions outlined in the Comprehensive Management Plan and associated sub-plans.	X	UH Hilo and TMT acknowledge and concur. Terms and conditions of the Comprehensive Management Plan and subplans are incorporated in the TMT Management Plan, which was incorporated into the CDUA.
GC9	The TMT Management Plan is approved, including all specific management actions articulated in the TMT Management Plan including, Cultural Resources Management, Natural Resources Management, Education & Outreach, Astronomical Resources, Permitting and Enforcement, Infrastructure and Maintenance, Construction Guidelines, Site Recycling, Decommissioning, Demolition & Restoration, Future Land Uses, and Monitoring, Evaluation & Updates. These management actions and their associated mitigation measures are incorporated as conditions of this permit.	X	UH Hilo and TMT acknowledge and concur. The TMT Management Plan was incorporated into the CDUA.
SPECIAL CONDITIONS			
SC1	Ensuring that employees attend mandatory cultural and natural resources training with a minimum of one days' training.		In addition to participation in the annual cultural and natural resources training, employees shall attend a minimum one-day training. TMT employees have been taking the orientation annually since 2013.
SC2	Working with the 'Imiloa Astronomy Center, OMKM, and Kahu Kū Mauna to develop informational exhibits for visitors regarding the natural, cultural and archaeological resources of Mauna Kea that could be used at the Mauna Kea VIS, 'Imiloa, TMT facilities, and other appropriate locations.		'Imiloa, Maunakea Observatories Support Services and OMKM are working on exhibit designs for the Visitor Information Station (VIS). Additional exhibits that may be used at the TMT facilities and 'Imiloa, and/or updates to the VIS will be also be explored following completion of the VIS exhibits. TMT is committed to working with the respective entities a few years after the start of construction.
SC3	Funding the re-naturalization of the closed access road on Pu'u Poli'ahu, partial re-naturalization of the batch plant staging area after construction has been completed, and camouflaging of the utility pull boxes in certain locations to reduce the visual impact from the summit area.		TMT is committed to funding and executing the re-naturalization of the vehicular road to the top of Pu'u Poli'ahu . Upon completion of construction of the TMT project, TMT will fund and execute the partial re-naturalization of the batch plant. Also upon completion of the installation of all electrical

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ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
			upgrades and in consultation with Kahu Kū Mauna, TMT will camouflage the utility pull boxes to reduce visual impacts in the summit area.
SC4	Implementing an invasive species control program.	X	TMT's invasive species control program is included in TMT's Best Management Practices. TMT is also required to comply with OMKM's Invasive Species Management Plan (ISMP). TMT secured the services of the Big Island Invasive Species Committee to assist with inspections required in OMKM's ISMP.
SC5	Working with OMKM to develop and implement a wēkiu bug habitat restoration study.		TMT is committed to working with OMKM on the wēkiu bug habitat restoration study. TMT has consulted with OMKM on the habitat proposal.
SC6	Implementing the "Zero Waste Management" policy.		The design of TMT is based on a zero waste policy. For example, TMT will have a closed wastewater system.
SC7	Filling employment opportunities locally to the greatest extent possible.		All TMT positions are advertised in Hawai'i County. TMT is building its administrative support staff and has recently filled several positions, including one Hawai'i Office Administrator , one Accounts Payable Specialist, one Senior Technical Manager, and one Environmental, Safety & Compliance Officer.
SC8	Mandating that employees traveling beyond Hale Pōhaku take part in a ride-sharing program using project vehicles.		A ride-sharing program is incorporated in the TMT Management Plan and Best Management Practices.
SC9	Using energy savings devices such as solar hot water systems, photovoltaic power systems, energy efficient light fixtures, and Energy Star rated appliances.		Energy efficient light fixtures are part of the TMT design and appliances will also meet this condition.
SC10	The University will decommission three telescopes permanently, as soon as reasonably possible, and no new observatories will be constructed on those sites. This commitment will be legally binding on the University and shall be included in any lease renewal or extension proposed by the University for Mauna Kea.		UH has committed to decommission three telescopes. The Caltech Submillimeter Observatory is currently undergoing the decommissioning process pursuant to the BLNR approved Decommissioning Plan. UHH removed the telescope from its summit facility and submitted its Notice of Intent to decommission to the Maunakea Management Board.

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ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
			UH anticipates submitting a notice of intent to decommission UKIRT by the end of 2020 and initiate the physical dismantling 2024.
SC11	Notwithstanding any lease renewal or extension, consistent with the Decommissioning Plan, at least two additional facilities will be permanently decommissioned by December 31, 2033, including the Very Long Baseline Array antenna and at least one additional observatory.		UH has committed to decommission, by the end of the current master lease, VLBA and one additional observatory.
SC12	Providing \$1 million annually, adjusted for inflation, for "Community Benefits Package" which will commence with construction and continue through the term of the sublease. The package will be administered via The Hawai'i Island New Knowledge (THINK) Fund Board of Advisors. In addition to the types of programs, described in the "Community Benefits Package" in the Findings of Fact, at least \$5,000 annually of the \$1 million shall support a program or programs to assist at risk youth, specifically focusing on the children of incarcerated parents.		<p>TMT has been making annual contributions to the THINK Fund since 2014. Seventy-five percent of the contributions are made to the Hawai'i Community Foundation and twenty-five percent to Ke Ali'i Pauahi Foundation. The last contribution occurred February 2019.</p> <p>Hawai'i Community Foundation is currently seeking proposals from Hawai'i Island non-profit organizations that work with children of incarcerated parents for the administration of the annual \$5,000.</p>
SC13	The Board of advisors shall ensure that a reasonable amount of funding is directed at programs for the most vulnerable and underserved members of Hawai'i Island communities so that they can participate in our technological future.		TMT has informed Hawai'i Community Foundation that the funds are to be distributed according to this CDUP condition.
SC14	The funding shall be distributed with reasonable promptness and not be used to build a permanent endowment.		TMT acknowledges and concurs.
SC15	Partnering with other institutions to implement a Workforce Pipeline Program, headed by at least one full-time position through the Community Outreach office, to prepare local residents for jobs in science, engineering, and technical fields.		Workforce Pipeline Program funding has been ongoing for ten years and will continue. The program is in partnership with UH Hilo, Hawai'i Community College, Department of Education, Department of Business Economic Development and Tourism, and a number of non-profit organizations. High school and college internships and mentorships are being funded for Hawai'i Island students.
SC16	UHH will ensure that the survey of the power line corridor easement complies with DLNR standards and is in accordance with the conditions contained in the grant of easement (including the		UH Hilo acknowledges the completion of the survey and implementation of this condition pursuant to the approved grant of easement is required prior to HELCO's commencement

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ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
	Mauna Kea Ice Age Natural Area Reserve) that was approved by the BLNR in August 1985. The University will provide copies of the survey to DOFAW.		of work to upgrade the power line.
SC17	OMKM will consult with the U.S. Fish and Wildlife Service and experts who are advising OMKM, including representatives from the DLNR regarding surveys of the wēkiu bug and invertebrates along the utility corridor, including Pu'u Hau Kea and the pu'u west of the Parking Area 1.		OMKM has been working with the Wēkiu Bug Scientific Committee since 2003. This committee, which includes representatives from DLNR and scientists, reviews data, and advises on survey and research efforts related to the Wēkiu Bug, arthropods and invasive species. The U.S. Fish and Wildlife Service serves in an advisory capacity to the committee.
SC18	The construction contractor will be required to minimize the visual changes to land within the utility line right-of-way during utility upgrades. Any disturbance outside of the easement area of the construction corridor will be restored to the extent possible.		HELCO has been made aware of these conditions. Should disturbances occur, TMT will, to the fullest extent possible, restore any disturbance made outside the easement area.
SC19	UH Hilo will present a plan for handling recreational parking during construction to the OCCL for review and approval, at least one month prior to beginning construction.	X	Recreational parking is being set aside in the batch plant area. OMKM consulted with Hawai'i Island Natural Area Reserve staff in the development of the plan. The parking plan is included in the construction documents and will be installed during the Phase I construction phase. The parking plan was submitted to DLNR on February 4, 2019.
SC20	Following construction, TMT shall keep their area clean and free of trash or unattended tools and equipment, unless authorized in writing by OMKM and OCCL.		TMT acknowledges and concurs. Upon completion of construction, OMKM shall include the TMT site in the twice-annual inspections of observatories for compliance with their permit.
SC21	The Archaeological Monitoring Plan will be submitted to the State Historic Preservation Division for review and approval prior to the onset of construction.	X	TMT's Archaeological Monitoring Plan was approved by SHPD in May 2013.
SC22	Sublease rent will be deposited into the Mauna Kea Lands Management Special Fund, and only used for management of Mauna Kea and related purposes as provided by law.		UH Hilo/OMKM confirms that all TMT sublease payments are deposited into the Mauna Kea Lands Management Special Fund and are used for management of Maunakea.
SC23	UH Hilo/OMKM will notify OCCL of the date of the twice-annual inspections of the project site and allow Department staff to attend if available.		UH Hilo/OMKM acknowledges and concurs.
SC24	UH Hilo/OMKM will provide OCCL and BLNR a copy of TIO's annual report to OMKM, as		UH Hilo/OMKM acknowledges and concurs.

CONDITIONS
TMT CDUP HA-3568

ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
	required by Section 5.3 of the TMT Management Plan.		
SC25	UH Hilo will allow BLNR to name a DLNR representative to participate in the CMP five-year management review process.		On January 25, 2019, the Board of Land and Natural Resources delegated the responsibility to appoint a DLNR representative to the Chair.
SC26	When provided or required, potable water supply and sanitation facilities shall have the approval of the Department of Health and the county Board of Water Supply.		UH Hilo requires TMT to submit copies of approvals from the Department of Health and Hawai'i County Department of Water Supply.
SC27	UH Hilo understands and agrees that this permit does not convey any vested rights or exclusive privilege.	X	UH Hilo acknowledges and concurs.
SC28	In issuing this permit, the Department and Board have relied on the information and data that UH Hilo has provided in connection with this permit application. If, subsequent to the issuance of this permit, such information and data prove to be false, incomplete or inaccurate, this permit may be modified, suspended or revoked, in whole or in part, and/or the Department may, in addition, institute appropriate legal proceedings.		UH Hilo acknowledges and concurs.
SC29	Where any interference, nuisance, or harm may be caused, or hazard established by the use, UH Hilo shall be required to take the measures to minimize or eliminate the interference, nuisance, harm, or hazard.		UH Hilo acknowledges and concurs. UH Hilo shall work with TMT to take required measures should any of these occur.
SC30	Should historic remains such as artifacts, burials or concentration of charcoal be encountered during construction activities, work shall cease immediately in the vicinity of the find, and the find shall be protected from further damage. The contractor shall immediately contact the State Historic Preservation Division (692-8015), which will assess the significance of the find and recommend an appropriate mitigation measure, if necessary; the Applicant will also notify the Office of Hawaiian Affairs at the same time.		TMT shall follow the protocols described in the Archaeological Monitoring and Historic Preservation Mitigation plans. If inadvertent burials are encountered, TMT shall follow the protocols in OMKM's Burial Treatment Plan that was approved by the State Historic Preservation Division.
SC31	During construction, appropriate mitigation measures shall be implemented to minimize impacts to off-site roadways, utilities, and public facilities.		OMKM rangers regularly patrol and monitor construction activities. They will address activities described in this condition.
SC32	No construction work shall be initiated until the Applicant demonstrates compliance with all	X	UH Hilo/OMKM acknowledges and concurs. Pre-construction CDUP permit conditions

CONDITIONS
TMT CDUP HA-3568

ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
	preconstruction conditions and mitigation measures specifically required in this decision. Once this condition has been satisfied, the Department will issue notice to proceed with construction.		have been addressed and are summarized herein.
SC33	TIO shall set aside funds annually in a sufficient amount to allow for site observatory and access way site restoration.		Pursuant to its sublease agreement with UH, TMT developed a Decommissioning Funding Plan which calls for the establishment of a sinking fund that will cover the cost of decommissioning. At the start of operations, TMT shall set aside \$1 million annually for the 50-year life of the project.
SC34	Daytime activities at TMT will be minimized on up to four days per year, as identified by Kahu Kū Mauna.		Upon consultation with Kahu Kū Mauna the four days when TMT activity is minimized are the Winter and Summer solstices and Vernal and Autumnal equinoxes.
SC35	UHH shall consult with the Kahu Kū Mauna Council and cultural practitioners to the extent feasible to plan for, and establish, an appropriate area on Mauna Kea, within the MKSR, to be used by native Hawaiians for religious and cultural purposes; provided that this condition shall not affect the timing of TMT construction or operation.		While Kahu Kū Mauna acknowledges that the public lands on Maunakea are accessible to native Hawaiian cultural practitioners, they have begun deliberating on a set-aside area to be used specifically by native Hawaiian practitioners for the exercise of traditional and customary practices.
SC36	UHH shall allow reasonable access to the area established under Condition 35 for the exercise of any native Hawaiian traditional and customary practices to the extent feasible, reasonable, and safe. The allocation of this area shall be in addition to all other cultural and access rights of native Hawaiians to other areas of Mauna Kea as provided by law or by other conditions set forth herein .		UH Hilo acknowledges and concurs. See SC35.
SC37	In order to enhance the Hawaiian cultural presence on Mauna Kea, UHH shall include products and handicrafts with a native Hawaiian cultural theme among those sold at the Mauna Kea VIS, and explore whether an expanded area for specifically native Hawaiian crafts can be accommodated at or near the VIS.		The Visitor Information Station (VIS) sells locally made handicrafts with native Hawaiian cultural theme and continues to expand its offerings.
SC38	UHH shall implement a cooperative internship and mentorship program between personnel working at the astronomy facilities on Mauna Kea and Hawaiian communities.		Maunakea Scholars is an educational program engaging local high school students who work with mentors (primarily graduate students at UH's Institute for Astronomy) in developing astronomy research proposals.

CONDITIONS
TMT CDUP HA-3568

ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
			<p>The students compete among themselves for time on the world's most powerful telescopes. This program is jointly sponsored by the Hawai'i Department of Education, Maunakea Observatories and University of Hawai'i. The program has reached over 400 high school students from all the major Hawaiian islands.</p> <p>Maunakea Observatories participate in the Akamai Workforce Initiative, which provides college students with summer internships at observatories and high- tech companies in Hawai'i. The program fosters advanced education for Hawai'i students (80 percent graduated from a Hawai'i high school or were born in Hawai'i), and increased participation of underrepresented and underserved populations in STEM.</p>
SC39	<p>UHH and TIO shall develop a plan to implement and extend early entry programs for at-risk children of Hawaiian ancestry and other at-risk youth in the community of UH Hilo. The early entry program shall provide educational opportunities in STEM-related and other curriculum such as the following:</p> <ul style="list-style-type: none"> (a) Astronomy, math, science, engineering, environmental science and technical support careers at astronomy facilities; (b) Hawaiian language and culture; (c) Navigation; (d) Geology; (e) Biology and agriculture; (f) Law Enforcement/criminal justice; (g) New disciplines of learning dependent on career fields needed; and (h) On-the-job training as necessary. <p>UHH/TIO shall report to BLNR on the progress of this condition prior to the completion of TMT construction; provided that progress on this condition or lack thereof shall not affect the construction or operation of the TMT Project and provided further that it requires no commitment for funding other than staff time for plan development.</p>		<p>UHH/OMKM and Maunakea observatories offer a number of initiatives described in this condition. Maunakea Scholars and Akamai program described in SC38 are two such examples.</p> <p>UHH has supported the development of navigation curriculum in use by Keaukaha One Youth Development and Ka Haka 'Ula Ke'elikōlani offers early immersion education at Ke Kula 'O Nāwahīkalanī'ōpu'u and develops/distributes curriculum through Hale Kuamo'o</p> <p>'Imiloa brings together members of the Hawaiian and astronomy communities to share a common vision for the future, bringing information about the cultural and natural history of Maunakea to students, teachers, our local residents, and visitors from around the world. 'Imiloa links to early Polynesian navigation history and knowledge of the night skies, and today's renaissance of Hawaiian culture and wayfinding with parallel growth of astronomy and scientific developments on Hawai'i Island. 'Imiloa has piloted a grant-funded navigation program since 2008 and is currently seeking to</p>

CONDITIONS
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ITEM	TASKS	PRE-CONSTRUCTION	COMMENTS
			<p>institutionalize this program.</p> <p>OMKM has for the past 15+ years been engaged in environmental studies including biological and physical research and survey. These programs are collaborations with UHH and Mānoa faculty, undergraduate and graduate students. Beginning in 2012 OMKM participates annually in the Pacific Internship Program for Exploring Science (PIPES) program by hiring two – three summer interns. This program is committed to increasing the recruitment and retention of local students, especially those of native Hawaiian ancestry, into fields of study, and ultimately careers, related to the natural resources of Hawai‘i and The Pacific Region.</p>
SC40	UHH shall make reasonable accommodations for the use of facilities at Hale Pōhaku for the Hawaiian Language and Hawaiian Studies programs at UHH and HCC, along with their continued use by others.		Halepōhaku is available for use for educational purposes, including meetings, workshops, and retreats.
SC41	Kahu Kū Mauna shall review policies concerning the construction and retention of personal or group shrines such as ‘āhu, and recommend policies to OMKM and/or BLNR as appropriate, within 18 months.		Kahu Kū Mauna developed a policy on the construction of new cultural features. This policy was approved by the Maunakea Management Board in May 2018.
SC42	UHH and OMKM are allowed to take reasonable measures consistent with law, including limitations on the use of the TMT Access Way, if necessary for the security of the TMT Observatory.		UH Hilo/OMKM acknowledges and concurs.
SC43	Other terms and conditions as may be prescribed by the Chairperson.		UH Hilo/OMKM acknowledges and concurs.

Thirty Meter Telescope (TMT) International Observatory (TIO)

Mitigation Measure Matrix for Compliance with CDUP HA-3568 General Conditions (GCs) 6, 7, 8, and 9 Related to Measures in the FEIS, CDUA, CMP, and TMT Management Plan

Topic	Mitigation Measures, Actions - Condensed	Pre - Const.	Compliance Status	Reference to Page Numbers and Condition Numbers in Documents		
				CDUP Condition	FEIS	TMT Mgmt Plan
Design Requirements	The TMT Observatory final design and construction will comply with the design standards outlined in the FEIS and CDUA (including location, size, finish, indoor HVAC, seismic safety, zero discharge wastewater system, energy savings, etc.).	X (Design)	TMT's final designs comply with the design standards described in the FEIS and CDUA. Construction associated with the "Civil Package Construction Documents" include approved designs.	Part of SC6, SC9, GC6, 7, 8, & 9	1-6, 2-15 to 17 , 3-52, 3-85-89, 3-101 to 103, 3-112	2-11, 4-30 , 4-31, 4-36, 4-39
	The Access Way final design and construction will comply with the design standards outlined in the FEIS and CDUA.	X (Design)	TMT's final designs comply with the design standards described in the FEIS (option 3) and CDUA. Construction associated with the "Civil Package Construction Documents" include approved designs.	Part of GC6, 7, 8, & 9	2-18 to 22 , 3-35, 3-48, 3-52 and 53, 3-76, 3-103 , 3-112	4-26 , 4-28, 4-30, 4-36, A-8
Historic Mitigation Plan	A mitigation plan will be developed and implemented meeting the requirements of HAR section 13-284-8(a)(2).	X (Plan)	A draft of the plan was provided as Appendix A of the TMT Management Plan provided with the CDUA. The plan has been finalized and accepted by SHPD.	Part of GC6, 7, 8, & 9	3-35	4-19, 4-20 , 4-24, A
Archaeological & Cultural Monitoring - Construction	An Archaeological Monitoring Plan and a companion Cultural Monitoring Plan will be developed, and cultural and archaeological monitors will be present during construction, as appropriate.	X (Plan)	The Archaeological Monitoring Plan was approved by SHPD in 2013. Kahu Ku Mauna was consulted and approved the Cultural Monitoring Plan. Monitoring is discussed in Section 2.2.2 of the BMP and will be applied when ground disturbing activities occur.	Part of SC21, SC30 , GC6, 7, 8, & 9	3-35, 3-191 , 3-193	
Materials/ Waste Management and Spill Prevention	A Materials Storage/Waste Management Plan (MSWMP) and component Spill Prevention and Response Plan (SPRP) will be developed and implement.	X (Plan)	The TMT Materials Storage and Waste Management Plan is provided in Section 4.1 of the Best Management Practices for the Civil Construction Package (BMP). The Spill Prevention and Response Plan is provided in Section 4.2 and Exhibit 5 of the BMP.	Part of GC6, 8, & 9	3-6, 3-128 to 130 , 3-161, 3-198 & 199 , 3-234	4-25 , 4-32, B-2
Waste Minimization	TMT will implement a Waste Minimization Plan (WMP) to reduce waste; avoid, minimize, or replace use of hazardous chemicals/materials; and reduce water and energy use.	X (Plan)	The TMT Waste Minimization Plan is provided in Section 5.3 and Exhibit 7 of the Best Management Practices for the Civil Construction Package (BMP).	Part of GC6, 8, & 9	3-128 , 3-130 , 3-171	4-18, 4-24, 4-32 , 4-36, 4-39
Cultural & Natural Resource Training	A mandatory Cultural and Natural Resources Training Program (CRNTP) will be implemented to educate employees, included but not limited to scientists and support staff, to understand, respect, and honor Maunakea's resources. CMP Management Actions C-7 and C-8.	X (Plan)	TMT employees including new hires will be required to undergo mandatory orientation/training. Mandatory training will be included in contractual provisions for contractors and vendors. Compliance is included in Section 2.2.1 of the BMP. TMT employees have undergone annual training since 2013.	Part of GC6, 7, 8, & 9	3-5, 3-23, 3-26, 3-32, 3-34 to 35 , 3-69 to 70 , 3-76, 3-226	2-11, 2-19, 4-9, 4-12, 4-14, 4-17, 4-20, 4-21, 4-24, 4-28 , 4-29, 4-38, A-10, B-1
Pre-Con Site Documentation	TMT has and will continue high-res documentation of the TMT Observatory site and Access Way prior to the start of construction to aid in site restoration.	X	Photo documentation of the TMT site was completed in 2013 and repeated in 2016.	Part of GC6, 8, & 9	3-204 , 3-205	4-23;
Invasive Species Program	TMT will in coordination with OMKM to implement an Invasive Species Prevention and Control Program to include mountain-wide and construction specific instructions that will be in place at time of construction. CMP Management Action C-9.	X (Plan)	The Invasive Species Prevention and Control Program is included in Section 3 of the of the Best Management Practices for the Civil Construction Package (BMP). TMT will also comply with OMKM's Invasive Species Plan.	SC4 , part of GC6, 8, & 9	3-5, 3-75 , 3-191, 3-198, 3-205	2-24, 4-3, 4-12, 4-20 & 21 , 4-24, 4-29, 4-38, B-1, B-19
Construction BMPs	TMT will prepare and implement a Construction BMP Plan that addresses NPDES permit needs, MSWMP, SPRP, WMP, other needs, and CMP Management Action C-2.	X (Plan)	The Best Management Practices for the Civil Construction Package (BMP) includes references to the Stormwater Pollution Prevention Plan (SWPPP) and other plans. This BMP will be updated to include future provisions as the phases of work progress.	Part of GC6, 8, & 9	S-18, 2-33, 3-192	4-7, 4-19, 4-25; B-2, B-3, B-17
NPDES Permit	TMT will obtain and comply with an NPDES permit.	X (Permit)	TMT obtained from the Department of Health a National Pollutant Discharge Elimination System (NPDES) permit (Permit HI S000431).	Part of GC3, GC6, 8, & 9	S-6, S-18, 3-192, 3-193, 3-194, 3-197, 3-256 , 3-257	4-25; B-2

Thirty Meter Telescope (TMT) International Observatory (TIO)

Mitigation Measure Matrix for Compliance with CDUP HA-3568 General Conditions (GCs) 6, 7, 8, and 9 Related to Measures in the FEIS, CDUA, CMP, and TMT Management Plan

Topic	Mitigation Measures, Actions - Condensed	Pre - Const.	Compliance Status	Reference to Page Numbers and Condition Numbers in Documents		
				CDUP Condition	FEIS	TMT Mgmt Plan
Community Noise Permit and Variance	The contractor will obtain and comply with both a community noise permit and a community noise variance.	X (Permit)	TMT has obtained a Community Noise Permit (Permit #H 19-002) for work during normal work hours and holds a Community Noise Variance Permit. A Community Noise Variance is only required when operating outside of normal construction hours of 7am to 6pm Monday through Friday (except holidays) and 9am to 6pm Saturdays. TMT does not plan to work outside normal work hours during the Civil Construction Phase.	Part of GC3, GC6, 8, & 9	3-203, 3-192, 3-203 , 3-257	4-25; B-2
Rock Movement	TMT will prepare and implement a Rock Movement Plan that addresses CMP Management Action C-3.	X (Plan)	The TMT Rock Movement Plan is provided in Section 4.6 and Exhibit 6 of the Best Management Practices for the Civil Construction Package (BMP).	Part of GC6, 8, & 9	3-188, 3-191	4-7, 4-19, 4-25 B-1, B-3
Construction Reporting	TMT will prepare and implement a Reporting Plan that addresses CMP Management Action C-4.	X (Plan)	The TMT Construction Activities Reporting Plan is provided in Section 2.1.1 of the Best Management Practices for the Civil Construction Package (BMP).	Part of GC6, 7, 8, & 9	na	4-7, 4-19, 4-24 B-1
Arthropod Monitoring	Arthropod monitoring will be performed prior to, during, and for two years following construction of the Access Way through the cinder cone habitat.	X	TMT has contracted Big Island Invasive Species Committee (BIISC) to perform the required monitoring. TMT will work closely with BIISC and OMKM to comply with this requirement prior to, during, and for two years following access way construction on the puu. BIISC has completed pre-construction monitoring activities and reports were submitted to OMKM on 1/7/2019.	Part of GC6, 7, 8, & 9	S-14, 3-76 , 3-229	4-29; E, esp. E-1, E-4
Fire Prevention & Response	The Project will develop and implement a fire prevention and response plan.	X (Plan)	The TMT Fire Prevention and Response Plan is provided in Section 2.1.4 and Exhibit 4 of the Best Management Practices for the Civil Construction Package (BMP).	Part of GC6, 8, & 9	3-205 & 206	4-25, B-1
Safety & Accident Prevention	The contractor will prepare and implement a Safety & Accident Prevention Plan.	X (Plan)	The TMT Safety and Accident Prevention Plan is provided in Section 2.1.2 and Exhibit 2 of the Best Management Practices for the Civil Construction Package (BMP).	Part of GC6, 8, & 9	3-201	4-24; B-1
Minimize Disturbance Area	In addition to the NPDES, BMP plan that will require flagging of the planned limits of disturbance, the location of nearby property boundaries will be surveyed to ensure the limits of disturbance do not encroach on neighboring parcels.	X (Plan)	Section 4.6 of the Best Management Practices for the Civil Construction Package (BMP) addresses this requirement.	Part of GC6, 8, & 9	3-201 , 3-205, 3-112	4-25, B
Modern Shrine	Appropriate protocols will be established and employed to relocate or dismantal the modern shrine in the vicinity of the observatory site.	X	The modern shrine, identified as a "find spot" erected in the early 2000s based on periodic archaeological surveys, was not a historic property, no permit was granted for its erection, and it was not registered with OMKM. The find spot was removed consistent with the Kahu Ku Mauna CMP CR-7 policy.	Part of GC6	3-36	



BEST MANAGEMENT PRACTICES FOR THE CIVIL CONSTRUCTION PACKAGE

TMT.FAC.CON.14.001.REL02

April 4, 2019

DOCUMENT APPROVAL

Author Release Note:

The state of development of this document is "Release (REL)" with the initial "Document Approval" signatures.

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1.0 INTRODUCTION

1.1 INTRODUCTION

The TMT International Observatory LLC (TIO) is constructing a 30-meter optical and infrared telescope on lands administered by the Department of Land and Natural Resources (DLNR) of the State of Hawaii and leased to the University of Hawaii - Hilo. The TIO LLC is a collaboration of the Association of Canadian Universities for Research in Astronomy (ACURA), the California Institute of Technology, the University of California, the National Astronomical Observatory of Japan, the National Astronomical Observatories of China and their consortium partners, and the Department of Science and Technology of India and their supported institutes.

TIO LLC will operate and eventually decommission the TMT sites.

TIO, also referred to as the TMT Project or just TMT, will construct the Thirty- Meter Telescope facility on Maunakea at the site subleased from the University of Hawaii - Hilo (UHH) for the TMT Observatory. DLNR has adapted "The Mauna Kea Comprehensive Management Plan" (CMP) and four sub-plans to effectively manage and guide existing and future activities and uses on Maunakea. The TMT Project must comply with all of the requirements of the CMP and CMP sub-plans, the Final Environmental Impact Statement, the Conservation District Use Permit (COUP), and the sublease with UHH. The TMT Project planning includes implementation of management measures and controls to help ensure the preservation and protection of cultural, historic, and natural resources of Maunakea.

1.2 PURPOSE

The Final Environmental Impact Statement (FEIS) and the COUP set forth the mitigation measures and natural resource conservation methods intended to mitigate the impacts of the TMT Project on Maunakea's varied resources. This document is intended to provide guidance and summary information in the form of best management practices for the management measures and controls and permits that apply to TMT, contractors and suppliers that perform construction work or provide construction support services at the Maunakea TMT observatory site. The TMT Project environmental protection agreements also apply to these other TMT locations: the Batch Plant Staging Area and the Hale Pohaku Staging Area.

1.3 SCOPE

TMT and TMT's contractors, subcontractors, suppliers and other organizations and persons working at the TMT site, Batch Plant Staging Area, the Hale Pohaku Staging Area and other areas within the Mauna Kea Science Reserve must adhere to these Best Management Practices.

This version of the BMP applies to the Civil Package construction, which includes rough grading of the TMT site, underground utility infrastructure, and access road construction.

1.4 LIST OF BEST MANAGEMENT PRACTICES PLANS REQUIRED FOR CIVIL PACKAGE CONSTRUCTION

- TMT Construction Activities Reporting Plan
- Safety and Accident Prevention Plan
- Fire Prevention and Response Plan
- Cultural, Archaeological and Environmental Monitoring Plan
- Materials Storage and Waste Management Plan
- Spill Prevention and Response Plan
- Rock Movement Plan
- Waste Minimization Plan

1.5 LIST OF PERMITS REQUIRED FOR CIVIL CONSTRUCTION

- Grading Permit (County of Hawaii, Department of Public Works, Engineering Division Permit Number 05917 has been obtained by TMT)
- Stockpiling Permit (County of Hawaii, Department of Public Works, Engineering Division Permit Number 05916 has been obtained by TMT)
- NPDES (Permit Number HI S000431 has been obtained by TMT)
- Oversize/Overweight Vehicle - Obtained by Contractor from the Hawaii Department of Transportation prior to movement of any load that requires this permit.
- Community Noise Permit - Obtained by Contractor.
- Community Noise Variance Permit (Docket No. 14-NR-VN-22, obtained by TMT, TMT.SUM.COR.14.029)

1.6 APPLICABLE DOCUMENTS

- AD1** - Final Environmental Impact Statement, Volume 1, Thirty Meter Telescope Project (TMT.FAC.CON.11.280)
- AD2** - Conservation District Use Permit Application, Thirty Meter Telescope Project (CDUPA) (TMT.FAC.COR.11.284)
- AD3** - Conservation District Use Permit, Thirty Meter Telescope Project (CDUP) (TMT.FAC.COR.11.285)
- AD4** - Thirty Meter Telescope Project Management Plan, Exhibit B of CDUPA (TMT.FAC.TEC.13.001)

- AD5 -** International Standards for Phytosanitary Measures #25, "Regulation of Wood Packaging Material in International Trade"
- AD6 -** International Standards for Phytosanitary Measures #23, "Guidelines for Inspection"
- AD7 -** Standard Operating Procedure 01 (SOP #01), "Cleaning of Vehicles and Personal Belongings," Invasive Species Plan, Office of Mauna Kea Management, 10 February 2015. (Current version will be maintained by OMKM at www.omkm.org/inspections)
- AD8 -** Standard Operating Procedure 02 (SOP #02), "Inspection of Construction, Scientific Equipment, & Supplies," Invasive Species Plan, Office of Mauna Kea Management, 10 February 2015. (Current version will be maintained by OMKM at www.omkm.org/inspections)
- AD9 -** Storm Water Pollution Prevention Plan (SWPPP).

1.7 REFERENCE DOCUMENTS

- RD1 -** "Final Report - Archaeological Monitoring Plan in Support of Construction of the Thirty Meter Telescope in the Astronomy Precinct on Mauna Kea, Ka'ohe Ahupua'a, Hamakua District, Island of Hawai'i, State of Hawai'i TMK:(3) 4-4-015:09 (por)", approved by Historical Preservation Division, Department of Land and Natural Resources, April 24, 2013. (TMT.FAC.COR.13.014)
- RD2 -** "Final Report - Historical Preservation Mitigation Plan In Support of Construction of the Thirty Meter Telescope in the Astronomy Precinct on Mauna Kea, Ka'ohe Ahupua'a, Hamakua District, Island of Hawai'i, State of Hawai'i TMK :(3) 4-4-015 :09 (por)", May 2012. (TMT.FAC.TEC .12.003)
- RD3 -** Mauna Kea Comprehensive Management Plan, Appendix A: Community Engagement Process (TMT.FAC.COR.11.272)
- RD4 -** Natural Resources Management Plan for the UH Management Areas on Mauna Kea (TMT.FAC.COR.11.273)
- RD5 -** Cultural Resources Management Plan for the UH Management Areas on Mauna Kea (TMT.FAC.COR.11.274)
- RD6 -** Public Access for the UH Management Areas on Mauna Kea (TMT.FAC.COR.11 .275)
- RD7 -** Decommissioning Plan for the Mauna Kea Observatories (TMT.FAC.COR.11 .276)
- RD8 -** Not used
- RD9 -** Final Environmental Impact Statement, Volume 2, Thirty Meter Telescope Project (TMT.FAC.COR.11.281)
- RD10 -** Final Environmental Impact Statement, Volume 3, Thirty Meter Telescope Project (TMT.FAC.COR.11.282)

RD11 - Acceptance Letter of the Governor Regarding Final EIS (TMT.FAC.COR.11.283)

RD12 - Access Way Arthropod Monitoring Report, Thirty Meter Telescope Project (TMT.SIT.TEC.12.005)

RD13 - Buffer Zone Lichen, Arthropod and Botanical Inventory and Assessment (500-m Survey) (TMT.SIT.TEC.12.004)

RD14 - Native Hawaiian Cultural Monitoring Program Plan for the Proposed TMT Observatory, Maunakea, Hawai'i (TMT.FAC.MGT.14.001.REL01)

1.8 CHANGE RECORD

Revision	Date	Section	Modifications
DRF01	10 Oct., 2014	All	Initial draft
DRF02	19 Oct., 2014	All	Formatted to TMT Document Templates
DRF03	06 Nov., 2014	All	Various edits for Draft 3.
DRF04	22 Feb., 2018	All	Various edits for Draft 4.
DR05	04-Apr., 2019	All	Various edits to Draft 4.

1.9 TERMS AND ABBREVIATIONS

BIISC	- Big Island Invasive Species Committee
BMP	- Best Management Practices
BLNR	- Board of Land and Natural Resources
CDUA	- Conservation District Use Application, Thirty Meter Telescope Project
CMP	- Comprehensive Management Plan
CDUP	- Conservation District Use Permit, Thirty Meter Telescope Project
DLNR	- Department of Land Natural Resources
FEIS	- Final Environmental Impact Statement, Thirty Meter Telescope Project
HDOH	- Hawaii Department of Health
HDOT	- Hawaii Department of Transportation
IRH	- Indoor and Radiologic Health, Branch of HDOH
MK	- Maunakea
MKCMP	- Maunakea Comprehensive Management Plan
MKSSOC	- Maunakea Support Services Oversight Committee
NGPC	- Notice of General Permit Coverage (subsection of NPDES)
NPDES	- National Pollution Discharge Elimination System, Clean Water Act
OMKM	- Office of Maunakea Management

OOVP	- Oversize and Overweight Vehicle Permit
SOS	- Safety Data Sheets
SOP	- Standard Operating Procedure
SPRP	- Spill Prevention and Response Plan
SWPPP	- Storm Water Pollution Prevention Plan
TBD	- To Be Determined
TIO	- TMT International Observatory
TMT	- Thirty Meter Telescope
WMP	- Waste Minimization Plan

2.0 TMT BMP FOR THE CIVIL CONSTRUCTION PACKAGE

2.1 TMT BMP REQUIREMENTS AND GUIDELINES

As noted earlier in this document, the TMT Project is subject to numerous environmental and cultural protection requirements/constraints that will be included in management planning and implemented throughout all phases of the project. Some of these requirements/constraints are considered to be TMT Project general requirements that need to be considered during all phases of the Project (see AD1, AD2, AD3, AD4, AD5, and AD6).

The following items are examples of these general project requirements/constraints (these items are also described in the subsequent parts of this BMP).

TMT Project will:

- a. Initiate, maintain and update as necessary, biological, cultural and historical resource conservation programs. These programs will include annual cultural and natural resource training of TMT, contractor and construction personnel during the construction phase. In addition, the TMT Project will employ two on-site monitors during construction; a cultural monitor and an archaeological monitor with the authority to stop work if necessary to protect or conserve a natural, cultural or historical resource.
- b. Coordinate with the OMKM-provided on-site construction monitor, also with authority to stop work if necessary to protect resources, public safety, or otherwise ensure permit compliance.
- c. Establish and maintain in coordination with OMKM, a TMT Construction Activities Reporting Plan.
- d. In conjunction with Partners, contractors and suppliers, assure that Materials Storage/Waste Management Plans and component Spill Prevention and Response Plans are established and implemented to comply with hazardous materials and waste minimization rules and regulations.
- e. Assure that Safety and Accident Prevention Plans are available and implemented during all Project Phases.
- f. Establish and implement Ride-Sharing programs during all phases of the TMT Project.

This *Best Management Practices for the Civil Construction Package* is intended for the following work:

The scope of work consists of the construction of the TMT Observatory site, rough grading, access road and underground utility infrastructure. This includes rough grading of the approximately 19,600 square meter (4.85 acre) TMT Observatory site,

and construction of 1.0 kilometer (0.6 mile) asphalt paved road, drainage, underground conduit, access holes and improvements associated with the access road and site.

The civil construction work will begin with a kick-off meeting organized by TMT Project. Part of the purpose of this kickoff meeting is to confirm that the various site restrictions, training requirements, and other construction limitation as discussed in the various plans and programs herein are understood. The meeting will also cover other critical aspects of the project, including schedule, points of contact, communications, invoicing, and other administrative issues.

The Contractor will also organize its own internal project kick-off meetings with key personnel as well as the appropriate subcontractors, if any. If necessary, additional meetings with TMT Project will be performed to confirm that all construction personnel are aware of the project requirements.

TMT Project will have a representative at the TMT Project sites during all on-site activity (TMT Site Representative), and Contractor and its sub-contractors will not perform work at the TMT Project sites without a TMT Site Representative present. The TMT Technical Manager will provide written notice to the Contractor Site Representative and OMKM when the TMT Site Representative is selected or changed. Contractor will keep the TMT Site Representative informed concerning all relevant updates and information regarding the work.

The Contractor Site Representative is responsible for receiving communications from TMT regarding work updates. In the event that on-site activity must be stopped or delayed, the TMT Site Representative will contact the Contractor Site Representative. The Contractor Site Representative will be responsible for notifying all site personnel about the work stoppage. The Archaeological Monitor, Cultural Monitor, and Construction Monitor (OMKM representative) also have authority to stop work and may notify site personnel. TMT will contact the Contractor Site Representative as soon as reasonably possible once it is determined that on-site activity cannot be performed. In the event that on-site activity must be stopped or delayed, Contractor will employ all reasonable means to minimize the cost for complying with the directive.

Two-way radios and cell phones will not be used on Maunakea, unless otherwise approved by the observatory directors, MKSSOC, and OMKM. Two- way radios and cell phones may be used in the case of emergencies.

The TMT Project, as well as Contractor and its subcontractors, will comply with all Federal, State, and Local laws and regulations in all aspects of the work including obtaining all necessary permits and bonds. Contractor and its subcontractors will comply with all requirements and guidelines of the plans and permits.

The TMT Best Management Practices will follow the Maunakea Orientation.

The TMT project sites are not contaminated to the best of TMT's knowledge. Accordingly, specific training requirements dealing with hazardous subsurface materials are not included herein. However, should such materials be encountered, Contractor will immediately notify TMT and OMKM. TMT notes that Contractor has hazardous environment capabilities and is capable of continuing to perform their work

if such materials are encountered once appropriate safety protocols are implemented and appropriate personal protective equipment suitable for the material encountered is obtained and implemented.

2.1.1 TMT Construction Activities Reporting Plan

This TMT Construction Activities Reporting Plan is intended to provide timely construction activities information to OMKM. TMT will provide reports to OMKM during the construction phase, at the time intervals listed below. The format of the monthly reports will typically consist of a letter containing all the monthly summaries described below, plus copies of logs and other relevant information as attachments. The format of the monthly report may be adjusted from time to time.

Archaeological and cultural monitoring reports will be prepared by the ASM Affiliates, Inc. and 'Oiwi Cultural Resources, LLC, respectively, in accordance with the requirements of the Historic Mitigation Plan (RD2), Archaeological Monitoring Plan (RD1) and Cultural Monitoring Plan (RD14). These reports are submitted directly to OMKM.

Biological monitoring reports will be prepared by the Big Island Invasive Species Council and submitted directly to OMKM as well as TMT.

Ongoing:

- Keep a daily log of weather conditions recorded on the TMT site.
- Keep a log of all notifications from and to State agencies.
- Keep a log of any data required by a permit.
- Keep a log and any data related to the Materials Storage and Waste Management Plan inspections or issues.
- Keep a log of all vehicles (contractor, subcontractor, vendor, etc.) with each transition going above or coming down from the Hale Pohaku paved-to-gravel road transition. (Vehicles equipped with Maunakea Observatories Support Services RFID tags need not be logged.)
- Keep a log of incidents and observations occurring inside the TMT construction areas. This would include items such as any stop work orders from monitors, observing ants or other potentially invasive species, spills, etc.
 - Any stop work orders issued by any of the construction, archaeological, or cultural monitors will be reported to OMKM directly by the monitor at the time of occurrence.
 - Any disturbances of archaeological sites will be reported per established protocols.
 - All incidents occurring inside the TMT construction areas will be reported at the time of occurrence. Only monthly reports will be filed when there have been no incidents.

- Keep a log of incidents and observations occurring outside the TMT construction areas. This would include items such as observing wekiu bugs or other wildlife in the area, observing cultural activities in the area, and observing non-TMT visitors engaged in inappropriate activities.
 - All incidents occurring outside the TMT construction areas will be reported within 24 hours.
- Keep a log of emergency situations (i.e., health emergencies, accidents, and fire) and maintain records summarizing response actions, timeliness, and lessons learned.
 - Any emergency situations will be reported to OMKM as soon as possible after the situation has been addressed.
 - Reports of investigations of any emergency situations will be provided to OMKM upon completion. TMT will keep OMKM apprised of the status while an investigation is underway.
- Cooperate with OMKM in any inspections of the TMT Site, Batch Plant and Hale Pohaku staging area for compliance with the COUP.
- Cooperate with OMKM on any reports OMKM prepares.

Monthly:

- Provide copies for the past month of the logs listed above.
- Provide a short summary of the construction progress in the past month.
- Provide a short summary of the expected work for the upcoming month.
- Provide a short summary concerning any activity for bidding, awarding, selecting contractors, etc. for near-term future construction contracts.

Annually:

- Provide copies for the past year of the logs listed above.
- Provide a short summary of the construction progress in the past year.
- Provide a short summary of the expected construction progress for the upcoming year.
- Provide a short summary concerning any activity for bidding, awarding, selecting contractors, etc. for construction contracts for the upcoming year.
- Provide a short summary of the status of construction with respect to the completion of TMT construction.
- Cooperate with OMKM in preparing any OMKM annual reports.
- TMT is to provide a complete draft to OMKM by December 31 of each year, covering the year ending on November 30.

2.1.2 Safety and Accident Prevention Plan

The TMT *Environmental, Safety and Health Plan* is attached as Exhibit 1 and incorporated into this Best Management Practices for the Civil Construction Package. TMT and all contractors will comply with this plan.

The safety and accident prevention plan prepared by Goodfellow Brothers, Inc., the contractor that will perform the work of the Civil Package, is attached as Exhibit 2 and is incorporated into this Best Management Practices for the Civil Construction Package.

The TMT Motor Vehicle Safety Policy for Maunakea is attached as Exhibit 3 and incorporated into the Best Management Practices for the Civil Construction Package.

All TMT staff, contractors, vendors, and other visitors to the TMT site are reminded that the elevation of the finished TMT site will be 13,162 feet, with other parts of Maunakea at even higher elevations.

All persons working at the TMT site and associated construction areas and at the Batch Plant should be aware of the symptoms of altitude sickness and look for these signs in themselves and in others. Any persons showing these symptoms should be taken to a lower elevation. Steps to minimize effects of Altitude Sickness include the following:

- Stop at Hale Pohaku for at least 30 minutes for acclimation
- Stay hydrated. Have at least 2-3 liters of water per person present at each work site.
- Limit presence above Hale Pohaku to no more than 12 hours in a calendar day or continuous time period.

A list of the symptoms of altitude sickness, pulmonary edema and cerebral edema are listed in the OMKM web page at the following link: <http://www.malamamaunakea.org/visitor-information/public-safety>. Other links to additional information can also be found at that link.

Personnel are reminded to watch for those symptoms in themselves and others around them. Promptly taking people to a lower elevation usually resolves the symptoms but people should always be taken to medical facilities when fainting and other serious symptoms are present, or when being taken to a lower elevation does not resolve the symptoms.

Personnel must wear cold weather gear when necessary when working on the site. If not protected or prepared, severe cold temperatures can cause hypothermia and frostbite. Large snow jackets or parkas, cold weather gloves, hats and waterproof, safety boots are recommended.

Sun exposure is another concern. All persons should wear appropriate clothing, sunscreen and sunglasses.

Persons traveling above Hale Pohaku should check the weather forecast the same day as the trip. The Maunakea weather forecast can be accessed at the following link: <http://mkwc.ifa.hawaii.edu/forecast/mko/>.

2.1.3 Quality Management System

Quality control in construction typically involves insuring compliance with standards and specifications for materials and workmanship in order to insure the performance of the facility under construction according to the design. The contractors are responsible for constructing the work in accordance with the plans and specifications. Each contractor is also responsible for controlling the quality of its work to meet contract plans, specifications and related requirements. The contractor's QC is the systematic implementation of a program of inspections, tests, and production controls to attain the required standards of quality and to preclude problems resulting from noncompliance. Each contractor will establish an independent QC program and write a Contractor Quality Control Plan (CQCP). The CQCP must provide for tests and inspections pursuant to various technical specifications. It will define procedures to ensure that activities affecting quality are properly documented and accomplished in accordance with contract documents; written instructions; and industry standards, codes and procedures. Furthermore, the CQCP will define methods for ensuring that activities affecting quality will be accomplished under controlled conditions.

The *Construction Specifications* for the Civil Package construction include specifications for quality control and quality assurance. These specifications are an integral part of the construction contract between TMT and the Contractor.

Administrative and procedural requirements are contained in *Section 01400 - Quality Requirements* of the *Construction Specifications*. Section 01400 lists extensive requirements for informational submittals, contractor's quality control plan, reports and documents, quality assurance, quality control, and special tests and inspection.

Independently of the contractors, the TMT on-site construction manager will provide quality assurance through daily monitoring and scheduled inspections to verify the effectiveness of the contractor's quality control program and assure that the quality and contract requirements are met by the contractors. The construction monitor assures that the contractor's quality control is working effectively and that the resultant construction complies with the quality requirements established by the contract.

2.1.4 Fire Prevention and Response Plan

TMT contractors will implement the following Fire Prevention and Response Plan. This plan outlines steps to be taken during construction to minimize the chance of fire at any of the TMT construction and staging areas. The purpose of the Fire Prevention and Response Plan for the TMT Project sites is to reduce or eliminate potential fire hazards and to provide a rapid, effective response should a fire occur. The contents of this plan will be reviewed and discussed with Contractor and subcontractor personnel prior to start of TMT work.

Fire protection will be primarily a combination of prevention, inspection, monitoring, and the availability of fire extinguishers. The following are the key elements of the plan:

Fire Prevention

Welding and grinding will require a Hot Work Permit (see Exhibit 4 as an example) and a fire monitor. In addition, this type of work will be restricted to designated areas at least 6.1 meters (20 feet) from any combustible materials, including dry grass, and will not be performed during periods of high winds that could blow sparks beyond the 6.1 meter (20 foot) buffer.

Smoking will be restricted at construction sites and staging areas to avoid starting fires. Smoking will be restricted to designated areas that are at least 6.1 meters (20 feet) distant from any combustible material including dry grass. Ash trays will be provided and their use required; cigarette butts will be properly extinguished and disposed.

Motorized equipment will be equipped with fire extinguishers. The extinguishers will be appropriate size and type to respond to that piece of equipment if it were to catch fire.

Motorized equipment will be properly maintained and inspected regularly for possible ignition sources. Carburetors and motors will be required to have protective screens and covers to reduce the possibility of heat sources starting fires.

Equipment being refueled shall have the engine shut off prior to performing to fueling or other servicing activities, and spill containment devices deployed.

During fueling or other servicing activities, all site personnel will observe no smoking rules and be familiar with flammable fluid spill prevention and response procedures.

Extra precautions shall be taken regarding heat sources and spills when operating near or over vegetation (this is not expected to be an issue at the TMT site, access way and the Batch Plant Staging Area, as there is no plant growth at these locations).

Only approved containers, tanks, and pumping equipment will be used for storage and handling of flammable and combustible liquids.

Precautions, including proper ventilation, will be taken to prevent the ignition of flammable vapors. Sources of ignition will include, but will not be limited to:

- Open flames
- Lightning
- Smoking
- Cutting and Welding
- Hot surfaces
- Frictional heat
- Static, electrical, and mechanical sparks
- Spontaneous ignition

- Chemical reactions
- Radiant heat

Flammable and combustible liquids and gases will be used in a manner that is consistent with the label and Safety Data Sheet ("SOS") for the product. Storage will be minimal. No more than the quantity that is required for the work activity will be onsite at any time.

Fire Response

There will be service-ready fire extinguishers available on site, particularly near combustible materials.

Prior to starting work at the TMT Project sites, Contractor and subcontractor personnel will have completed training in the proper use and operation of fire extinguishers.

Only UL-listed extinguishers will be used. Access to available extinguishers will be maintained at all times. The extinguishers will be inspected monthly and maintained in operating condition. Defective equipment will be immediately tagged, removed from service, and replaced.

Service-ready fire extinguishers and spill kits will be readily available nearby during fueling or other servicing activities.

Contractor and subcontractor personnel working at the TMT Project sites will have available cell phones or other communication equipment that provides verified coverage at or near the TMT Project sites that can be used to contact the fire department and other emergency response teams immediately in the event of fire or other emergency. (Cell phones and two-way radios will be used only in emergencies; these will normally be kept off.)

2.2 CULTURAL AND NATURAL RESOURCE PROTECTION REQUIREMENTS

2.2.1 Cultural and Natural Resources Training Program

TMT personnel, and all contractor, supplier and vendor personnel performing work on Maunakea as part of the construction of TMT will undergo cultural and natural resource training (Maunakea Users Orientation) prior to performing work at the TMT Project sites. This is an annual mandatory requirement when working for the TMT project.

TMT will comply with the one day, TMT project specific Maunakea Orientation Plan requirement by mandatory attendance of a class presented by OMKM. TMT personnel will attend the project specific Maunakea Orientation one time and at the first opportunity. Contractors will report to TMT, and TMT will verify with OMKM, that contractor's personnel that will work on TMT sites have undergone the mandatory training.

Both OMKM and TMT maintain a list of all persons that have completed an orientation session and issues a card to each person. The card shows the date of completion of the orientation. Numbered stickers for placing on hardhats are also issued to people that will be working on TMT sites. OMKM can require that any person not having either the card or the sticker immediately leave TMT sites.

The Maunakea Users Orientation must be repeated annually and in accordance with approved OMKM procedures and must be completed before arriving on UH managed lands.

All work will be performed in accordance with the principles established in the Maunakea Orientation. Any person not behaving in a manner consistent with the principles established in the Maunakea Orientation will be required to leave TMT sites.

2.2.2 Cultural, Archeological and Environmental Monitoring Plan

TMT will provide independent cultural, archaeological and construction monitors. These monitors report directly to OMKM.

The archaeological monitoring will be provided by ASM Affiliates, Inc. (Bob Rechtman). The monitoring will be in accordance with the *Archaeological Monitoring Plan in Support of Construction of the Thirty Meter Telescope in the Astronomy Precinct on Mauna Kea* (RD1) and *Historical Preservation Mitigation Plan in Support of Construction of the Thirty Meter Telescope in the Astronomy Precinct on Mauna Kea* (RD2).

An archeological monitor must be present during all ground-disturbing activities as defined by the monitor. The archaeological monitor has the authority to stop work in accordance with protocols in RD1 and RD2. Work in areas under a stop work order can only be resumed in accordance with the protocols of RD1 and RD2 and by written authorization of TMT's Construction Manager and the archaeological monitor that issued the stop work order.

The cultural monitoring will be based on a monitoring plan approved by Kahu Ku Mauna Council. The cultural monitoring will be in accordance with the *Cultural Monitoring Program Plan for the TMT Observatory to be built on Mauna Kea, Hawaii* (RD14).

A cultural monitor will be present at all times that the archaeological monitor is present, periodically when other construction activity is underway at the TMT site, and otherwise as defined in the cultural monitoring plan. Any shrine, find spot, offering, or other evidence of cultural activity will be reported to the cultural monitor. The cultural monitor is authorized to issue a stop work order. No work will be performed that will disturb such a find until written authorization has been issued by the cultural monitor that issued the stop work order and the TMT Construction Manager.

Construction monitoring will be provided through OMKM. This construction monitor is present to verify that construction activities are in compliance with the Comprehensive Management Plan, the Final Environmental Impact Statement, the Conservation

District Use Permit, and any other plans and permits that govern TMT's construction on TMT sites.

A construction monitor must be present on site at all times construction activity is underway at the TMT site. The construction monitor may give oral or written directives to TMT and TMT's contractor to ensure compliance with governing conditions. The construction monitor is authorized to stop activities that the construction monitor deems to be not in compliance, including stopping all work on site. Work in activities under a stop work order can only be resumed upon written authorization of the construction monitor that issued the stop work order and TMT's Construction Manager. The Construction monitor's order to cease construction activities shall be for a period not to exceed seventy two (72) hours for each incident. All orders to cease construction issued by the construction monitor shall be immediately reported to the Chairperson of BLNR and OMKM. The Chairperson may issue a cease and desist order to extend the period of time that construction activity is prohibited, or such other order as the Chairperson deems appropriate.

Should historic remains such as artifacts, burials, or concentration of charcoal be encountered during work activities, work shall cease immediately and the find shall be protected from further damage. The contractor shall immediately contact the State Historic Preservation Division (808-692-8015) which will assess the significance of the find and recommend an appropriate mitigation measure when necessary.

3.0 INVASIVE SPECIES PREVENTION AND CONTROL PROGRAM

Movement of people, personal supplies, construction materials, earth moving equipment, and vehicles to the construction areas could introduce non-indigenous weedy flora or invasive fauna pests to the Maunakea summit region or Hale Pohaku. These alien species can out-compete and displace native species and thereby reduce or eliminate populations.

The educational component to the Cultural and Natural Resources Training Program requires that construction personnel be trained to understand the sensitivity of University managed lands and to follow the measures described below, as applicable to their position.

TMT Project has implemented an Invasive Species Prevention and Control Program which includes Big Island Invasive Species Committee (BIISC) Invasive Species Inspection and Monitoring Services. BIISC will follow OMKM- approved Standard Operating Procedures (SOPs) based on the biological monitoring and inspection requirements mandated in the Maunakea CMP and TMT's final EIS and COUP. BIISC will regularly coordinate with the Office of Maunakea Management to ensure protocols continue to comply with the Maunakea CMP and the Invasive Species Management Plan. BIISC will provide staffing by OMKM-approved biologists. Components of the program during the construction phase shall include, but not be limited to, the following alien species prevention and control requirements: 3.1) TMT Permit, 3.2) the OMKM Invasive Species Management Plan policy for Cleaning of Vehicles and Personal Belongings SOP #1 (AD7), and 3.3) the OMKM Invasive Species Management Plan policy for Inspection of Construction, Scientific Equipment and Supplies SOP #2 (AD8).

3.1 TMT PERMIT REQUIREMENTS FOR INVASIVE SPECIES PREVENTION

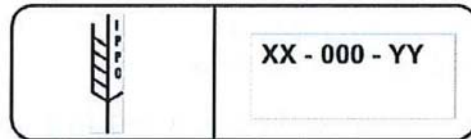
The following requirements apply to all TMT activities, in addition to the Maunakea Invasive Species Management Plan, as they were stipulated in the TMT FEIS or permit.

Prior to proceeding beyond Saddle Road, in advance of entry to Hale Pohaku and the Maunakea UH Management Areas, all construction materials, equipment, crates, and containers carrying materials and equipment will be inspected and certified free of invasive species by a trained biologist, selected by the Office of Maunakea Management (OMKM) and approved by the State Department of Land and Natural Resources (DLNR), who will certify that all materials, equipment, and containers are free of any and all flora and fauna that may potentially have an impact on the Maunakea summit ecosystem .

Inspection and repacking of all shipments will be done prior to proceeding beyond the Saddle Road so that only essential packing material is used for the final transportation

to the construction site. This will also help reduce the volume of material potentially harboring invasive species and minimize the waste generated at the construction sites.

Wooden pallets must be free of bark to prevent transport of alien species as defined in International Standards for Phytosanitary Measures #15 "Regulation of Wood Packaging Material in International Trade", prepared by the Secretariat of the International Plant Protection Convention, <https://www.ippc.int/publications/regulation-wood-packaging-material-international-trade-0> (see AD5). This standard applies to all wooden materials, including pallets used in delivery, cribbing, or dunnage.



Example mark (above) found on wood meeting the treated, bark-free requirement. See full document for range of accepted marks.

Contractors will be required to inspect shipping containers, crates, and packing material before shipment to Hawaii. The purpose of inspections is to ensure that no plant, animal, or soil is present in the shipment, including the container and packing materials. Once completed inspection forms will be forwarded to TMT for confirmation. See AD7 and ADS for expectations upon arrival in Hawaii.

Items that could serve as a food source for invasive species, such as food wrappers, will be collected separately from other debris and removed from the Maunakea summit region construction sites at the end of each day.

Materials and clothing will be washed or otherwise cleaned prior to proceeding above Saddle Road. This will be done at lower elevation locations. In addition, there is a requirement that everyone brushes down their clothes and shoes to remove invasive plant seeds and invertebrates prior to traveling above Saddle Road.

Waste containers must be regularly pressure-washed using steam and/or soap to reduce odors that may attract bugs.

All construction vehicles and equipment must be pressure washed and inspected in accordance with SOP #01 and SOP #02 (see AD7 and ADS) to verify the absence of any invasive species before being moved above Saddle Road to the summit construction regions. In addition, all construction materials, equipment, crates, and containers carrying materials and equipment must be inspected and certified free of invasive species by a trained biologist, selected by OMKM and approved by the DLNR.

Construction areas above Saddle Road, including areas used by TMT at the Hale Pohaku staging area, the Batch Plant Staging Area, Access Way and the TMT site will be monitored weekly for the presence of invasive species. The monitoring will be performed by a trained biologist selected by OMKM and approved by the DLNR. Invasive species identified during monitoring will be controlled to prevent spread.

3.2 CLEANING OF VEHICLES AND PERSONAL BELONGINGS

This section *summarizes* SOP #1 (see AD7). Complete details and requirements applicable to the TMT project are found in SOP #1. The Invasive Species Prevention and Control Program applies to the passengers, vehicle operators, immediate personal possessions, and any vehicle or heavy equipment operating under a permit (CDUP, Special Use, or other) on University managed lands (Hale Pohaku, the summit access road above Hale Pohaku, and the Mauna kea Science Reserve).

All vehicles entering University of Hawaii (UH) managed lands on Maunakea must be inspected to ensure they are free of plant, animal, and earthen materials. These guidelines apply to all vehicle use (private or commercial) related to the Conservation District Use Permit (CDUP).

TMT will enforce washing of the vehicle undercarriage on a monthly basis for vehicles that leave and re-enter UH Managed lands, per SOP #1 (see AD7).

3.2.1 Personal Belongings

Personal belongings and vehicle safety equipment are to be cleaned and inspected by the operator prior to entering the Saddle Road junction.

3.2.2 Vehicle Cleaning

All vehicles are to be cleaned both inside and out by the operator and a TMT invasive species form completed prior to entering the Saddle Road junction. Vehicles with three or more axles, and equipment (motor vehicles without a highway license plate), must be inspected by a DLNR-approved biologist.

3.2.3 Inspections

Prior to commencement of each journey, the *vehicle operator* is to visually inspect the vehicle exterior and interior to ensure it is free of contaminants and other debris that might harbor plant, animal, or earthen materials. If the operator observes a build-up of these contaminants, he/she must clean or arrange for the vehicle to be cleaned prior to entering the Saddle Road junction. Vehicles with three or more axles, and heavy equipment, must be inspected by a DLNR-approved biologist.

TMT vehicle operators must complete the TMT vehicle inspection forms prior to each use. Once completed the forms must be submitted to the TMT Office Manager.

3.2.4 Emergency Action

Should an invasive species be found on vehicles or equipment within Maunakea, the operator is to stop, immediately leave Maunakea, and return to a location below Saddle Road junction where the vehicle or equipment can be cleaned.

If plant, animals, or earthen materials are observed at any time, contain and securely seal the package or delivery (using garbage bag, plastic wrap, etc.), and contact

OMKM staff immediately. The contaminated package or delivery is not permitted to proceed to Maunakea, until re-inspected and approved by a DLNR-approved biologist. All findings will be recorded and reported to TMT.

OMKM Rangers and staff may conduct vehicle inspections on Maunakea at any time to verify cleanliness; this includes unattended vehicles. Vehicle owners will be notified if any concerns are identified.

3.2.5 Verification

OMKM Rangers and staff may conduct vehicle inspections on Maunakea at any time to verify cleanliness; this includes unattended vehicles. Vehicle owners will be notified if any concerns are identified.

3.2.6 Failure to Comply

Contractors who fail to comply with these invasive species guidelines will be subject to a penalty. Such penalty may be imposed immediately by the Ranger, or after the report has been reviewed by OMKM staff. For example, a vehicle discovered with potted plants on the summit on a Tuesday may be directed to leave immediately or entered in the daily Ranger report and directed to leave the following day after the Ranger report is reviewed by OMKM staff.

3.3 INSPECTION OF CONSTRUCTION, SCIENTIFIC EQUIPMENT AND SUPPLIES

This section *summarizes* SOP #2 (see AD8). Complete details and requirements applicable to the TMT project are found in SOP #2. Inspection and cleaning of construction and scientific equipment is required prior to traveling above the Saddle Road junction. This requirement refers to loads, deliveries, packages, construction materials, scientific tools and equipment that will be used on Maunakea. This requirement does not refer to items not going onto Maunakea, nor does it refer to the cleaning of vehicles with 2 axles or less.

3.3.1 Preparation

Those shipping or traveling onto Maunakea lands are encouraged to:

- Maintain clean storage, workshop, and shipping locations that are free of invasive plants, insects and other animals.
 - Sites that are not clean and free of invasive species must have cleaning methods on-site and clean any cargo on the delivery vehicle before and again after loading (i.e. the cargo must be clean and inspected before being loaded, inspected during loading, cleaned again, and then re-inspected). It is preferred that inspection sites are clean and free of invasive species.
- Be aware that an inspection may be required and to include additional time for this activity in planning for shipping and travel.

- Maintain a location for inspections that is free of plant, animal, or earthen material; regularly treated for invasive species; with suitable cleaning supplies (vacuums, running water, etc.) available to take remedial action when concerns are identified during inspections.

When shipping supplies and equipment to UH managed lands, operators are required to:

- Minimize materials and dunnage included to the minimum required for safe and secure delivery. If minimizing materials is not possible, then be prepared to remove packing materials for the invasive species inspection.
- Clean vehicles and deliveries: Cleaning includes removal of all plant, animal, and earthen materials on supplies and equipment prior to arrival on Maunakea. See the Cleaning of Vehicles and Personal Belongings SOP (AD7) for cleaning details. Once cleaned and inspected, if diverted to another job outside of Maunakea, vehicle and cargo must be re-cleaned and re-inspected prior to returning to Maunakea.
- Those that plan on staging or storing equipment destined for the TMT site at Hale Pohaku are required to schedule a re-inspection of the staged item(s) before proceeding above Hale Pohaku. Details, including storage duration, are specified in the inspection SOP (AD8).

3.3.2 Equipment, Materials, Supplies, & Load Guidelines

When shipping supplies and equipment to UH managed lands, operators are required to:

- Minimize materials and dunnage included to the minimum required for safe and secure delivery. If minimizing materials is not possible, then be prepared to remove packing materials for the invasive species inspection.
- Clean vehicles and deliveries: Cleaning includes removal of all plant, animal, and earthen materials on supplies and equipment prior to arrival on Maunakea. Once cleaned and inspected, if diverted to another job outside of Maunakea, vehicle and cargo must be re-cleaned and re-inspected prior to returning to Maunakea.
- Those that plan on staging or storing equipment at Halepohaku are required to schedule a re-inspection of the staged item(s) before proceeding above Halepohaku. Details, including storage duration, are specified in the inspection SOP.

Personal belongings are to be cleaned and inspected by the operator prior to entering the Saddle Road junction.

All vehicles are to be cleaned by the operator, prior to entering the Saddle Road junction. All vehicles entering University of Hawaii (UH) managed lands on Maunakea must be inspected to ensure they are free of plant, animal, and earthen materials. Prior to commencement of each journey, the vehicle operator is to visually inspect the vehicle exterior and interior to ensure it is free of contaminants and other debris that

might harbor plant, animal, or earthen materials. If the operator observes a build-up of these contaminants, he/she must clean or arrange for the vehicle to be cleaned prior to entering the Saddle Road junction. Vehicles with three or more axles, and heavy equipment, must be inspected by a DLNR-approved biologist. Inspections by a DLNR-approved biologist are considered a commercial activity and cannot occur along roadsides, at State or County parks (i.e. Mauna Kea County Rec Area), Department of Hawaiian Homelands (i.e. DHHL parking at Pu'uuhuluhulu). Generally inspections need to occur in Hilo, Waimea, or Kona.

For further detail see SOP #2 (AD8).

3.4 INVASIVE SPECIES CONTROL PROGRAM

The TMT invasive species monitoring and control program will be conducted by BIISC, in consultation with OMKM and applicable State agencies. Details of methods and response are addressed in OMKM's Maunakea Invasive Species Management Plan and the TMT FEIS and permit. Relevant policies and practices of this document apply to this component of TMT-related activities.

3.4.1 Failure to Comply

Contractors who fail to comply with the OMKM Invasive Species guidelines will be subject to a penalty by OMKM and immediate removal from the TMT project site. Such penalty may be imposed immediately by the Ranger, or after the report has been reviewed by OMKM staff. For example, a vehicle discovered with potted plants on the summit on a Tuesday may be directed to leave immediately or if communication is entered in the daily Ranger report and directed to leave the following day after the Ranger report is reviewed by OMKM staff.

4.0 ENVIRONMENTAL PROTECTION REQUIREMENTS

4.1 MATERIALS STORAGE AND WASTE MANAGEMENT PLAN

If not properly managed, solid and hazardous materials and waste used and stored in construction areas could impact cultural and biological resources, aesthetic and visual characteristics, and water quality in the surrounding area.

To minimize the potential for damage or contamination, construction contractors will implement this Materials Storage and Waste Management Plan. The plan includes measures/methods for materials and waste storage. Materials will be stored in a manner so as to minimize their impact on the surrounding environment. Measures included in the plan are:

- The contractor will implement measures to minimize storm water pollution in accordance with the Storm Water Pollution Prevention Plan (SWPPP) (AD9).
- Establish an inspection program to ensure satisfactory material storage and waste disposal, including reporting inspection results (and logs of inspections) as outlined in the reporting section of this document. All TMT related waste collected outside the active construction site must be individually identified in this reporting.
- "Roll-off" containers will be equipped with secure tops and lids to ensure no debris can escape, including during high winds (defined as 120mph for engineering standards, unless specified otherwise).
- Outdoor trash receptacles/containers will be secured to the ground with attached/secured lids and plastic liners to assure that the receptacle, its lid, or its contents will not blow away and the contents will not be exposed to storm water.
- "Roll-off" and other trash containers will be pressure washed immediately prior to every delivery to a TMT site on Maunakea (within 24 hours prior to delivery) and delivered empty (free of trash or any detectible residue).
- Construction materials and supplies will be covered with heavy tarps; steel cables attached to anchors that are driven into the ground may also be used to secure materials. Materials will be secured at the close of each work day, and throughout the day during periods of high winds.
- Waste will be collected on a regular basis before containers become completely full.
- Food waste and food containers will be collected separately and removed daily (i.e. food waste, lunch containers, wrappers, etc. will not be disposed of with regular construction debris).
- Waste containers will be picked up and transported off-site by licensed contractors and disposed of at appropriate facilities. Waste containers will be

removed from the site within 24 hours if biological materials are identified (by odor, sight, pest aggregations, etc.).

- The contractor will be required to provide appropriate and adequate hazardous material training that includes proper and safe handling, correct use and environmental protection methods, SDS's, and approved methods for disposal and transport.
- Construction contractors are required to provide an adequate number of portable toilets for use at their construction sites. The contractors will be responsible to verify that these facilities are properly maintained and serviced by a licensed and permitted contractor.

4.1.1 Components of Materials Storage Management

Generally, all materials will be stored per the manufacturer's recommendations and per all county, state, and federal requirements.

4.1.2 Bulk Erodible Materials

Bulk erodible materials are generally excavated rock/soil and imported aggregate or other fill materials. Refer to the Rock Movement Plan when considering the importation, management, and movement of fill or excavated material to the summit region. This includes:

- No material from off-mountain will be imported for use as fill. This includes the following restrictions:
 - No material from below the summit region (roughly 3,962.4 meters (13,000 feet) and above) will be imported to the summit region for use as fill.
 - No material from below Saddle Road will be imported to Hale P6haku or the summit region for use as fill.
- Aggregate, sand, and other materials necessary for concrete batching, bedding for conduits and other buried utilities, and base course under slabs may be imported and used as components of concrete and similar construction materials and uses; however, imported aggregates, sand, and other materials not used for those purposes will be removed from the construction sites once concrete batching is complete. While at the construction sites, these materials will be stored in containers or lined areas to minimize the potential for spillage and to keep them isolated from the environment. Invasive species protocols (AD7 and AD8) also apply to such aggregate materials.

Refer to the project's NPDES permit for protocols regarding the storage of these materials. This includes:

- All materials are to be managed per local, state, and federal requirements as well as permit requirements, such as the NPDES permit for the project.

- Excavated soil is to be screened in the field for potential contamination. Potentially contaminated material is to be segregated from clean material to the degree possible.
- Locate stockpiles a minimum of 15.24 meters (50 feet) or as far as practicable from concentrated runoff or outside of any natural buffers, if any. Provide Storm Drain Inlet Protection and/or Perimeter Sediment Controls as applicable in the area utilized for stockpiles.
- Excavated material will be stockpiled adjacent to the open trench if the material is to be reused as backfill.
- If excavated material is not to be used as backfill on-site, it will be immediately loaded into trucks for off-site disposal or stockpiled temporarily in a designated location that reduces (a) stockpiled material from impacting storm water by providing adequate setback from waterways and drain inlets, and (b) the potential for tracking soil off-site when loaded and removed for off-site disposal.
- Imported materials will be stockpiled in a designated location if it cannot immediately be put to use. The designated location providing adequate setback from waterways and drain inlets.
- Excavated material/stockpiles will be protected when (a) material will not be added or subtracted to a stockpile for a period greater than twenty four (24) hours, and (b) when a significant rain event occurs. Protection measures will include:
 - If the materials being stockpiled is deemed wind erodible, cover the stockpile with tarps and hold the tarps in place with rocks, ropes, wood, or other suitable material that can withstand high winds in the summit region.
 - Place work area isolation devices, such as gravel bag, fiber roll/sock, and/or silt fence around the stockpile.

4.1.3 Building Products

The policies detailed in the Storm Water Pollution Prevention Plan (SWPPP) govern the management of these materials. The SWPPP states:

Building products will be stored at the 13-North site in areas not used for active construction, the Batch Plant Staging Area, and the Hale Pohaku Staging Area. Those areas will be protected by Perimeter Controls and Stabilized Construction Exits. Within the construction areas building products will be stored as necessary for the on-going construction activities. The items will be stored per manufacturer recommendations. The only additional BMP associated with these items is that within the summit region (Batch Plant Staging Area and 13-North site) they are to be covered with heavy tarps; steel cables attached to anchors that are driven into the ground may also be used to hold materials down. Materials will be secured at the close of each work day, and throughout the day during periods of high wind. The staging area will be fenced off and the staging of material beyond the limits of the fence or BMP measures will not be allowed.

4.1.4 Petroleum Products, Other Chemicals, and Hazardous Materials

The policies detailed in the SWPPP govern the management of these materials. The SWPPP states:

Petroleum and hazardous materials required for the work will be stored properly in tightly sealed containers that are clearly labeled. Items that fall into this category include, but are not limited to:

- Petroleum products, such as gasoline, diesel, oil, solvents, and other petroleum distillates
- Paint
- Curing compounds
- Glue and adhesives
- Detergents

Storage areas for petroleum products, other chemicals, and hazardous materials will have the following attributes:

- Be clearly labeled (preferably in original containers), including appropriate warning placards, and tightly sealed when not in use.
- Be covered and elevated at least 6-inches off the ground surface (i.e. on pallets, portable, durable chemical containment).
- Have secondary containment.
- Be placed away from storm water conveyances and drains.
- Have a spill kit, appropriate to the type and volume of products stored.
- Meet all local and state solid-waste management regulations.

Whenever possible, all of a product will be used up before disposing of the container. If the product is a hazardous material, surplus product must be disposed of following manufacturers' or local and State recommended methods for proper disposal container.

The storage of petroleum products or hazardous materials outside of designated areas will not be allowed. These materials are only to be removed from designated storage areas during times of active use and returned promptly when that use is complete. One example of an appropriate storage area would be Conex (a shipping container) specially-designed with secondary containment and containers for lube and hazardous materials.

Additional measures related to petroleum and hazardous materials storage include:

- An accurate and up-to-date inventory of such materials at the site will be maintained. The inventory of such materials on-site will be kept to a minimum, only enough product required to do the job will be stored on-site.

- Safety Data Sheets (SOS) for all materials stored in the area will be available to site workers.
- Substances will not be mixed with another unless recommended by the manufacturer.

4.2 SPILL PREVENTION AND RESPONSE PLAN

The policies detailed in the Storm Water Pollution Prevention Plan (SWPPP) govern for Spill Prevention and Response. In addition, Goodfellow Brothers, Inc., have prepared a spill prevention and response plan that supplements the policies of the SWPPP. The GBI Spill Prevention and Response Plan is included as Exhibit 5. The following paragraphs describe additional information and measures.

For site grading, no significant quantities of fuel or combustible material will be present or stored at the TMT Project sites. The amount of fuel storage will be minimized to what is required for refueling of heavy equipment on-site. In addition, contaminated materials are not anticipated in the subsurface. Surface contamination from fuel, combustible materials or excavation operations is not anticipated. The potential for spills will come from the routine need to refuel the heavy equipment that will not be making daily trips down to Hale Pohaku for refueling.

Contractor and its subcontractors who will be doing the refueling have included in their work plans measures to minimize the potential impact of a spill or unintentional release of hazardous materials on the surrounding environment. To prevent overflow due to expansion with changes in elevation, all fuel tanks shall not be more than 3/4 full prior to transport to the summit (unless used as the fuel source for vehicle transport to the summit).

Contractor will provide appropriate spill and response education and training to their personnel. The education and training includes standard spill prevention practices and spill response procedures. The contact information for Federal, State and County organizations and emergency response teams that should be notified in the event of a spill is included in Contractor's Safe Work Plan.

During the site grading, Contractor and applicable subcontractors will have appropriate spill response materials and equipment stored and available at the locations where lubricating materials and fuel are stored and used, including water and equipment transport vehicles and associated support equipment.

A spill kit will be kept with the heavy equipment and work vehicles that travel to the TMT Project sites in case of accidents. Clean up response to spills will be done promptly. TMT acknowledges that if a Reportable Quantity is exceeded, the appropriate authorities (including OMKM) will be notified.

When equipment with engines or motors is stored overnight, Contractor will deploy durable barriers or other suitable methods to contain or prevent fuel/oil spills and leaks. Motorized equipment, when stationary, must have a large, durable drain-pan in place

suitable for catching fuel or fluid leaks, anchored to ensure it cannot be blown away in high winds.

Storage of fuel and lubricating fluids at the TMT Project sites will have provisions for secondary containment to capture any material that accidentally escapes from the primary storage unit.

Storage containers and containment areas will be inspected daily to insure that they are intact and functional. Should a leaking container be identified it will be moved to a ventilated area away from ignition sources. Proper response methods by the container supplier will be followed.

4.3 EROSION AND WATER QUALITY

Prior to the start of work at the construction site, contractors are required to submit to the TMT Project, their plans for control of soil erosion and methods they will employ to minimize contamination of surrounding waters and storm water collection systems. Construction activities have the potential to cause erosion and degrade storm water quality due to sediment from unstable soil at excavations and stockpiles when exposed to heavy rain. In addition, run-off of sediment laden/contaminated storm water and other water sources such as water used to wash concrete trucks, control dust, chemicals and petroleum products could impact surrounding waters and storm water collection systems if not properly controlled. Erosion control methods that include use of biological material (hay bales, compost, wood shavings, excelsior tubes, etc.) are not permitted. Local rock or cinder, not derived from TMT construction activity, may not be used for erosion control.

The civil construction grading plan lies entirely within the footprint of the final construction of the TMT Observatory. Due to the porosity of the site and the minimal runoff expected, no special provisions will be provided. This is consistent with the approved grading plans for the final construction of the TMT Observatory.

All activity will conform to applicable provisions of the water quality and water pollution control standards contained in Hawaii Administrative Rules, Title 11, Chapter 54 - Erosion and Sedimentation Control, of the Hawaii County Code. Appropriate best management practices will be employed at all times during construction.

4.4 AIR QUALITY AND LIGHTING

The generation of excess dust from the TMT construction areas is the primary air quality concern due to the potential impact on cultural, botanical, wildlife, and astronomical resources. Plants, arthropods, and habitat adjacent to unpaved roads and construction sites are the most susceptible to impact from dust. Other potential air quality impacts are associated with emissions from engines such as carbon monoxide and sulfur. Another potential source of dust could be due to storms and the accompanying high winds that can arise quickly at the summit. Construction contractors will be required to submit to the TMT Project their plan for minimizing generation of dust at the construction sites. The contractor's dust mitigation planning

shall include methods to prevent/control the generation of dust during grading operations, dust from roads and material stockpiles, movement of materials by truck, and high winds. Also, to reduce the potential mobile source of emissions from vehicles and equipment, the construction contractors will be required to include in their Air Quality plans, outlines of their procedures for vehicle/equipment maintenance and scheduling inspections.

Regarding lighting, during certain construction events or phases of construction, the addition of external lighting may be necessary. The use of external lighting shall be kept to a minimum. When a contractor finds it necessary to plan for the use of external lighting, they must first coordinate their lighting plan with the TMT construction site monitor, OMKM, and in turn with the other observatories. The use of external lighting must also be used in compliance with other applicable requirements.

Jet fuel (JP4), or a blend of jet fuel and diesel, will be required rather than pure diesel in order to run equipment at the site altitude. This is also expected to reduce engine emissions.

Grading of the TMT site and access way construction Site are expected to have the highest potential for dust development during the work. For this reason, water trucks will cycle between the project site and the potable water source at Hale Pohaku in order to provide dust control during the site and road grading operations. Only water from potable sources are permitted for use. Grading will not occur without these dust control provisions.

The most likely dust sources other than the site and access road grading would be the occasional driving on the access roads itself. Maintaining a slow speed will help minimize the potential of dust issues.

Contractor will provide to the TMT Site Representative evidence of current vehicle and motorized equipment maintenance schedules and inspections to help ensure reduction of engine emissions.

4.5 ADDITIONAL DISTURBANCE AND ENCROACHMENT

Contractor is to minimize the existing terrain disturbance as much as possible. Toe of cut and fill as shown on the drawing is the extent of the terrain disturbance required to maintain elevation and slope. The contractor shall not go beyond the edge of disturbance with any equipment, vehicle, etc. and take all means to minimize the disturbance of the natural terrain. The TMT NPDES permit will outline steps to prevent disturbance of land beyond that which is necessary. Construction contractors will submit their plans and procedures that will be implemented to comply with the TMT Project NPDES. Items to be addressed are: the requirement for flagging of the planned limits of the disturbance by surveyors and the location of nearby property boundaries prior to the start of construction and monitoring of construction activities to verify no disturbances beyond the flagged/designated area. This will also be done at the Batch Plant Staging Area. These steps will help ensure that all disturbances will remain with approved areas.

During the construction phase, any ground disturbing activity will be monitored by both a cultural monitor and an archeological monitor.

4.6 ROCK MOVEMENT PLAN

The Rock Movement Plan prepared by Goodfellow Brothers, Inc., is attached as Exhibit 6 to this Best Management Practices.

The following are additional requirements for the Rock Movement Plan and are referenced by the Goodfellow Brothers plan:

4.6.1 (Not Used)

4.6.2 Rock Movement Monitoring

Whenever construction activities include the excavation or disturbance of previously undisturbed rock or soil the following monitoring will be performed.

- Archaeological monitoring per the project's approved Archaeological Monitoring Plan.
- Cultural monitoring per the project's approved Cultural Monitoring Plan.

4.6.3 Specific Rock Movement Requirements

OMKM and TMT have established that a trained biologist selected by OMKM and approved by DLNR is not required to be on site at all times to monitor excavation, disturbance, and/or transport of rock and soil material. The construction monitoring provided by BIISC and the BIISC inspections of equipment and materials will be sufficient and complies with the CMP.

No previously undisturbed natural area in the UH Management Areas shall be disturbed unless it has been designated as a project disturbance area and that has been delineated by a survey. Only these previously disturbed areas within the UH Management Areas that are designated for project use are to be disturbed during construction. Those areas include the Hale Pohaku Staging Area, the Batch Plant Staging Area, and the roadway and test site areas of the Access Way and TMT Observatory site. Those previously disturbed areas may be utilized by the project at any time; however, excavation is not to occur in these areas unless required by the project and observed by a cultural and archaeological monitor.

4.6.4 Materials Control

There will be no soil or cinder obtained from off the mountain used as fill on Maunakea. The project will balance the excavation (cut) material with the need for fill (material brought in to raise the ground level) so that there will be a slight amount of excess cut material. This includes the following restrictions:

- No material from below the summit region (roughly 3,962.4 meters (13,000 feet) and above) will be imported to the summit region for use as fill.
- No material from below Saddle Road will be imported to Hale Pohaku or the summit region for use as fill.

Aggregate, sand, and other materials necessary for concrete batching may be imported and used as components of concrete and similar construction materials; however, imported aggregates, sand, and other materials not used for those purposes will be removed from the construction sites once concrete batching is complete. While at the construction sites, these materials will be stored in containers or lined areas to minimize the potential for spillage and to keep them isolated from the environment.

4.6.5 Aggregate Materials

Aggregate, sand, and other materials necessary for concrete batching, bedding for conduits and other buried utilities, and base course under slabs may be imported and used as components of concrete and similar construction materials and uses; however, imported aggregates, sand, and other materials not used for those purposes will be removed from the construction sites once concrete batching is complete. While at the construction sites, these materials will be stored in containers or lined areas to minimize the potential for spillage and to keep them isolated from the environment. In addition, invasive species prevention policies identified in AD6 and AD8 apply.

5.0 OTHER ENVIRONMENTAL PROTECTION PLANS, PERMITS, AND VARIANCES

5.1 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

NPDES Permit Number HI S000431 has been obtained for the TMT Project. This permit covers all Civil Construction work. TMT and all contractors will comply with the terms of this permit.

5.2 COMMUNITY NOISE PERMIT AND COMMUNITY NOISE VARIANCE

TMT's contractors are required to obtain a Community Noise Permit from the Hawaii Department of Health prior to starting work on TMT sites. Construction under a Community Noise Permit is allowed from 7:00 am to 6:00 pm, Monday through Friday and 9:00 am to 6:00 pm on Saturdays.

The Hawaii Department of Health may require special restrictions and conditions when issuing a Community Noise Permit. TMT's contractors will observe all special restrictions and conditions of Community Noise Permits issued to that contractor.

TMT has obtained a Community Noise Variance from the Hawaii Department of Health (Docket No. 14-NR-VN-22) that is valid through June 30, 2019. This permit is granted for the following days and times:

Monday through Friday	5:00 am - 7:00 am	and 6:00 pm – 8:00 pm
Saturday	5:00 am - 9:00 am	and 6:00 pm – 8:00 pm
Sundays and Holidays	5:00 am - 8:00 pm	

The Community Noise Variance has restrictions, including the following:

- TMT will have a job-site inspector to whom immediate complaints can be forwarded for prompt response and who shall have the general responsibility of monitoring quiet work procedures. (The TMT Construction Manager will normally be designated as the job-site inspector for Community Noise Variance purposes.)
- Other observatories that will be impacted by the nighttime activity shall be given sufficient notice regarding the project. The notification for the planned nighttime activity shall contain the name and telephone number of the job-site inspector. In addition, a copy of any notifications, as well as progress reports, shall be sent to the Indoor and Radiological Health Branch.
- If the noise level is such that numerous complaints are received by the Department, the applicant shall cease operations upon receipt of an order and complete the project during the hours on weekday and weekends as directed.

- The applicant shall notify the Indoor and Radiological Health Branch as to the date and time of any variance hour activity as soon as the dates are confirmed and also when the project is completed.
- The use of reverse signal alarms is prohibited from the hours of 8pm - 7am.
- Pursuant to Section 342F-5(d)(3), H.R.S., the applicant shall be required to perform noise sampling during the variance hours and report the results of such sampling to the Indoor and Radiological Health Branch.

TMT and TMT's contractors will observe these and all other conditions of the Community Noise Variance when performing construction activities outside the hours allowed by the Community Noise Permits.

The TMT Project in-conjunction with OMKM and Kahu Ku Mauna, will identify cultural events that would be sensitive to construction noise in the vicinity of TMT Observatory site and the Batch Plant Staging Area. TMT will require construction contractors to reduce construction noise and activities in the vicinity of these identified cultural events on up to four days a year. The TMT Project will notify the contractor of the designated days.

5.3 WASTE MINIMIZATION PLAN

The waste minimization plan prepared by Goodfellow Brothers, Inc., the contractor that will perform the work of the Civil Package, is attached as Exhibit 7 and is incorporated into this Best Management Practices for the Civil Construction Package.

[Note: The attached plan is a construction mitigation plan intended for the Civil Package. An operation waste minimization plan will be submitted prior to start of operations.]

5.4 OVERSIZE AND OVERWEIGHT VEHICLES PERMIT (OOVP)

TMT construction contractors are required to obtain an OOVP from the HOOT for movement of loads that exceed weight, height, or size restrictions for the roadways. Special accommodations may also be required to move these loads through town, as standard lane widths may not be sufficient to allow for normal traffic flows and patterns. It is anticipated that the OOVP will require some loads to be moved during non-peak traffic hours. Most other construction materials, not requiring an OOVP, should also be transported during non-peak traffic hours. It is proposed if possible, that construction contractors plan their truck/load movements in the early morning before peak traffic. TMT and construction contractors will also need to coordinate with OMKM to reduce the potential impact to other observatory vehicle traffic.

OMKM Rangers and the OMKM Director will also be notified, in writing, of oversize/overweight vehicle transport. With oversize/overweight vehicles requiring OMKM Ranger escort, notice will be provided at least five (5) business days ahead (exceptions may be granted by OMKM if circumstances require shorter notice). When oversize/overweight vehicles are accompanied to the project site by uniformed police

escort, at least twenty four (24) hours advance notice will be provided. OMKM reserves the right to reschedule movement plans based on staff availability, safety, or management considerations. Written follow-up notification will identify when assistance was needed or other difficulties were encountered. TMT will also comply with all road-conditions communication protocols established by the Maunakea Observatories Support Services Oversight Committee and Safety Committee.

5.5 RIDE-SHARING PROGRAM

TMT's contractors will participate in a Ride-Sharing Program. Participation will occur whenever possible. For example, it is anticipated that the heavy equipment drivers (dozers, loaders, etc.) will ride share to Hale P6haku, leaving the equipment on site until it is demobilized. This measure is designed to limit traffic on Maunakea Access Road, ensure reliable access to the public, and to limit the potential introduction of invasive species and to minimize dust.

Several vehicles however (such as water trucks) are considered equipment and not commuting vehicles.

There should always be one commuting vehicle available at the TMT site in case of emergencies.

5.6 ROAD GRADING ARRANGEMENTS

TMT will arrange, and fund, an additional grading of the road each week by MKSS. Special gradings will be arranged when necessary.



EXHIBIT 1. TMT ENVIRONMENTAL, SAFETY & HEALTH PLAN



THIRTY METER TELESCOPE

ENVIRONMENTAL, SAFETY & HEALTH (ES&H) PLAN

TMT.PMO.MGT.10.002.CCR11

July 28, 2014

DOCUMENT APPROVAL

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This is the first CCR release of this document.

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1. INTRODUCTION

1.1 PURPOSE

This document describes the TMT Environment, Safety and Health (ES&H) program based on standard practices for system and functional safety. This document provides a management approach for helping to assure safe/low risk designs and operations throughout all activities associated with the development, design, construction and operation of the TMT. The ES&H program provides a means to identify, eliminate or control ES&H hazards and risks through hazard analysis and risk assessment. The TMT ES&H activities are tailored to cost-effectively perform those tasks required to help assure adequate ES&H protection.

1.2 SCOPE

The ES&H Plan provides guidelines for TMT Project procedures and processes to ensure environmental, safety and health protection. The ES&H Plan applies to all Partner organizations, contractors and subcontractors supporting the TMT Project. In addition, the ES&H Plan requirements apply to the design and use of TMT Project furnished equipment or support equipment.

TMT Partner organizations manage their own ES&H programs. However, TMT systems will be designed and fabricated to satisfy TMT ES&H protection requirements. In areas where a TMT Partner institution ES&H plan does not cover or conflicts with the TMT ES&H Plan, the TMT ES&H Plan applies. A written waiver must be submitted and approved by the TMT Project Manager to override TMT ES&H Plan precedence.

TMT Project contractors will implement their own ES&H policies and procedures, subject to review and audit by the ES&H Officer and approval by the TMT Project Manager. In areas where the contractor ES&H plan does not cover or conflicts with the TMT ES&H Plan, the TMT ES&H Plan applies.

1.3 APPLICABLE DOCUMENTS

Applicable documents contain requirements and standards that apply to this document.

- AD1 – Hazard/Risk Assessment Processes and Guidelines, (TMT.PMO.MGT.10.004)
- AD2 – Cultural and Environmental Guidelines for TMT Work in Hawaii, (TMT.FAC.CON.12.001)
- AD3 – OSW TN002 TMT Guidelines for Software Safety, (TMT.SFT.TEC.11.022)
- AD4 – TMT Reviews: Definitions, Guidelines, and Procedures, (TMT.SEN.SPE.12.002)
- AD5 – TMT Product Data Package Definition, (TMT.SEN.SPC.12.001)

1.4 REFERENCE DOCUMENTS

Reference documents contain information complementing, explaining, detailing, or otherwise supporting the information included in the ES&H Plan.

- RD1 – ES&H Work Permit, (TMT.PMO.COR.13.013)
- RD2 – ES&H Work Permit (Hawaii Excluded), (TMT.PMO.COR.13.019)
- RD3 – TMT Project Incident Report, (TMT.PMO.COR.13.012)
- RD4 – TMT Site Visit Checklist, (TMT.PMO.COR.13.014)

1.4.1 External Reference Documents

External reference documents contain information complimenting, explaining, detailing, or otherwise supporting the information in the ES&H Plan. These reference documents include U.S. Regulatory Requirements, Industrial and Professional Organization and Safety Design Requirements and Guidelines. Not all of these documents are cited within the ES&H Plan.

United States Federal Law

- Occupational Safety and Health Administration (OSHA)
 - Toxic and Hazardous Substances – 29 CFR 1910, Subpart Z
 - Construction Industry Standards – 29 CFR 1926
- Department of Transportation (DOT)
 - Transport and Disposal of Hazardous Material – 49 CFR 172
- Environmental Protection Agency (EPA)
 - The Clean Water Act (CWA)
 - The Toxic Substances Control Act (TSCA)

Standards/Requirements

- IEC 62061 – Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems
- IEEE STD 1228-1994 – IEEE Standard for Software Safety Plans
- MIL-STD-882E – DOD Standard Practice for System Safety
- MIL-STD-1629A – Procedures for Performing a Failure Mode and Effects Analysis
- National Fire Protection Association (NFPA) – Fire Codes and Handbook of Fire Protection
 - NFPA 70 National Electric Code (NEC)
 - NFPA 75 Fire Protection for Essential Electronic Equipment
 - NFPA 79 Electrical Standard for Industrial Machinery
 - NFPA 101 Life Safety Code
 - NFPA 791 Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation
- ANSI Z136.1 American National Standard for Safe Use of Lasers
- International Building Code
- National Safety Council (NSC) – Accident Prevention Manual for Industrial Operations
- State of Hawaii – State Water Quality Standards

Professional Organizations Safety Design Requirements and Guidelines

- American Concrete Institute (ACI)
 - ACI 301-10 Specifications for Structural Concrete
 - ACI 318-11 Building Code Requirements for Structural Concrete and Commentary
- American Society of Civil Engineers (ASCE)
- American Society of Mechanical Engineers (ASME)
- American Institute of Steel Construction (AISC)
 - Steel Construction Manual
- American Welding Society (AWS)

1.5 CHANGE RECORD

Revision	Date	Section	Modifications
REL09	04 October, 2013	All	Initial Release
REL10	25 February, 2014	Document Approval	Added Document Approval Page.
CCR11	28 July, 2014	All	Various edits and changes.

1.6 DEFINITIONS

These are common definitions presently supported by the TMT ES&H Program.

CCR. Change Control Release.

Condition. An existing or potential state such as exposure to harm, toxicity, energy source, activity, environmental impact, etc.

Contractor/Supplier. A private sector enterprise engaged to provide services or products within agreed limits specified by a contract and/or statement of work.

DCC. Document Change Control.

ES&H Safety. The application of engineering and management principles, criteria, with processes and techniques to optimize all aspects of safety and environmental protection within the constraints of operational effectiveness, time, and cost throughout all phases of the TMT observatory system life cycle.

ES&H Safety Critical Computer Software Components. Those computer software components and units whose errors can result in a potential hazard, or loss of predictability or control of a system.

ES&H Officer. An engineer or scientist who is qualified by training and/or experience to perform ES&H system safety engineering and management tasks.

ES&H Safety Manager. A management discipline that defines ES&H program requirements and ensures the planning, implementation and accomplishment of ES&H tasks and activities consistent with the overall program requirements.

ES&H Safety Program. The combined tasks and activities of ES&H (safety) management and ES&H engineering implemented by project and group managers.

ES&H Program Plan. A description of the planned tasks and activities to be used to implement the required ES&H system safety program. This description includes organizational responsibilities, resources, methods of accomplishment, milestones, depth of effort, and integration with other program engineering and management activities and related systems.

Fail safe. A design feature that ensures that the system remains safe or, in the event of a failure, will cause the system to revert to a state which will not cause a mishap or hazardous conditions.

Hazard. A condition that is prerequisite to a mishap.

Hazard Probability. The aggregate probability of occurrence of the individual events that create a specific hazard.

Hazard Severity. An assessment of the consequences of the worst credible mishap that could be caused by a specific hazard.

Hazardous Material. Anything that due to its chemical, physical, or biological nature causes ES&H, public health, or environmental impact concerns that result in an elevated level of effort to manage, handle or eliminate.

Incident (Accident). An unplanned event or series of events resulting in death or injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment.

Risk. An expression of the possibility/impact of a mishap in terms of hazard severity and hazard probability.

Risk Assessment. A comprehensive evaluation of the hazard/risk probability and its associated severity.



Safety (ES&H). Freedom from those conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment.

Safety Critical. A term applied to a condition, event, operation, process or item of whose proper recognition, control, performance or tolerance is essential to safe system operation or use; e.g., ES&H critical function, ES&H critical component, or assembly.

Safety-Related Electric Control Systems (SREC). Systems with electric/electronic instrumentation and controls installed to shut-down and/or take equipment or operations to a safe state.

Safety-Critical Software. Software criticality is used to determine how critical a specified software function is with respect to the safety of the system.

Subsystem. An element of a system that, in itself may constitute a system.

System. A composite, at any level of complexity, of personnel, procedures, materials, tools, equipment, facilities, and software. The elements of this composite entity are used together in the intended operational or support environment to perform a given task or achieve a specific purpose, support, or mission requirement.

TMTPO. TMT Project Office.

2. TMT ES&H PROGRAM

Many of the criteria for the TMT ES&H Program are drawn from existing ES&H documents, good design practices and industry consensus standards. In addition, in some cases the application of such criteria is dictated by law, and little discretion is left to TMT Project, Partners or contractors. Examples are USA Federal OSHA, EPA and DOT laws. In these cases the ES&H task is to research the laws and standards to assure that these ES&H requirements are satisfied. In addition, all ES&H protection requirements must be applied in an effective manner to assure that the intent of the requirement is satisfied.

An important part of the TMT ES&H program is to establish and maintain ES&H protection education and training programs for every TMT/Partner employee or visitor to a TMT Project site including students and contractor/supplier personnel. The intent of these programs is to make individuals aware that they are personally responsible for their own ES&H protection and for the protection of other individuals at all times. The TMT Project has implemented a work permit process to help assure that the planned work or activity has been evaluated for hazards and risks and that it is safe and environmentally acceptable. Before work can start, a survey/inspection of the work site is also performed to identify (potential) hazards.

Additional ES&H protection requirements or revisions of existing requirements may be identified through a continuing review of TMT incident reports, mishap/incident data from other observatories and research institutions, and assessment of lessons learned information.

2.1 ES&H SYSTEM PROGRAM MILESTONES

The TMT ES&H Officer will assure that the status of all ES&H activities (e.g., safety reviews, Work Permits, Incident Reports, personnel ES&H training activities, etc.) are current with the TMT Project phase and scheduled activity, particularly the project design review process. The status of the design ES&H hazard and risk analyses is an agenda item for each design review. The Final Design Review for a subsystem/system is not considered complete until all ES&H action items are either closed or the plan for closure has been reviewed and approved.

2.2 ES&H DESIGN HAZARD ANALYSIS REQUIREMENT

Starting during the TMT design phase, a hazard analysis process (based on MIL-STD-882E) is used to identify and classify (risk and severity) the potential hazards. This hazard and risk assessment process is used to identify design or mitigation methods to be implemented that will reduce hazards/risks to an acceptable level and potentially help increase system reliability (AD1). In addition, the TMT Project System Engineer will in some cases, designate subsystems and systems designs that must be subjected to an FMEA evaluation process to help assure acceptable ES&H protection. Procedures for performing a FMEA process may be found in MIL-STD-1629A: Procedures for Performing Failure Mode Effects and Criticality Analysis.

2.3 ES&H PROTECTION GUIDELINES

The TMT ES&H Plan will assure Project compliance with all applicable environmental protection rules, regulations and requirements as stated in the TMT Final Environmental Impact Statement (FEIS) and the Conservation District Use Permit (CDUP).

A summary of the environmental protection requirements contained in the FEIS and the CDUP may be found in the TMT "Cultural and Environmental Protection Guidelines for TMT Work in Hawaii" (AD2).

ES&H protection is controlled through the use of TMT ES&H Work Permits (RD1 and RD2, See examples of these forms in Sections 6.1 and 6.2). A TMT ES&H Work Permit (WP) must be

approved for each work location before the work can start. The Work Permit describes the planned work location, identifies the potential hazards and ES&H risks, and mandates methods to minimize the ES&H concerns. This process includes a hazard analysis and, on ES&H critical items, developing and implementing appropriate (sub)system and operational hazard controls and procedures, as well as defining ES&H design criteria, (including results of design FMEAs) verification tests, inspections, and assessment reports.

In addition, for work that will be performed at any one of the TMT Hawaii sites, the site visit leader (task/work leader) must prepare and submit a TMT Site Activity Checklist (RD4, See an example of this form in Section 6.4) to verify that all required environmental and cultural protection requirements have been satisfied.

2.4 ES&H PROTECTION DESIGN GUIDELINES

All TMT design activities shall comply to the extent possible with the following design guidelines:

- a. Design for minimum risk. During the design phase, eliminate or reduce to an acceptable severity level, all ES&H hazards and risks. Hazard and risk mitigation by design may include the application of a safety-related programmable electric control system (SREC).
- b. IEC Standard 62061 will be specifically applied for the design of SREC systems.
- c. If necessary, consider alternate design approaches to minimize risk from hazards that cannot be eliminated. Such approaches include the use of interlocks, redundancy, fail-safe design, procedures and personnel training.
- d. Provide ES&H warning devices. Include hazard warning and caution notes (always in English) in the assembly, operations, maintenance, and repair instructions. Use distinctive markings on hazardous components and materials, equipment, and facilities to ensure personnel and equipment protection. These shall be standardized in accordance with the responsible authority (agency) requirements or by TMT Project direction.
- e. To the maximum extent possible, restrict the use of hazardous substances and minimize electrical and electronic equipment waste. Provide appropriate training and personal protective equipment (PPE) for hazardous waste handling, storage and disposal in accordance with applicable Federal, State and local agency ES&H requirements.
- f. Locate equipment so that access during operations, servicing, maintenance, repair, or adjustment, minimizes personnel exposure to hazards (e.g., pinch points, hazardous chemicals, high voltage, electromagnetic radiation, cutting edges, and sharp points/edges).
- g. Minimize hazards and risk resulting from extreme environmental conditions (e.g., temperature, pressure, noise, toxicity, high-altitude, acceleration and vibration).
- h. Design to minimize risk created by human error in the operation and support of the system.
- i. Protection of the power sources, controls and critical components of redundant subsystems by physical separation or shielding.
- j. Minimize the severity of personnel injury or damage to equipment or environmental impact in the event of a mishap.
- k. Design software used for safety-related electrical control systems or monitoring of safety critical functions in accordance with a safety-critical software safety plan based on "OSW TN002 TMT Guidelines for Software Safety" (AD3).
- l. Review design criteria for inadequate or overly restrictive requirements regarding ES&H. Recommend new design criteria supported by study, analyses, FMEA, or test data.

- m. Disseminate ES&H information to appropriate design, engineering, operations, and program management organizations. Establish and maintain up-to-date ES&H training programs.
- n. Apportion the ES&H effort and resources in a manner commensurate with the magnitude of the hazards and risks to minimize costs and complexity.
- o. Establish and maintain an effective administrative procedure for incident reporting, cataloging, tracking and resolving identified hazards and distributing "lessons-learned" information.

2.5 REVIEWS

The TMT Project has an established formal design review process to evaluate progress in the development of observatory sub-system designs or ES&H protection (AD4, AD5). The goal of each design review is to ascertain and verify that there is adequate hazard/risk assessment with plans and mitigation.

In addition, to assure that the TMT ES&H program is vital and continues to maintain adequate safety and environmental protection through all phases of the project including observatory operations, the TMT Project Manager may request that an external agency perform annual ES&H reviews. This type of review compares the level of ES&H analyses, documentation, procedures, and verification of ES&H controls with the maturity of the program and science activity. The review shall evaluate the level of ES&H support and determine if the ES&H program is properly oriented to provide the ES&H methods and protection necessary to assure that potential mishaps are prevented by elimination or control of identified hazards. A secondary part of the review process is to determine if all hazards were identified, if risk assessments have been performed correctly with reasonable impacts projected and if hazards are properly controlled. By performing this type of external check the TMT Project Manager is assured that the TMT Project has made the best attempt at providing an operationally safe system with minimum environmental impact.

Prior to the start of modifications, assembly or integration operations at the TMT observatory or support facilities, ES&H inspections will be performed by a small group of TMT observatory personnel selected by the Telescope and Facilities Managers with approval by the TMT ES&H Officer and/or the TMT Project Manager.

An ES&H review shall be carried out personally, at least annually, at the TMT site by the ES&H Officer and the TMT Project Manager.

Prior to the start of TMT commissioning or science operations there shall be a review of the facility and operational ES&H program and procedures. Approval to start these operations is contingent upon a preoperational review and approval by representatives of all involved organizations to assure compliance with ES&H requirements.

3. DOCUMENTATION

This section describes the ES&H documents required in addition to the ES&H related documents required by the formal design review. The TMT Design Reviews include ES&H documents that summarize hazard/risk assessments, hazard mitigation methods, sub-system safety plans, results of FMEA investigations, operation plans and procedures, and etc. Other ES&H documentation requirements may be added as the ES&H Steering Committee finds necessary. All TMT documentation, signs and notices will be in English. The proposed ES&H documents that will be generated to assure appropriate project ES&H requirements:

- (1) ES&H Assessment Report is required with approval for initial (startup) operation of the TMT. It addresses TMT observatory operation plans for the enclosure, laser system, telescope, first-light science instruments, hazards/risk assessments and their mitigation methods/controls, ES&H waivers, hazardous materials lists and procedures, handling/operational test plans and other supporting information. Subsequent to the initial observatory start of operations, ES&H Safety Assessment Report updates will be issued to identify new or continuing safety issues that need resolution. The reports are prepared by the TMT ES&H Officer and System Engineering with subsystem-engineering inputs as requested by the Project Manager.
- (2) Safety Critical Software Plans are prepared in accordance with "OSW TN002 TMT Guidelines for Software Safety" (AD3), and submitted for TMTPO Approval.
- (3) Operating Plans and/or Procedures include TMT Observatory test and operating plans, processes and procedures to be used and supported at TMT observatory operated support facilities. These plans and procedures contain the necessary ES&H restrictions and directions to assure ES&H requirements are met. Included under this category:
 - a. Site Initialization/Startup Procedure identifies hazardous operations during startup operations. Those items involving hazards will be clearly marked in the initialization and startup sequence.
 - b. Emergency Procedures address the types of plausible emergencies, including a seismic incident, during each phase of the operations. The steps necessary to minimize injury to people and to prevent uncontrolled release of hazardous energy or materials are described. Steps necessary to minimize damage to facilities and equipment are also described. The steps to be taken, the responsible people, involved emergency crews, equipment and facilities to be employed, etc., are included.
- (4) Contractor Work Permits and Site Activity Checklists are to be submitted by contractors building or installing TMT hardware and/or accessing TMT sites (RD4, See an example of this form in Section 6.4). Note: of particular concern are contractor plans and methods for installation and use of large construction cranes and scaffolding. Also of concern are plans for installation and testing of observatory electrical equipment and electrical systems. In the case of a small piece part or other simple piece of equipment, the ES&H Officer may waive this requirement.
- (5) Other TMT Documentation Requirements include ES&H information such as TMT Project Incident Reports (RD3, See an example of this form in Section 6.3) to be prepared and submitted as TMT requirements dictate. The TMT ES&H Steering Committee and TMT Project System Engineer may identify other documents required or needed to analyze or control hazardous activities.

3.1 DESIGN AND OPERATIONAL ES&H DOCUMENT GUIDELINES

Appropriate instructions to ensure safe and environmentally acceptable operations must be included as part of all TMT ES&H project documentation; for example:

- (1) Only applicable ES&H standards shall be included in design specifications, reviews, and functional requirements documents.
- (2) ES&H Work Permits (RD1 and RD2, See examples of these forms in Sections 6.1 and 6.2) or procedures containing hazardous operations must be clearly marked in the text of the work permit or procedure where the hazardous events occur. The front covers of procedures shall be marked in red "HAZARDOUS OPERATIONS."
- (3) Operational ES&H constraints must be included at the proper position in work permits or procedures and shall be conspicuously marked.
- (4) Hazard warning signs will be in English and must conform to applicable OSHA standards.
- (5) Testing and commissioning ES&H requirements and constraints must be included in the applicable test plans and procedures and shall be conspicuously marked.
- (6) Procedures for hazardous materials handling and disposal including applicable DOT, State of Hawaii, and OMKM requirements shall also be included.
- (7) Procedures and personnel training for spill prevention and spill response mediation.

4. ES&H SYSTEM ASSURANCE

ES&H system assurance combines two methods to achieve and maintain an acceptable level of hazard and risk mitigation and ES&H protection for all project activities throughout the TMT Project life cycle.

4.1 PERSONNEL TRAINING AND CERTIFICATION

The TMT ES&H Steering Committee will review and specify the type and frequency of personnel training and certification required for ES&H protection. Procedures and personnel training will be required for activities involved with the handling and installation of schedule/cost critical observatory components and all hazardous operations. The Committee members will ensure that such requirements are satisfied.

The TMT ES&H personnel training program content will include compliance information as specified by the State of Hawaii, OSHA, DOT, OMKM, FEIS and CDUP ES&H protection requirements. The TMT ES&H Steering Committee will monitor the ES&H training programs and recommend changes to the TMT ES&H Officer.

4.2 AUDIT PROGRAM

Each TMT ES&H Steering Committee member and/or Group Leader will periodically survey project activities under his/her responsibility to assure adequate ES&H protection is implemented and maintained at an acceptable level. Suspected ES&H protection deficiencies will be communicated to the TMT Project Manager and the TMT ES&H Officer for review and corrective action.

An ES&H review shall be carried out personally, at least annually, at the TMT site by the ES&H Officer and the TMT Project Manager.

5. RESPONSIBILITIES

5.1 TMT MANAGEMENT ES&H RESPONSIBILITIES

The TMT Project is managed by the TMT Project Manager. The Project Manager reports to the TMT Observatory Collaborative Board and has the necessary authority and is responsible to ensure that all elements of the TMT Project including ES&H are carried out successfully. In addition, the TMT ES&H program is the responsibility of the Project Manager.

The TMT Project Manager ES&H protection responsibilities also include:

- ES&H protection review and approval of Partner organization hardware designs, manufacture, assembly, testing handling and shipping procedures/processes.
- The monitoring of other contributing agencies for ES&H concerns.
- Integration, commissioning and operation of the TMT System in a safe fashion.

The TMT ES&H Officer is responsible for ES&H planning documentation and surveillance. The ES&H Officer manages ES&H program activities on behalf of the TMT Project Manager and reports directly to the Project Manager on matters pertaining to the ES&H program.

The TMT ES&H Officer will review and approve all TMT Project contractually required contractors/suppliers ES&H protection plans.

Protection of the environment, and personnel safety and health, is also a TMT line management responsibility supported by the ES&H Officer.

Everyone attached to the TMT Observatory (Partners and staff members, visitors, employees and contractors) are personally responsible for ES&H protection and safe practices. All individuals must identify hazards and promptly bring them to the attention of the local line supervisor, or manager, ES&H Officer, or Project Manager.

5.2 TMT WORK PACKAGE MANAGER ES&H RESPONSIBILITIES

It is the responsibility of each TMT Work Package Manager and Partner Work Package Manager to convey to the Work Package contractors and suppliers, specific TMT ES&H protection requirements that they must satisfy for their TMT work, particularly for design, fabrication, testing, handling and shipping activities. Contractors and suppliers will be responsible for establishing and maintaining adequate environmental protection and safety of their personnel for all work performed at a TMT site. The use of existing TMT contractor and supplier ES&H protection plans and processes may be used if it can be determined that they will satisfy the TMT Project ES&H design and protection requirements.

TMT contractors and suppliers will submit weekly ES&H protection status reports to the TMT Work Package Managers. The content of these reports will include status and summary information for TMT Incident Reports, TMT Safe Work Permits, TMT Design Review ES&H action items, and any other ES&H related issue.

The TMT and TMT Partner Work Package Manager must verify that TMT contracts and purchase orders specify delivery of sufficient ES&H information/data at the time of acceptance and delivery, that verifies the item satisfies all applicable TMT ES&H design and protection requirements.

5.3 PROCESS FOR MANAGEMENT DECISIONS

The TMT ES&H Steering Committee advises the TMT Project Manager regarding ES&H issues and concerns throughout the TMT ES&H organization. The following processes assure identification of critical and catastrophic hazards, and controls to eliminate or minimize these

hazards, and recommendations for corrective actions as a result of reviews of Incident Reports and suggestions for personnel ES&H training.

TMT ES&H Steering Committee Organization. The TMT ES&H Officer is the designated Chairperson, and is a permanent member of the Committee. The Steering Committee members are recommended by the TMT ES&H Officer and appointed by the TMT Project Manager. The members are drawn from Levels 2 & 3 of the TMT Organization. As appropriate, additional consultants (i.e.: other ES&H specialists, Laser ES&H Officer, specialty engineering/scientific personnel etc.) may be appointed as members of the Committee.

TMT ES&H Steering Committee Meeting Schedule. The Committee will meet on a regular basis, as appropriate for TMT Project needs. Line supervisors or managers may request a Committee review when they have an ES&H issue that involves interfaces outside of their organization, or if they wish to have an opinion on an ES&H issue that impacts their budget or schedule.

The Chairperson of the ES&H Steering Committee is the TMT ES&H Officer and is responsible for:

- (1) Organizing, scheduling and conducting ES&H Steering Committee and associated meetings.
- (2) Assigning action items or tasks to the members of the Committee or other required assignments to other TMT staff personnel, as necessary, to carry out Committee functions and/or resolution of action items.
- (3) Coordination of ES&H Steering Committee activities with the appropriate groups and outside agencies.
- (4) Assuring that the Committee work is carried out in a timely and effective manner.

The TMT ES&H Officer, acting as a member of the ES&H Steering Committee, is also responsible for:

- (1) Assessing ES&H concerns regarding the interfaces between personnel, hardware, software, and/or equipment elements.
- (2) Providing guidance and information to the Committee on ES&H matters, i.e. policy, requirements, standards, etc.
- (3) Suggesting areas for Committee evaluation and subjects for consideration.

Steering Committee Duties. The TMT ES&H Steering Committee shall carry out the following duties:

- (1) Review and recommend the applicability of ES&H requirements for all TMT Project activities.
- (2) Evaluate techniques for minimizing or safely accommodating the hazards that cannot be eliminated.
- (3) Evaluate construction, system integration, commissioning and operations schedules, and work permits, to assure appropriate personnel and equipment ES&H planning is included. Advise/recommend changes to work permits as required.
- (4) Review design changes which have ES&H implications and concur with those changes that are acceptable from an ES&H viewpoint.
- (5) Review incident reports (RD3, See an example of this form in Section 6.3), specify corrective action to be implemented. Accident/incident investigations and reporting will be in accordance with the applicable agency policy (OMKM, OSHA, DOT, and TMT ES&H requirements).

- (6) Prepare and place in the TMT DCC, Committee Meeting minutes and notes, records of committee actions, Work Permits and associated documents including Incident Reports.

5.4 INTEGRATION & COORDINATION OF ES&H

The TMT ES&H program includes status reports of ES&H plans and design implementation at each project design review. In addition, the ES&H Steering Committee monitors and reviews ES&H action items to help assure that actions requested are responded to in a timely and appropriate fashion.

TMT ES&H requirements must be met on a schedule compatible with the overall TMT schedule. Scheduled milestones such as ES&H reviews, data submittals, and verification procedures should be part of ES&H planning in each area.



6. ES&H FORMS EXAMPLES

- 6.1 TMT ES&H Work Permit Example**
- 6.2 TMT ES&H Work Permit (Hawaii Excluded) Example**
- 6.3 TMT Project Incident Report Example**
- 6.4 TMT Project Site Activity Checklist Example**



6.1 TMT ES&H WORK PERMIT EXAMPLE



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TMT ES&H WORK PERMIT

Work Permit Number: _____ Date Permit Issued: _____
Valid From: _____ (MM/DD/YY) to _____ (MM/DD/YY) Permit Issued by: _____
Work/Task Leader Name: _____ Phone: _____
Work location (list all work locations): _____
Work description: _____ (Attach existing work plans, reports and procedures if applicable. Attach additional pages as necessary.)

Precautions Always Required, Note Compliance Status with each Requirement

- All workers/visitors clothing and shoes must be brushed clean and inspected for invasive species prior to travel above Saddle Road
- All vehicles must be washed and inspected for invasive species prior to travel above Saddle Road
- Emergency procedures, copies distributed
- Emergency Contact Names & Phone Numbers _____
- Safety Monitor(s) during work activity Names & Phone Numbers _____
- Ride Sharing, maps, driving instructions, hazards and precautions
- Emergency equipment & location including two-way communication
- Trash Collection and Disposal Methods _____
- Sanitary Waste Collection and Disposal Methods _____
- Fire Prevention Methods _____

Special Precautions Required, Note Compliance Status with each Requirement

- Work plans, procedures reviewed with work crew, work site safety/Hazard Inspection
- Buddy System, no work alone is permitted
- Accident prevention and safety, identify work area hazards and mitigation
- Altitude Sickness prevention, monitor for symptoms, proper hydration, emergency oxygen
- Monitoring and verification of safe work atmospheric/environmental conditions
- Safety Equipment Required:

<input type="checkbox"/> Safety glasses	<input type="checkbox"/> Laser eye protection
<input type="checkbox"/> Hardhat and safety shoes	<input type="checkbox"/> Emergency medical supplies
<input type="checkbox"/> Fire extinguishers	<input type="checkbox"/> Supplementary illumination
<input type="checkbox"/> Warning signs	<input type="checkbox"/> Barricades
<input type="checkbox"/> Safety harness and Lifeline	<input type="checkbox"/> 2-way radio or phone, verified operation
<input type="checkbox"/> Protective clothing, gloves, emergency oxygen and bottled water (extreme environmental conditions)	
- Verify all personnel/visitors have completed CDUP orientation/training
- Applicable CDUP plans and permits: ____ Y, N, N/A
- Pre and Post work "Roll Call", verify all personnel are accounted for

Work Permit Submitted by: _____

Print Name

Signature

Date

When Work Permit is Completed, Submit Copies to TMT Project Manager, TMT ES&H Officer and DCC

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6.2 TMT ES&H WORK PERMIT (HAWAII EXCLUDED) EXAMPLE



ES&H WORK PERMIT (HAWAII EXCLUDED)

Work Permit Number: _____	Date Permit Issued: _____
Valid From: _____ to _____	Permit Approved by: _____
	Permit Issued to: _____
Work/Task Leader Name: _____	Phone: _____
Work location (list all work locations): _____	
Work description: (Attach existing work plans, reports and procedures if applicable. Attach additional pages as necessary.) _____ _____ _____	
Precautions Always Required, Note Compliance Status with each Requirement	
<input type="checkbox"/> Emergency procedures, copies distributed	Yes No
<input type="checkbox"/> Emergency Contact Names & Phone Numbers _____	
<input type="checkbox"/> Safety Monitor(s) during work activity Names & Phone Numbers _____	
<input type="checkbox"/> Emergency equipment & location including two-way communication _____	
<input type="checkbox"/> Trash Collection and Disposal Methods _____	
<input type="checkbox"/> Fire Prevention Methods _____	
Special Precautions Required, Note Compliance Status with each Requirement	
<input type="checkbox"/> Work plans, procedures reviewed with work crew, work site safety/Hazard Inspection	Yes No N/A
<input type="checkbox"/> Buddy System, no work alone is permitted	
<input type="checkbox"/> Accident prevention and safety, identify work area hazards and mitigation	
<input type="checkbox"/> Monitoring and verification of safe work atmospheric/environmental conditions	
<input type="checkbox"/> Safety Equipment Required (check all required):	
<input type="checkbox"/> Safety glasses	<input type="checkbox"/> Laser eye protection
<input type="checkbox"/> Hardhat and safety shoes	<input type="checkbox"/> Emergency medical supplies
<input type="checkbox"/> Fire extinguishers	<input type="checkbox"/> Supplementary illumination
<input type="checkbox"/> Warning signs	<input type="checkbox"/> Barricades
<input type="checkbox"/> Safety harness and lifeline	<input type="checkbox"/> 2-way radio or phone, verified operation
<input type="checkbox"/> Protective clothing, gloves, emergency oxygen and bottled water (extreme environmental conditions)	
<input type="checkbox"/> Pre and Post work "Roll Call", verify all personnel are accounted for	
Work Permit Submitted by: _____	
Print Name	
Signature _____	Date _____
When Work Permit is Completed, Submit Copies to TMT Project Manager, TMT ES&H Officer and DCC	



6.3 TMT PROJECT INCIDENT REPORT EXAMPLE



TMT PROJECT INCIDENT REPORT	
Incident Report Number: _____	
Type of Investigation: <input type="checkbox"/> Unsafe Condition <input type="checkbox"/> Injury <input type="checkbox"/> Property Damage <input type="checkbox"/> Illness <input type="checkbox"/> Other	
Facility/Site Location: _____	
Employee Involved: _____ (last) (first)	
Employee Involved: _____ (last) (first)	
Date of Incident: _____ Time of Incident: _____	
Was there any injury? Yes(<input type="checkbox"/>)/No(<input type="checkbox"/>) If yes, explain: _____	
Was Emergency Response Team requested? Yes(<input type="checkbox"/>)/No(<input type="checkbox"/>) If yes, explain: _____	
Was there any property damage? Yes(<input type="checkbox"/>)/No(<input type="checkbox"/>) If yes, explain: _____	
List persons involved: _____	
Describe fully how accident/incident happened: (State what each person was doing at the time of the injury/property damage and circumstances leading to the incident.)	
Facts (Factors that directly contributed to the accident/incident):	
Conclusions/Recommendation (What actions should be taken to prevent a future similar occurrence):	
Report completed by: _____ (Print name)	
_____ (signature)	
Date report prepared: _____	
The original of this report is to be forwarded to the immediate supervisor, copies to TMT Project Manager and TMT ES&H Officer.	

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6.4 TMT PROJECT SITE ACTIVITY CHECKLIST EXAMPLE



TMT.PMO.COR.13.014.REL02
TMT SITE ACTIVITY CHECKLIST

PAGE 1 OF ____

TMT SITE LOCATION, Check/Specify Location(s):		<input type="checkbox"/> Other: _____
<input type="checkbox"/> Port Staging Area		<input type="checkbox"/> Hale Pohaku
<input type="checkbox"/> Batch Plant Staging Area		<input type="checkbox"/> TMT Mauna Kea Site
TMT Visit Leader: _____	OMKM Contact Name: _____	
(Print name)	(Print name)	
PURPOSE of SITE VISIT: _____		
TMT ES&H Work Permit Approved: <input type="checkbox"/> Number: _____ Date: _____		
TMT ES&H Work Permit Duration: _____ (MM/DD/YY) to _____ (MM/DD/YY)		
Authorization to Enter Site <input type="checkbox"/> Name: _____		
VERIFY COMPLETION OF REQUIRED ANNUAL CULTURAL, ARCHAEOLOGICAL, NATURAL RESOURCES, AND INVASIVE SPECIES PREVENTION AND CONTROL TRAINING:		
Size of Group (#): _____		
Names of Visitors, Affiliation(s), Certification(s) and Certification Date(s) enter on next page:		
Contact/Coordination:		
<input type="checkbox"/> OMKM	Name: _____	
<input type="checkbox"/> MK Rangers	Name: _____	
<input type="checkbox"/> Cultural Monitor	Name: _____	
<input type="checkbox"/> Archaeological Monitor	Name: _____	
<input type="checkbox"/> Natural Resources Monitor	Name: _____	
<input type="checkbox"/> Invasive Species Monitor	Name: _____	
<input type="checkbox"/> Vehicle Inspector	Name: _____	Location: _____
<input type="checkbox"/> Clothing/Shoes Inspector	Name: _____	Location: _____
<i>Note: Vehicles and Visitor's Clothing and Shoes must be inspected/cleaned prior to proceeding above Saddle Road/HP</i>		
<input type="checkbox"/> Cultural Orientation Training	Name: _____	
<input type="checkbox"/> Archaeological Orientation Training	Name: _____	
<input type="checkbox"/> Natural Resources Orientation Training	Name: _____	
<input type="checkbox"/> Invasive Species Prevention and Control Orientation/Training	Name: _____	
<input type="checkbox"/> No Smoking and Fire Prevention Briefing	Name: _____	
<input type="checkbox"/> Safety and Accident Prevention Briefing	Name: _____	
<input type="checkbox"/> Trash/Waste Collection/Disposal Briefing	Name: _____	
<input type="checkbox"/> Dust Minimization Briefing	Name: _____	
Speed Limits, Road Conditions, Weather Conditions		
<input type="checkbox"/> Ride Sharing Briefing	Name: _____	
No. Vehicles: _____	No. Passengers/Vehicle: _____	Vehicles Inspected: <input type="checkbox"/>
<input type="checkbox"/> Avoid Disturbance/Encroachment Briefing	Name: _____	
Areas to Avoid, SMA, Site Access Routes/Paths, TMT Site Boundaries, Excessive Noise Warnings		
Trash/Waste Collection and Disposal Plans and Arrangements	Completed: <input type="checkbox"/>	
Sanitary Waste Collection and Disposal Arrangements	Completed: <input type="checkbox"/>	
Check List Submitted by: _____		
(Print Name)		
_____ (Signature)		
_____ (Date)		
When Site Activity is completed, submit copies to TMT Project Manager, TMT ES&H Officer and DCC		

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Visitor Name: _____	Affiliation: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Visitor Name: _____	Affiliation: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Visitor Name: _____	Affiliation: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Visitor Name: _____	Affiliation: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Visitor Name: _____	Affiliation: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____
Certificate: _____	Date: _____

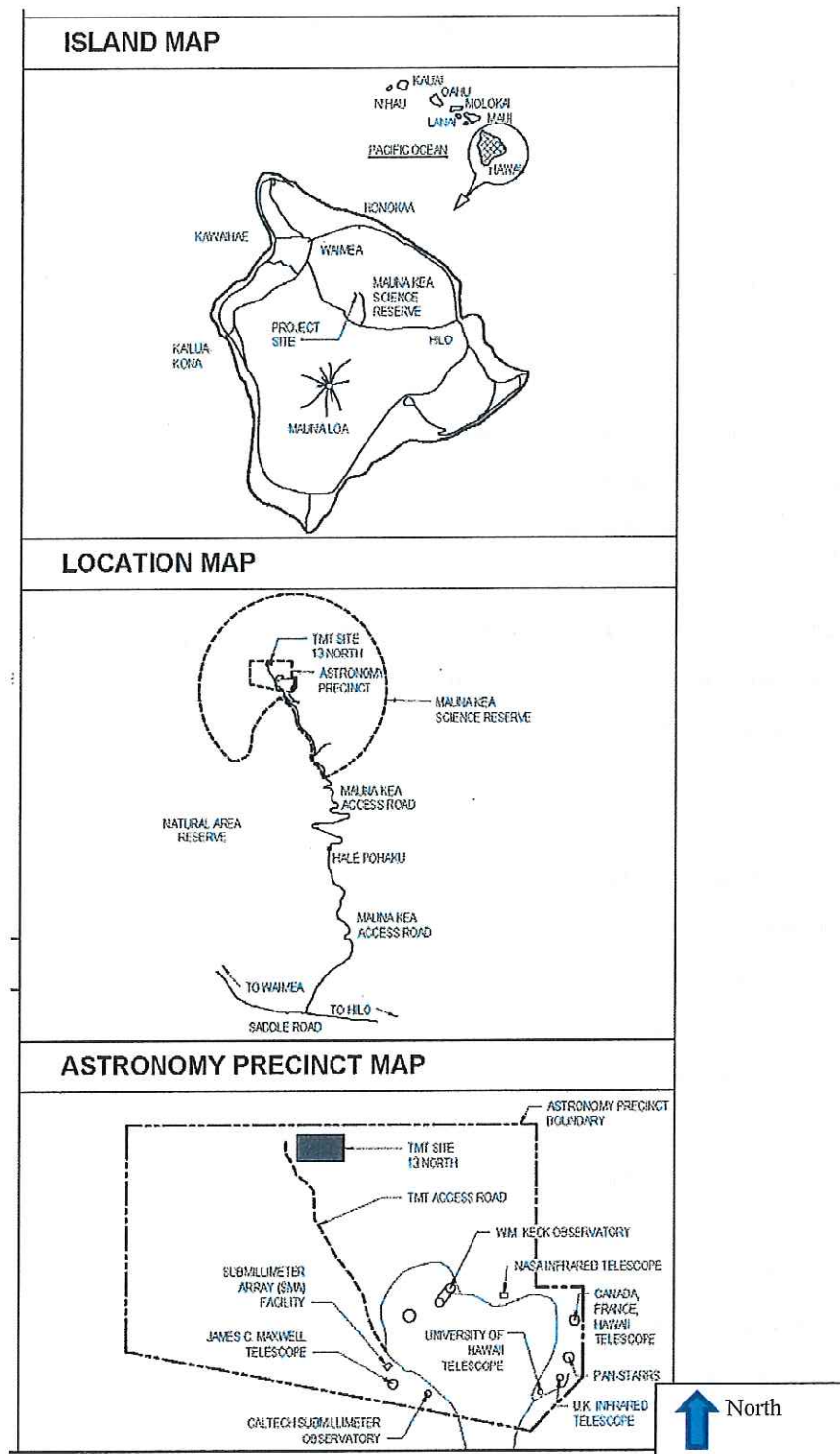
(Copy page as needed to include all visitors)

EXHIBIT 2. CONTRACTOR SAFETY AND ACCIDENT PREVENTION PLAN

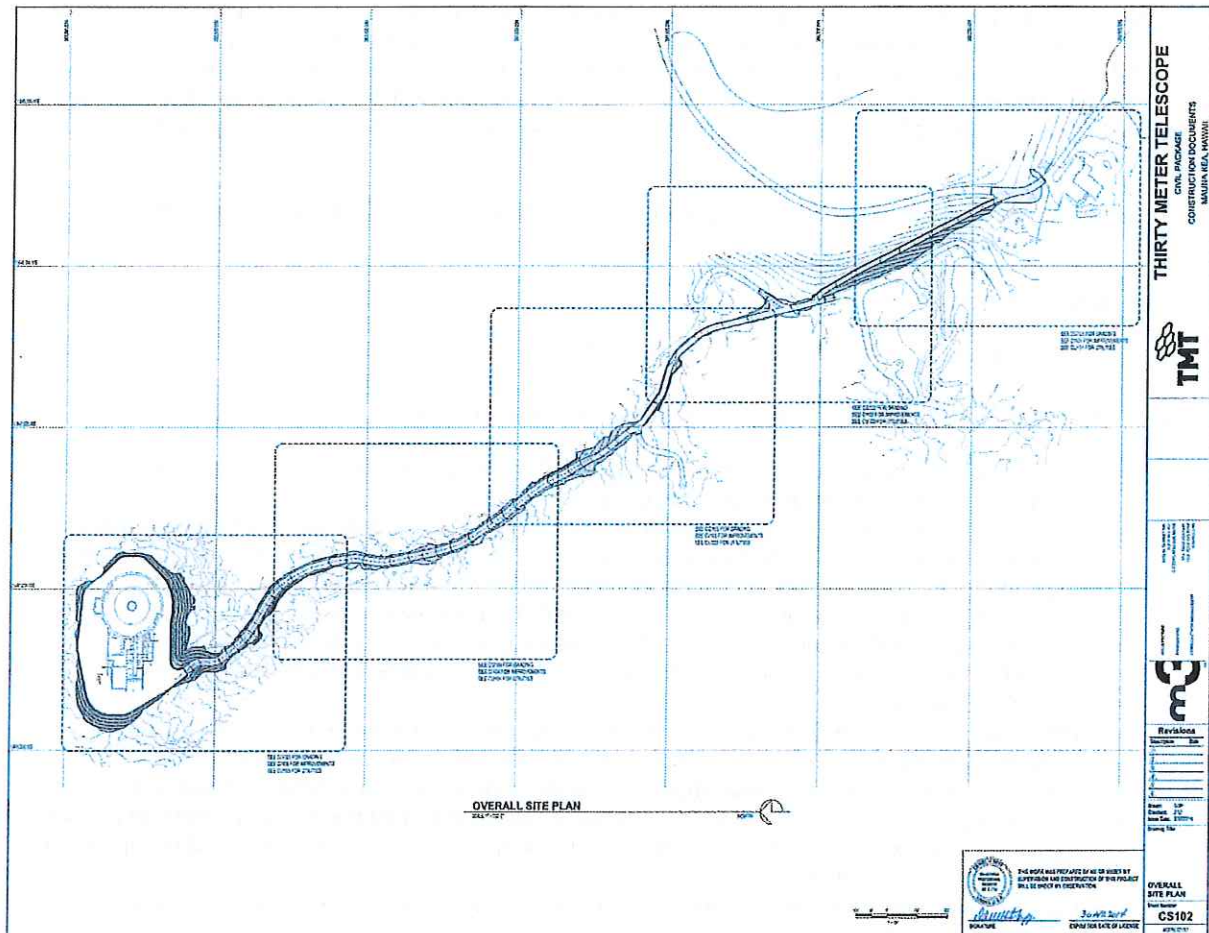
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Vicinity Map:



Site Map:



Organizational Structure

The organizational structure part of this plan establishes the specific chain of command and specifies the overall responsibilities of supervisors and employees. The organizational structure shall be reviewed and updated as necessary to reflect the current status of site operations. Responsible personnel and telephone numbers will be provided to TMT at the start of on-site construction. Copies will be posted at the job trailer upon installation. Supervising on-site personnel will have this information with them during on-site construction.

The above personnel are assigned the responsibility and authority to implement and enforce the site health and safety plan.

Competent Persons

TO BE DETERMINED AT TIME OF CONSTRUCTION

In addition, identified qualified persons have the following responsibilities:

- Ensure that the same procedures and requirements of the prime contractor plan are adhered to by sub-contractors and visitors entering the site
- Maintain current knowledge of all applicable OSHA/HIOSH standards and regulations; maintain current knowledge of all applicable state or other governmental safety and health standards and regulations; ascertain that all personnel are appropriately knowledgeable; and coordinate application and administration of such requirements for the project site.
- Conduct routine safety surveys of project operations to ensure compliance with applicable OSHA/HIOSH safety and health standards and regulations. Identify any defects and initiate corrective actions.
- Utilize authority to stop work in unsafe areas during activities involving unnecessary risks or hazards; and stipulate necessary compliance to permit resumption of such work.
- Ensure compliance with all contamination compliance plan measures, wherever applicable.
- Prepare injury reports & submitting them to the Safety Department immediately; maintain required record keeping system; provide adequate documentation and safety inspection and occupational health monitoring activities.
- Conduct accident investigations; analyze root causes and formulate recommendations for corrective prevention action.
- Conduct new employee jobsite orientation, and communicate safe work practices and safety goals.

Employee Safety Responsibility

GBI is committed to providing a safe and healthful workplace and to eliminating any worker injury. Each employee is responsible for his/her own safety, as well as the safety of those around him/her and must conduct their work in a safe manner.

- Employees are to stop work immediately to correct any unsafe conditions that are encountered and to take corrective action so work may proceed in a safe manner. If the employee cannot correct this unsafe condition, they are to notify their immediate supervisor.
- Crews will fill out and maintain a Field Level Hazard Assessment card (FLHA) as a crew before each work shift.
- An employee who sees an unsafe act by another employee shall express their concern to the other employee (keep comments positive and constructive – avoid criticizing in a negative or demeaning manner).
- Employees can fill out a SPOT THE TRAP card when an unsafe act, near miss or unsafe condition is seen on the job site.
- Employees are required to attend daily tailgate safety meetings before starting work in the morning.
- Employees must attend and sign a weekly 12 Lifesaving Commitment and Toolbox safety topic briefing.
- All employees shall use all equipment in a safe and responsible manner and as directed by supervisory personnel.

- Employees shall inspect prior to use all personal protection equipment and use PPE that is provided and know the proper care, cleaning, storage and decontamination per manufacturer's directions.
- Employees shall inspect all equipment, tools, electrical cords and work areas.

Best Practices:

- Always work in a professional manner – help make the entire job safe.
- Horseplay, scuffling and practical jokes are prohibited.
- Always assist your fellow employee and especially aid the new employee to learn safe work practices.
- Adhere to the site speed limits – don't rush.
- Never take chances – you are required and expected to work with the right safeguards and practices.
- Plan your work – thinking through and organizing tends to produce safety. Never act impulsively.
- If you feel what you are doing is unsafe, notify your immediate supervisor and safety department.
- Keep mind on your work – an accident with lost time will only compound the situation.
- Try to maintain a healthy attitude – a distracted employee tends to be a careless employee.

Drug and Alcohol Use:

- No one shall knowingly be permitted to work while under the influence of intoxicating liquor and or drugs.
- Be in good physical condition before starting to work. Do not expose yourself and others to injury while your alertness or ability is impaired by illness, lack of sleep or fatigue.
- All employees onsite will be subject to GBI's four-point substance abuse program which includes post-offer, post-accident, random, and reasonable suspicion testing.

Hazardous Materials:

- Each employee has the right to know what hazards are associated with the material they are handling.
- GBI has three forms of access to SDS information; First is a hard copy of the SDS sheets (discuss with foreman for location. Second, is by accessing our online database at the following URL

<https://msdsmanagement.msdsonline.com/?ID=819F07E1-830D-4442-9F49-D55E5BEE7299>

Third, is through the Chem Mgmt App.

- This information will be distributed in the form Safety Data Sheets (SDS), and discussed routinely during toolbox safety meetings.
- Keep hands as clean as possible to prevent skin irritation, or other conditions, when working with cement, chemicals, oils or cleaners.
- Wear the proper PPE.
- Before eating wash your hands thoroughly, especially after handling construction materials.

Emergency Response

Pertinent emergency contact numbers are provided in this section.

Medical: 911
Police: 911
Fire Department 911

North Hawaii Community Hospital..... (808) 885-4444
Kaiser-on-the-job..... (808) 334-4415

Other Numbers:

Police Department Non-emergency..... (808) 935-3311
Department of Water Supply..... (808) 270-7633
Electrical Emergencies..... (808) 969-6666
Gas Company (800) 935-0021
Hawaiian Tel-Com..... (808) 643-4411
Chemical / Oil Spills (808) 961-8337
Poison Control Center..... 1-800-222-1222
HAZMAT National Response Center..... 1-800-424-8802

Hawaii State Department of Health:

Hawaii Evaluation and Emergency Response (HEER).....(808) 586-4249
(After hours)..... (808) 247-2191

In the event that a release enters the storm or sewer system, the ERC will immediately notify the National Response Center (NRC) at 1-800-424-8802, the Hawaii Department of Health, Hazard Evaluation and Emergency Response Office (HEER) at 808-586-4249 and LEPC at 935-2785.

Emergency Procedures

In responding to an emergency situation, no procedure can prepare you for all situations. A calm and rational approach will always help in minimizing the problem associated with the emergency. The following procedures are intended to be preliminary instructions for the immediate actions required when an accident occurs.

If Injury Is NON-Critical:

- 1) Provide first aid and use protective barriers (rubber gloves, mouth guard, etc)
- 2) Contact your Supervisor and fill out all accident reports
- 3) Drive injured worker to the Kaiser Clinic

If Injury Is Critical:

- 1) Onsite Foreman will be the on-scene lead and will call emergency services needed or will designate a person to do so
- 2) Designate employee to meet emergency services at front gate
- 3) Provide good Samaritan first aid and use protective barriers (rubber gloves, mouth guard, etc)
- 4) Protect or remove persons from any life threatening dangers
- 5) Cordon off area for investigation
- 6) Contact main office
- 7) Whenever possible allow only trained professionals (police, fire and rescue personnel) to proceed with rescue operations

How to Report an Emergency

Employees may respond to low danger emergencies, such as administration of first aid, fighting small fires (with fire extinguishers) and clean-ups of small chemical spills (of less than 55 gallons or 500 pounds). All employees shall evacuate from the danger area when an emergency not listed above occurs and shall not assist in handling the emergency.

Should outside medical or other emergency assistance be required, personnel shall notify the Site supervisor/Foreman of the nature of the emergency and call shall be made to 911. If the injury or illness appears to be minor, the person may be driven to the emergency room or hospital.

When calling for assistance in an emergency situation, the following information should be provided:

- Name of person calling
- Telephone number of caller's location
- Name of person(s) exposed or injured
- Nature of emergency
- Actions already taken

IMPORTANT: The recipient of the call should hang up first – not the caller.

Status and Capabilities of Emergency Response Providers

Local emergency responders (fire department, medical providers and transporters) are on full time alert and have the capabilities to respond to any anticipated site emergency.

Site Specific Contractual Safety Requirements

- All heavy equipment and vehicles will be equipped with approved and "service ready" fire extinguishers.
- Explosives will not be used. Personnel will not possess or transport explosives on Mauna Kea.
- Contractor and subcontractor personnel will not use on or transport to Mauna Kea any weapons, including any firearms, during the performance of TMT work.
- Smoking will be restricted at the TMT project sites. Smoking will be restricted to areas at least 20 feet distant from any combustible material including dry grass. The use of ash trays is required; cigarette butts will be properly extinguished and disposed in approved containers.
- Motorized equipment will be properly serviced and maintained and inspected regularly for possible ignition sources. Carburetors and motors will be equipped with protective screens and covers to reduce the possibility of heat sources starting fires.
- Equipment being refueled shall have the engine shut off prior to performing fueling or other servicing activities.
- During fueling or other servicing activities, all site personnel will observe no smoking rules and be familiar with flammable fluid spill prevention and response procedures.
- Extra precautions shall be taken regarding heat sources and spills when operating near or over vegetation (this is not expected to be an issue on Mauna Kea, as there is no plant growth at the TMT Site).
- Use only approved containers, tanks, and pumping equipment for storage and handling of flammable and combustible liquids.
- Take precautions, including proper ventilation, to prevent the ignition of flammable vapors.
- Sources of ignition include, but are not limited to:
 - open flames
 - lightning
 - smoking
 - cutting and welding
 - hot surfaces
 - frictional heat
 - static, electrical, and mechanical sparks
 - spontaneous ignition
 - chemical reactions
 - radiant heat
- Use flammable and combustible liquids and gases in a manner that is consistent with the label and Material Safety Data Sheet ("MSDS") for the product.
- Waste (trash) will be collected every day and disposed of at appropriate facilities.
- Appropriate spill response materials and equipment stored and available at the locations where lubricating materials and fuel are stored and used, including water and equipment transport vehicles and associated support equipment.

Pre-emergency Planning

The types of emergencies anticipated include personal injuries, fire and small chemical spills. An OSHA/HIOSH compliant first aid kit shall be made available at the site and location known to employees. Also, one employee trained and currently certified in first aid and CPR shall be onsite at all times. Evacuation meeting area will be at the jobsite office or other prearranged area. A charged and inspected fire extinguisher shall be available on each piece of equipment. All GBI vehicles have fire extinguishers and first aid kits. Spill containment equipment will be made available if hazardous materials are stored on site.

Site Security and Control

During an emergency situation, all personnel are responsible for assuring the public's safety and shall keep all bystanders and unauthorized personnel from entering the site. The accident site shall be cordoned off until the investigation is complete. At no time shall personnel give statements regarding an emergency to persons not associated with emergency response or management.

General Health and Safety Work Practices

This SSHP advocated exercising every reasonable precaution when performing the work to prevent property damage and to protect the safety and health of employees, the public and the environment. Employees have certain responsibilities for their own safety, as follows:

- Report to work rested, physically and mentally fit to perform the job assignment
- **Restricted work activities for this project** are no eating, drinking, gum and tobacco chewing will be allowed in areas identified as containing hazardous materials
- Compliance with company safety and OSHA/HIOSH regulations
- Working while under the influence of intoxicants, narcotics or controlled substances is prohibited
- Wear suitable clothing for the weather and the work
- Wear PPE and follow established procedures for a particular job. Do not wear jewelry or loose-fitting clothing when operating or near equipment.
- Report all unusual behavior or conditions that may cause injury or illness to others or damage to property to your supervisor and/or safety department (including other contractors on site)
- Read warning labels on containers and equipment. Follow specified precautions.
- Discontinue any operation that could lead to injury, illness or property damage
- Keep horseplay and other disruptive behavior away from the job
- Promptly report to the Safety Department any occupational injury, illness or exposure to toxic material. If injured, get first aid. Small injuries can become serious if neglected.
- Promptly inform the Safety Department whenever new substances, processes, procedures or equipment that could present new safety and health hazards are brought into work areas or on to projects
- Work upwind of any field activity such as dust, fumes etc.
- Perform work in a manner that will minimize dust from becoming airborne (i.e., use water spray or wet technique when feasible)
- Be alert to abnormal behavior or other personnel that may indicate distress, disorientation or other ill effects
- Verify that vehicles have an ABC-rated fire extinguisher and locations of first-aid kits
- Monitor weather conditions, particularly wind direction, because they could affect potential exposure
- Be aware of the amount of solar radiation exposed skin is receiving. Take steps to minimize the potential for sunburn
- Operate a vehicle only if you are a licensed driver. Seatbelts must be worn when operating company equipment or when driving a private vehicle on company business.
- No employee shall ride on steps, in bucket of any equipment
- Drive vehicles in a safe manner and obey traffic and safety regulations
- Operate equipment only if you are a trained operator. Conduct and document a daily equipment inspection.
- Notify the safety department if contact with blood and/or human body fluids occurs during the administration of first aid.
- All Trenches and excavations 5 ft and greater require benching or shoring to prevent cave-ins
- All excavations and trenches 4 ft and greater require a means of egress within 25ft of workers
- Fall protection & fall restraint is required at heights of 6ft and above

- Lock out/Tag out procedures are to be followed
- Flammable liquids shall be used only in small amounts and kept in proper safety can
- No Smoking or open flames around Flammable Liquids
- Storage of flammable liquids other than company trucks will be stored in proper containers and in a designated area with proper signage

These general safety responsibilities listed above also apply to subcontractors and visitors.

Reports and Recordkeeping

Record keeping is a crucial component of any effective health and safety program. Site safety records shall therefore be updated daily.

The following logs, reports and records shall be maintained Safety Department:

- Site safety meetings
- Daily Site Inspections
- Employee training records – site specific
- Daily and Weekly safety inspection logs
- Pre Job & Pre Task planning forms
- All recordable injuries will be recorded on the OSHA 300 log at the home office
- Sub-contractors must submit accident and injury reports to the Safety Department on all incidents within 24 hours of occurrence, and comply with the general contractor's entire safety and health plan.

Accident Reporting and Near Hits

The purpose of an investigation is not to find fault with anyone, but rather to find the root cause, so as corrective action can be taken to prevent a similar accident or near miss in the future. When an accident occurs, it indicates something is wrong, and it becomes essential that a thorough investigation be conducted. In most cases, the island Safety Manager will be responsible for accident investigation.

- An investigation will be made of all accidents that involve an injured person and regardless of the severity of the injury.
- All accidents and near misses shall be reported to your immediate supervisor, Regional Manager and safety Department immediately. The incident shall be investigated and an Accident or Near Hit Report shall be forward to GBI's Safety Department and Region Manager.
- The investigation should be made as soon after the accident as possible and, in no case, should it begin any later than twenty-four hours after the accident has happened.
- Any injury or property damage accidents, no matter how minor, are to be reported according to this section.
- All incident scenes shall be preserved so that a thorough incident investigation may be performed. Investigation shall include sketches, pictures and witness statements.
- All causes of the incident shall be investigated and the findings presented to site personnel to prevent future incidents.
- All accidents involving property damage, and injuries requiring first aid, shall be documented on an accident injury report and submitted to GBI's Safety Department for review.
- In the event of an accident, which requires the hospitalization of an employee, no equipment, material or product related to the incident may be moved or altered until GBI safety department and/or Police give clearance.
- In the event of a fatality, probable fatality, or hospitalization of two or more employees as a result of an accident must be reported to HIOSH within 8 hours.
- After an incident occurs the safety department may authorize the removal of equipment, materials or product, in the event that they create additional hazards to persons.

12 Lifesaving Commitments and Maka'ala Program-

At Goodfellow Bros. (GBI) we believe that all fatal accidents at work can be prevented. Our goal is for each employee of GBI to return home to their loved ones every day, in the same physical condition prior to the start of their work shift. At GBI, safe production and the excellence of our quality workmanship is critical towards achieving or mission to be the contractor of choice by clients, employees and communities in which we live and work.

****All employees are required to know the 12 Lifesaving commitments****

On the first day of the work week one of the 12 Lifesaving commitments will be discussed by the foremen/project managers:

- 1) Perform atmosphere testing before entering a confined space
- 2) Verify isolation from hazardous energy sources before work begins and use the required PPE
- 3) Obtain authorization before entering a confined space
- 4) Protect yourself against crushing and caught-in-between injuries
- 5) Protect yourself against a fall when working at heights
- 6) Do not walk under a suspended load
- 7) Being under the influence of alcohol or drugs while working or driving is prohibited
- 8) While driving, use of a cellular phone is limited to placing or receiving calls by utilizing a hands-free device
- 9) Protect and properly secure all loads and materials
- 10) Do not enter an unprotected trench or excavation deeper than 5ft
- 11) Protect against contact with overhead and underground power lines
- 12) Be aware of the safe practices required to protect yourself and your coworker from potential hazards associated with working in proximity to mobile equipment

Field Level Hazard Assessment (FLHA) card - Maka'ala Card

To comply with federal regulation an employer must assess a work site and identify existing and potential hazards before work begins at the work site or prior to the construction of a new work site. The hazard assessment must include methods of control or eliminate the hazards identified. This process must be a collaborated effort which includes full participation from every employee.

- As a crew, employees will fill out a FLHA card daily to address the potential hazards and the controls in place to protect themselves. Everyone on the crew will sign the card and the foreman will keep the card throughout the day.
- This card will be reviewed by the foreman and project manager and spot checked by team and the safety department.
- New hazards/controls will be added as tasks and/or work sites change
- Safety department will collect all cards at the end of the week

In addition to one of the 12 lifesaving commitments, a "Toolbox topic" will be discussed. The foremen will pick out an applicable topic and use it to professionally develop their personnel.

The foreman/project manager will conduct a safety orientation meeting prior to initiation of field activities, and weekly thereafter and:

- 1) Whenever risks or hazards change;
- 2) Whenever new personnel arrive; and
- 3) When site operations warrant indoctrination and training.

Every morning the foremen will conduct a daily Pre-job Tailgate meeting to discuss that days anticipated hazards.

Where procedural deficiencies are identified, additional safety meetings will be conducted to address the situation. The following should be addressed during the meetings:

- Review any accidents and near misses
- Review of planned activities and work tasks
- Hazard Recognition
- Contaminant/hazard monitoring and associated action levels (if applicable)

- Decontamination procedures (if applicable)
- PPE required
- Site Communication methods
- Site personnel and responsibilities
- On going safety awareness and documented tailgate safety meetings
 - Copies of tailgate meeting topics and signed attendance rosters shall be provided to the Safety Manager weekly

Training and Competent Person Designation

Federal OSHA's definition of a competent person has two distinct parts:

- 1) "One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees," and
- 2) "One who has authorization to take prompt corrective measures to eliminate them."

The competent person must have the training, knowledge, intelligence, and wherewithal to recognize and identify situations and conditions that put workers at risk. Such competence should also include the ability to predict a hazardous situation.

All employees working onsite who may be exposed to health or safety hazards, and supervisors who are responsible for site conditions, shall receive training meeting the requirements of this section before they are permitted to engage in operations that could expose them to safety or health hazards.

Jobsite Inspection Procedures

- 1) To help ensure proper working condition of equipment and machinery and to identify unsafe conditions and practices; the supervisor will be required to:
 - a. Conduct a site safety inspection, which must be emailed to the safety department daily.
 - b. Ask for feedback each before shift to address any concerns, methods, and also the work practices of subcontractors, to ensure that equipment is being operated in a safe manner and adequate site safety conditions.
 - c. Ensure proper use of Zonar equipment.
 - d. Conduct daily safety surveys, paying particular attention to equipment safety items (guards, alarms, etc.), PPE being used properly, methods of work done in a safe manner and within policy and general housekeeping.
 - e. Report any unsafe site conditions of noncompliance with OSHA/HIOSH standards to the Safety Department immediately.
 - f. After completing an inspection, all deficiencies should be immediately corrected.
 - g. Ensure all flammable and combustible materials are stored properly and have proper container labeling.
 - h. Ensure all equipment is pre-shift safety inspected by a qualified operator and all deficiencies and non-deficiencies are listed on a mobile equipment check off form.
 - i. A qualified operator shall inspect all portable conveyer plant and all deficiencies and non-deficiencies are listed on a plant equipment check off form.
 - j. All open trenches and excavations shall be checked prior to the start of work.
 - k. All Personal Protective Equipment (PPE) shall be inspected prior to its use.

Employee Orientation

All new personnel prior to starting work on site will receive the following orientation. Instruction will include the following, but not limited to:

- GBI's 12 Life Saving Commitments
- Maka'ala safety policies and general safety rules.
- Employee's Field Level Hazard Assessment cards
- GBI's disciplinary policy.
- Familiarizing the employee with the company's claim filing and accident reporting procedures.
- Informing the employee of the company's procedures for reporting unsafe conditions or practices.
- Explaining work activities that require the use of personal protective equipment; particular attention being paid to the importance of and proper use and care of personal protective equipment.

- Inform employees to wear the proper attire, hardhats, safety glasses, high-visibility vests 100% of the time, long pants, shirts with sleeves, and sturdy steel-toed work boots.
- Familiarize employees with the policy for discovery of hazardous materials onsite.
- Familiarize employees with the job assigned, and any related safe work practices.
- Inform employees of appropriate emergency procedures and exit routes.
- Inform employees of the location of first aid kits, and fire extinguishers.
- Inform employees of the location of the MSDS book and training on GBI's Hazard Communication program.

Hazardous Jobsite Conditions

- Excavations, trenches, holes, slopes or ditches (either constructed or naturally occurring)
- Heavy equipment traffic
- Crusher operations
- Soil Contaminants
- Underground utilities
- Slip, trip and fall hazards
- Contact with sharp or jagged objects such as nails, sharp metal or broken glass
- Electrical hazards
- Equipment and machinery hazards
- Unstable surfaces, which may fall or give way
- Lifting and carrying of heavy objects
- Tripping, Slipping and Falling Hazards
- Walking and working surfaces (uneven ground, slopes, rocks, etc.)

Other safety hazards can be caused by the work itself. For example, protective clothing or equipment may impair a worker's agility, hearing and vision, increasing the risk of an accident. Employees will stop work upon the discovery of any buried suspicious liquids, or items with suspicious contents or markings, and hazardous materials.

Common Jobsite Safety Hazards

- 1) During the workday, trenches and below-grade excavation areas that are not active will be clearly delineated by the use of high visibility barriers. Barriers will be established at the end of each workday.
- 2) Use of safety harnesses, lanyards and guard rail systems will be required for any personnel working 6 ft or more feet above any surface, including on man-lifts and conveyers. The use of guard rails for work surfaces 6 ft or higher that can with stand 200 lbs of force. Work surfaces of unknown or suspect integrity will be strengthened or overlain with a work platform capable of supporting all personnel and equipment in use in that area.
- 3) To minimize tripping hazards caused by construction debris, material will be removed daily from the work areas and stockpiled in appropriate designated storage areas. This "house cleaning" effort will be enforced by the foreman at the end of each day.
- 4) All tasks can be accomplished without any object free-falling to the ground. All equipment and material will be slow lowered to the ground using a crane, skip bucket or rope and pulley. No personnel shall work under any suspended load at any time. Only authorized personnel will be allowed in areas under and around conveyor belt system or other like hazards. These areas will be kept clear of all unauthorized personnel until these hazards no longer exist.

Heavy Equipment and Traffic

- 1) The use of heavy equipment onsite presents the greatest potential for injury to personnel. To minimize these hazards, designated routes will be established for mobilization through the facility and specific traffic patterns will be established. All trucks will use spotters for backing procedures if the area contains hazards such as work crews, pedestrians or other physical hazards. All personnel working along roadsides or heavy equipment traffic are required to wear high visibility safety vests. It is GBI's policy that all personnel onsite to wear high visibility safety vests.
- 2) Personnel needing to approach heavy equipment during operation will observe the following protocols:
 - a. Make eye contact with the operator.
 - b. Signal the operator to cease heavy equipment activity.

- c. Approach the equipment and inform the operator of intentions.

Only qualified personnel, as determined by the Site foreman, will operate heavy equipment. Those crew members directly involved with spotting for the operator will be the only personnel allowed within the operating radius of the heavy equipment. Any employee working in the line of or in the swing radius of a bucket can only do so if the bucket is grounded and operating system is locked out. All other personnel will remain a safe distance away from these operations. Vehicles will yield to all bikes and pedestrians.

Only equipment that is in safe working order will be used. To maintain this policy, all equipment brought onto the project site and prior to the start of each shift will be inspected for structural integrity, smooth operational performance and proper functioning of all critical safety devices in accordance with the manufacturer's specifications. This inspection will be performed by a qualified equipment operator and/or the foreman. Equipment not conforming to the operational and safety requirements during this inspection will not be put into service until all necessary repairs are made to the satisfaction of the inspection group.

Physical Hazards

Physical hazards involve the potential for injury or adverse health from physical agents such as:

- Noise
- Heat stress
- Airborne
- Oxygen deficiency

Noise:

GBI may conduct noise monitoring periodically during work. The sound level meter or noise dosimeter used will meet OSHA/HIOSH requirements (ANSI S1.4-1971[R1976], Specifications for Sound Level Meters, (Type 2) for measuring noise levels in decibels with an A- and C- weighted scale in slow response.

Time-weighted average exposures to continuous noise greater than 85 dBA will necessitate implementation of the Hearing Conservation Program stated in 29 CFR 1910.95, Occupational Noise Exposure, including continued area noise monitoring, additional personnel training regarding noise hazards and protective measures and the mandatory use of hearing protection.

In general, the use of earplugs or earmuffs is mandatory when operating any equipment and when noise prevents conversation in a normal voice at a distance of 3 feet. This "rule of thumb" is an indication that noise levels may exceed the OSHA action level of 85 decibels. When these conditions are present or suspected, the Safety Department will be notified to conduct a noise survey using a noise meter calibrated in accordance with the manufacturer's instructions.

Heat Stress:

Heat Stress: Work will be performed in environments with elevated ambient temperatures. While working with hazardous materials, the use of disposable protective clothing could reduce evaporative cooling that could lead to stress in a non-acclimatized individual under intense work regimens. The types and symptoms of heat stress, from least severe to most severe include:

- Heat Rash: Affected areas of the body may exhibit skin rashes. These rashes may cause itching and tingling. First Response: after work, shower, dry skin thoroughly, change wet clothing, cool body temperature.
- Heat Cramps: Usually occur in the muscles of the abdomen and lower extremities. These are usually caused by profuse sweating, which depletes electrolyte supply. First response: move individual to cool area or shade and remove unneeded clothing to increase evaporative cooling; provide small amounts of cool water to drink; gently message affected muscles; seek medical attention.
- Heat Exhaustion: Symptoms may include profuse sweating; hot, moist skin; normal or low body temperature; weak, rapid pulse; shallow, rapid respiration rate; and pale, clammy skin. Other symptoms may include headache, extreme fatigue, weakness, dizziness, nausea and fainting. This may rapidly progress to an emergency situation. First Response: call for ambulance; move individual to cool area or shade; remove unnecessary clothing; place person on back with feet elevated; offer cool water to drink ONLY if conscious; transport to hospital.

- **Heat Stroke:** Symptoms may include hot, dry, and flushed skin; strong, but varying pulse; high core body temperature; seizures; and loss of consciousness. Other symptoms include headaches, dizziness, and dryness in mouth. Heat stroke may be differentiated from heat exhaustion by the high body temperature and dry, flushed skin. The onset may occur rapidly; adverse health effects may be permanent. Periodic communication between and observation of co-workers should be maintained by using the buddy system. This is an emergency situation. Treatment: Call for immediate ambulance transport to a medical facility. Move individual to cool area or shade, remove clothing, sponge with cool water and fan to dissipate heat; transport immediately to hospital.
- If conditions such as high temperatures and high humidity are present, with heavy workloads and the use of personal protection that restricts evaporative cooling, work/rest regimens should be implemented to prevent heat stress.

In summary, heat stress may be caused by factors that include combinations of elevated ambient temperatures, relative humidity, radiant heat and wearing of PPE. The effects of heat stress are heat rash, cramps, and exhaustion and in extreme cases, heat stroke. Field personnel will be trained to recognize heat stress symptoms. Cool water will be readily available to the employees, who will be encouraged to drink frequently during each break.

Airborne Hazards:

Most aspects of the project will represent minimal airborne risk to employees. Nuisance dust, generated by various construction and excavation tasks should be minimal, if dust becomes a problem, dust suppression techniques, such as water sprays, will be utilized.

Oxygen Deficiency:

Managing oxygen deficiency involves first identifying all areas where an oxygen deficiency exists. In all areas, such as pits, trenches, vaults, manholes, and low spots in uneven terrain, where the presence of gases heavier than air is suspected to displace necessary oxygen, a survey of oxygen concentrations and gaseous vapors will be conducted with an oxygen meter using instruments such as a combination oxygen/combustible gas indicator (CGI) and organic vapor analyzers such as an FID or PID. If less than 19.5 percent oxygen or more than 5 parts per million (ppm) of hazardous organic gases are detected, work will be halted, the site or work area evacuated and the safety department or designated person will conduct tests prior to further activities.

If confined spaces as defined in OSHA/HIOSH regulations are encountered, the Safety Department will be notified and work will cease until all requirements of confined spaces are met.

Confined Space Entry:

Work in confined spaces is not anticipated for this project. If entry and work in confined space is required, the Safety Department will need to assess the potential hazards, add appropriate documentation to this SSHP, and train personnel regarding the requirements for confined space entry.

The purpose of a Confined Space Program is to ensure that persons assigned to work in confined spaces have procedures and training to reduce the risk for accidents and injuries. All affected employees will participate in this confined space program.

A confined space is an enclosed space having all of the following characteristics:

- 1) Limited or restricted means of entry and exit;
- 2) Large enough for a person to enter; and
- 3) Not designed for continuous employee occupancy.

Confined spaces may include, but are not limited to: manholes, sewers, pipelines, culverts, underground utilities vaults, storage tanks and pits and trenches over four feet deep.

A permit required confined space is a space with one or more of the following:

- 1) Is large enough and so configured that an employee can enter and perform assigned work.
- 2) Has a limited or restricted means for entry or exit.
- 3) Is not designed for continuous human occupancy, and has one or more of the following:

- a. Has a knowing potential to contain a hazardous atmosphere;
- b. Has the potential for engulfment of entrant;
- c. Contains any recognized serious safety or health hazard;
- d. Walls or a floor which slopes downward and tapers to a smaller cross-section.

If any of these conditions exist contact your immediate supervisor / Safety Department immediately.

Disciplinary Action

Employees are expected to use good judgment when doing their work and to follow established safety rules. We have instituted a disciplinary policy to provide appropriate consequences for failure to follow safety rules. The disciplinary procedures are designed not so much to punish as to bring unacceptable behavior to the employee's attention in a way that the employee will be motivated to make corrections. The severity of the incident and whether or not the employee knowingly disregarded the rules are factors in deciding the course of action.

- 1) Verbal Warning: A verbal warning notice is an official warning and the least serious type of warning notice that a supervisor issues an employee for the violation of Company rules and standards.
- 2) Written Warning: A written warning notice is the official notice to an employee when there is either a serious violation of company rules and standards, or a violation is repeated.
- 3) Disciplinary time off work without pay, or termination.

Supervisors could determine that due to repeated offenses, or the seriousness of an offense, it may be necessary to give an employee disciplinary time off without pay.

Hand Tools

- Always use the right tool for the job – keep them in good condition.
- Keep saws, knives, chisels and other tools sharp. A dull tool is a dangerous tool.
- Keep tools clean. Greasy and dirty tools can cause slips and smashed fingers.
- Mushroomed or burred heads on chisels and hammers can cause serious injury – keep tool heads ground down.
- Wear eye protection when using chisels or punches or whenever a chance of eye injury exists.
- Files or rasps shall be equipped with handles.
- Never use a screwdriver as a chisel. Keep screwdrivers square. Do not use when worn or broken.
- Make sure hammer, sledge and other tool heads fit tightly and will not fly off.
- Never substitute tools – if it takes a lot of force, it is not the right tool.
- Never use handle extension or "cheaters" – use a larger tool.
- Carry tools in a box or tool belt – not in pants pocket or pants belt.
- When cutting material, lay it on a flat surface. Do not support it on your leg – cut away from you rather than towards you.
- Do not use pliers, or pipe wrench as a substitute for other wrenches.

Power Tools

- Know the safe way to use power tools – read the instructions and have experienced employee instruct you in the correct use of the power tool.
- Do not use a power tool if any safety devices on it are not working properly or missing.
- Never lift or lower electric tools by the power cord – use a rope.
- Make sure that all portable or stationary tools are grounded or have a GFI.
- Inspect all electrical cords prior to use for broken wires, cuts and missing prongs.
- Use lift-lug on the power saws to raise blade guard – never tie or wedge back guard.
- Do not repair or adjust electric equipment unless you are an electrician.
- Never use tools with cords that are frayed or with insulation worn off, especially if any copper wires are seen. Return poor tools to the yard for repair.
- Never force tools – keep sharp cut or drill at a safe comfortable speed.
- Authorized experienced employees shall only use chain saws only. Extreme care shall be taken to keep saws straight and out of binds to avoid breaking blades.
- Never disable any safety device on any piece of equipment or tool.

Personal Protective Equipment

- Hard Hats, High Visible Vests are required 100 % of the time while on the Jobsite.
- Safety glasses shall be worn in all posted areas.
- Wear safety goggles when grinding, sawing, and jack hammering or chipping. Goggles are to be worn whenever there is the possibility of splashing. Safety glasses shall be worn when hammering or any other situation where an injury to your eyes exists. All eye protection shall meet current ANSI Z87.1 standards. Safety glasses are required on this project at all times, except when operating equipment with completely enclosed cabs.
- Employees will be required to use respiratory protection devices as job conditions require them. Due to the low concentration of contamination in the soils, it is not anticipated that respiratory protection will be routinely required during excavation. However some construction tasks may locally generate sufficient nuisance particulate that filtering face piece respirators (dust masks) may be appropriate. Exposed employees will follow GBI's respiratory program. Respirators will be approved by NIOSH.
- Gloves shall be worn when handling steel, lumber, cable or any material, which can cause injury to your hands. Rubber gloves shall be worn when working with chemicals and solvents.
- Work Boots shall be sturdy leather with hard soles that will not create a slipping hazard and to protect from any piercing/cutting injuries. Steel-toed boots, or steel-toed boot caps, are required for those who are exposed to objects that could possibly fall on their feet, and are mandatory on this project. Rubber boots shall be worn while working in water or any other muddy condition and Where required by job specific or by a products MSDS. Do not wear tennis shoes or shoes that have badly worn or thin soles. Wear shoes that fit well – loose fitting shoes are dangerous. Calks or other suitable footwear which will afford reasonable protection from slipping be worn while working on logs, poles, pilings or similar forest products.
- Earplugs shall be worn around any equipment or noisy area. Continual exposure to noise can cause permanent damage. GBI requires all employees to wear hearing protection while operating any equipment.
- Hardhats shall be worn whenever overhead hazards exist. Hats shall be free of cracks and chips, and shall be in kept in good condition. Wear only those hat that meet ANSI Z89.1 standards.
- Wear the right work clothes and safety shoes for your job. Clothing should allow freedom of movement, but not loose, such that it could get caught in equipment or machinery. Shirts must have sleeves; no tank tops are allowed. Long pants shall be worn.
- Do not wear jewelry items such as rings, or looped-pierced earrings, which could get caught on nails or other objects causing injury.
- Always wear your high-visibility, reflective safety vest while working. Vests should carry the minimum rating of ANSI Class II.

Welding and Cutting

No employee shall attempt welding or using a burning torch unless he is qualified and has a thorough knowledge of the work involved.

- Ensure proper welding and hot permits are obtained with the prime contractor or local agency if applicable.
- Wear protective clothing, goggles, gloves and other protective equipment to protect from rays or hot sparks.
- Never weld or cut in a confined area unless ventilation is provided.
- Before commencing, inspect the area to make sure there are no combustible materials nearby.
- Keep a minimum of 10B fire extinguisher on hand at all times.
- Always remember to use curtains or shields to protect others from the rays of the arc particularly during repair of equipment away from the shop where the public may not know of the dangers of arc exposure.
- Anti-flash back devices should be installed on the fuel side of all gas and oxygen cutting torches.
- Never weld or cut any drum, container or tank, which has contained gasoline, oil or other flammable liquid until proper cleaning and cutting methods are used.
- Cylinders shall not be transported unless protective caps are on and tanks are secured. Cylinders shall be stored only in authorized locations in the upright position with caps secured.
- Before using a cutting torch, inspect the torch head and hoses to ensure they are in good working order. Check for leaks by performing a drop test on oxy/ac hoses, torch and gauges. If a leak is detected, replace it immediately.

- Turn off cylinders and the end of shift or if changing job location.

Fire Prevention

- Lighting matches, lighters, smoking or any open flame is not permitted around any flammable or combustible materials.
- Do not fuel any vehicle or equipment while the engine is running.
- Gasoline, paint thinners and other low flash point solvents are never to be used for cleaning and should be stored in proper ventilated area. Keep all areas clean and place oily, greasy rags in the metal containers provided for them.
- Remember all trucks, pickups and equipment are equipped with fire extinguishers – if not let your foreman know immediately.
- All bottles such as propane, oxygen and acetylene shall be stored and tied in a vertical position in designated areas. Oxygen and acetylene shall not be stored within 20 ft each other or by a non-combustible barrier at least 5 ft high with a fire resistance rating of 30 minutes.
- Good housekeeping aids greatly in fire control.
- Employees should be aware of the hazardous properties of materials in their work place, and the degree of hazard each pose. Accumulations of materials which can cause large fires or generate dense smoke that is easily ignited or may start from spontaneous combustion.
- Only fight small fires that can be extinguished with a fire extinguisher. Otherwise, call 911 for the fire department.

Housekeeping

- Good housekeeping shall be practiced daily, as it greatly improves operating efficiency and helps to prevent accidental injuries.
- Each worker is responsible for house cleaning in their work area.
- Particular attention must be given to keeping a clean house where slips, trips, or falls may occur.
- Steel, lumber and other materials shall be stacked, stored and limited in height and stored in designated areas.
- Keep ramps, stairways roadways, walkways and any other paths clear.
- Avoid running hoses, power cords, welding leads, ropes, across traffic areas. These could cause slip, trip, and fall hazards.
- Prevent foot punctures by removing or bending nails or other sharp objects that protrude from materials.
- Scrap materials for disposal should be in orderly piles and should not interfere with any ongoing work in progress.
- Cleanup any oils, grease or any other material that might cause slips, falls, or be the potential for a fire hazard.
- Always return material and tools to their storage place and store them in a safe manner.
- Never leave a tool such that it could cause accidents.

Highway Vehicles

- Unless you are an authorized driver, operator or mechanic, stay away from all vehicles and equipment.
- Always load a vehicle such that it will allow the maximum possible visibility, and ensure your load is well secured to prevent accidental fallout. Always make sure the load is properly positioned so it will not shift.
- All drivers shall maintain proper licenses and obey all street and highway speed and traffic laws.
- Drivers are to spot check mechanical condition before leaving the site areas.
- Drivers are to report all unsafe or mechanical trouble to foreman or master mechanic.
- Unauthorized persons are not permitted to ride in company vehicles.
- Drive Defensively – even if you think you have the right of way; do not insist on having it if another tries to take it.
- Make sure sideboards and undercarriage is clean of dirt and rock.
- When working on vehicles always make sure the vehicle is properly blocked and locked/tagged out.

- Never back up a truck without clear vision. Whenever possible, have another employee spot and guide you.
- When parking a vehicle make sure all brakes are set and wheels are against the curb or properly chocked.
- Always keep your vehicle clean both inside and out.
- Inspect and all lights, and signals, and ensure license plate numbers are visible.
- Only GBI Personnel are allowed as passengers in company-owned vehicles, and no one may ride in the bed of pickups or other areas that are not designated for passengers.

Equipment

- Equipment shall be pre-shift safety checked by a qualified operator and any deficiencies, or non-deficiencies, shall be properly documented.
- Never operate equipment unless you are authorized and qualified.
- Never leave running equipment unattended.
- Never allow fellow workers to ride in or hang on equipment, unless it is equipped with a seat for this purpose.
- Never stand under a backhoe, crane boom or other load – cables can break or booms slip.
- Always make sure blades, buckets, rippers or other moving parts are lowered when equipment is parked or unattended.
- Always wear your safety belts while operating your equipment.
- Anyone working on the ground around equipment must wear a safety vest.
- Backing of equipment can easily cause accidents; so if you can't see behind you, get an observer.
- Always physically turn head and look before engaging clutch, or reverse lever.
- If machine has been motionless over a few seconds it is imperative that you see that it is clear to backup, even if it requires getting off equipment to check, if unable to see clearly behind.
- Loaders and blades are exceptionally dangerous when working on streets, or areas where the traveling public can pull up behind equipment with small cars.
- Possible methods to avoid accidents:
 - Always think before engaging reverse gear.
 - Turn head and check mirrors, if available.
 - Check to see if the guinea hopper or grade setter is in the clear.
 - Never jerk or suddenly reverse direction.
 - If you can't see clearly, or do not know if it is safe to backup – don't until you check or have someone who can guide you check.
 - Barricade or Fence off any areas that could have any affect public or other workers.
 - Follow Lock-out /Tag-out procedures.

Rigging

- 1) Prior to Lifting, all rigging equipment for material handling shall be inspected prior to use of each shift and as necessary during each shift.
- 2) Defective rigging equipment shall be removed from service.
- 3) Rigging equipment shall not be loaded in excess of its recommended safe working load.
- 4) Rigging equipment when not in use shall be removed from the immediate area.
- 5) Chains used for overhead lifting shall be proof tested alloy steel.
- 6) Alloy chain slings shall have permanently affixed I.D. stating size, grade, rated capacity, and sling manufacture.
- 7) Wire ropes/slugs shall have permanently affixed I.D. tags stating size, grade, rated capacity, and manufacturer. Wire ropes shall not be secured/connected using knots. Protruding ends of strands in splices on slings and bridles shall be covered or blunted. Wire rope slugs can provide a margin of safety by showing early signs of failure. Visually inspect wire ropes/slugs before use, and remove from service if any of the following conditions are noted:
 - a. Severe corrosion
 - b. Localized wear (shiny worn spots) on the outside,
 - c. A one-third reduction in outer wire diameter,
 - d. Damage or displacement of end fittings - hooks, rings, links, or collars - by overload or misapplication,
 - e. Distortion, kinking, bird caging, or other evidence of damage to the wire rope structure, or
 - f. Excessive broken wires.

- 8) Before lifting, make sure that the load is not lagged, clamped or bolted to the ground.
- 9) Guard against shock loading by taking up the slack in the sling slowly.
- 10) Keep all personnel clear while load is being lifted.
- 11) Only one person to give signals and control lifts.
- 12) Never raise a load more than necessary.
- 13) Never leave a load suspended.
- 14) Never work under a suspended load.

Ladder Safety

- Read and follow the manufacturer's instructions label affixed to the ladder if you are unsure as to how to use the ladder.
- Do not use ladders that have loose rungs, cracked or split side rails, missing rubber foot pads, or are otherwise visibly damaged.
- Keep ladder rungs clean and free of grease; remove buildup of material such as dirt or mud.
- Do not use metal ladders around electrical power lines.
- Allow only one person on the ladder at a time.
- Face the ladder when ascending or descending.
- Maintain a three-point contact by keeping both hands and one foot or both feet and one hand on the ladder at all times when climbing up or down the ladder.
- When performing work from a ladder, face the ladder and do not lean backward or sideways from the ladder.
- Do not stand on tables, chairs, boxes or other improvised climbing devices to reach high places; use the ladder or stepstool.
- Do not stand on the top rung of any ladder.
- Ladders should have a 4 to 1 slope or 75 ½ degrees from horizontal.
- Do not stand on a ladder that wobbles, or that leans to the left or right of center.
- When using a ladder, extend the top of the ladder at least 3 feet above the edge of the landing.
- Secure the ladder in place if on slippery surfaces or loose ground.
- Do not move a rolling ladder while someone is on it.
- Do not place ladders on barrels, boxes, loose bricks, pails, concrete blocks or other unstable bases.
- Do not carry items in your hands while climbing up or down a ladder.
- Do not place ladders in a passageway or doorway without posting warning signs or cones that detour pedestrian traffic away from the ladder; lock the doorway that you are blocking with the ladder and post signs that will detour traffic away from your work.
- Step Ladders:
 - Do not use the top two steps or ladder caps of a stepladder as a step or stand
 - Always level all four legs and lock spreaders in place
 - All Ladders with broken or missing rungs or steps, broken or split side rails or other defective parts shall be tagged and placed out of service.

Excavation and Trenching Safety

The purpose of this program is to establish safe and proper procedures for excavation and trench work and to comply with OSHA/HIOSH regulations. All affected GBI employees will comply with the Excavation/Trenching/Shoring program.

The site foreman is responsible for their employees and sub contractors to follow and comply with all applicable laws and regulations of OSHA/HIOSH and the land owner. Excavation Safety is to protect our workers from the hazard of moving ground.

Procedures:

Trenches and Excavations:

- 1) Call appropriate locating service 48 hours in advance of any scheduled excavation.
- 2) Except in solid rock and compacted shale, the sides of all trenches and excavations, including embankments four feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect employees.

- 3) Trenches less than four feet in depth shall also be effectively protected when there are indications that hazardous ground movement is possible.
- 4) Excavations and trenches shall be inspected regularly by a competent person to ensure worker safety.
- 5) No person shall be allowed to work in a trench over four feet in depth unless there is a top person in constant attendance. The top person shall be in addition to the equipment operator when the person in the trench is not in constant view of the equipment operator.
- 6) The surface of the slope of any trench or excavation shall be cleared of boulders stumps, or other hard masses of earth in the form of chunks, that could roll or slide into the trench or excavation, endangering persons below.
- 7) In excavations or trenches which employees are required to enter, excavated or other material shall be stored at least two feet or more away from the edge of the excavation or trench. Barriers or other effective retaining devices may be used to prevent excavated or other material from falling or rolling into the excavation or trench.
- 8) Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation or trench. If necessary, pumps and deep wells shall be used to minimize water infiltration both on the surface and subsurface.
- 9) If it is necessary to place or operate heavy equipment on a level above and closer laterally than the depth of the trench or excavation, the sides of the excavation or trench shall be sheet piled, shored or braced as necessary to resist the additional pressure due to such superimposed loads.
- 10) Barriers or stop logs shall be utilized when mobile equipment is operated adjacent to excavations or trenches, and the operator has an obstructed view of the trench. Barriers or barricades shall be used to mark all trenches, deep wells, pits and excavations.
- 11) Trees, boulders, utility poles and other surface encumbrances located so as to create a hazard to workers involved in excavation or trenching work, or in the vicinity thereof, at any time during operations, shall be removed or made safe prior to beginning work.
- 12) When excavations or trenches are made in locations adjacent to backfilled excavations or trenches, additional precautions, by way of shoring and bracing shall be taken to prevent slides or cave-ins.
- 13) Walkways, runways, and sidewalks shall be kept clean of excavated material or other obstructions and no sidewalk shall be undermined unless shored to carry a minimum live load of 125 lbs. per square foot.
- 14) When employees are required to be in excavations or trenches four feet deep or more, an adequate means of exit, such as a ladder or steps shall be provided and located so as to require no more than 25 feet of lateral travel.
- 15) When existing loop water mains are running laterally within two feet of the excavation or trench wall, the valve that is the greatest distance from the work site shall be closed. The exact location of the valve shall be marked and access to the valve maintained prior to entering the trench. A valve key of sufficient length to shut the valve off shall be available at all times.
- 16) Except in solid rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall is underpinned and all other precautions taken to insure the stability of the adjacent walls for the protection of employees involved in the excavation work or in the vicinity.
- 17) If the stability of adjoining buildings or walls is endangered by excavations, shoring, or bracing, underpinning shall be provided. Such shoring shall be inspected regularly and maintained as required.
- 18) Support systems shall be planned and designed by a Registered Professional Engineer when trenches are to be in excess of twenty feet in depth, adjacent to structures or improvements, or subject to excessive vibration or ground water.
- 19) If for any reason prior to, during, or subsequent to the placement of the trench shoring or bracing system, voids should form in the sides or face of the trench, such voids shall be filled with compacted material or blocking to distribute the load uniformly onto the shoring system.
- 20) Portable trench boxes or sliding trench shields may be used in lieu of a shoring system or sloping. Where such equipment is used, they shall be designed, constructed, and maintained in a manner, which will provide protection equal to or greater than sheeting or shoring.
- 21) Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or bracers shall be released using ropes or equipment to remove them from the top of the trench.
- 22) Trench shoring, sloping and the use of trench boxes are outlined on the diagrams and tables on the following pages.

Types of Soil:

This section describes methods of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. Definitions and descriptions of acceptable visual and manual tests for use in classifying soil are based on the American Society for Testing Materials (ASTM), the Unified Soils Classification System, U.S. Department of Agriculture (USDA) Textural Classification Scheme, and the National Bureau of Standards.

- Cemented soil: Soil where particles are held together by a chemical agent, such as calcium carbonate. A hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.
- Cohesive soil: Clay or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clay silt, sandy clay, clay and or organic clay.
- Dry soil: Soil that does not exhibit visible signs of moisture content.
- Fissured: A soil material that tends to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.
- Granular soil: Gravel, sand, or silt, with little or no clay content. Granular soil lacks cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.
- Layered system: Two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.
- Moist soil: A condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.
- Plastic: A property of a soil that allows the soil to be deformed or molded with cracking, or appreciable volume change.
- Saturated soil: A soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.
- Stable rock: Natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.
- Submerged soil: Soil which is underwater or is free seeping.
- Type A: Cohesive soils with unconfined compressive strength of 1.5 ton per square foot (tfs) or greater. Examples of cohesive soils are clay, silty clay, sandy clay, clay loam and, sometimes, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A.
- Type B: Granular soils or loam with unconfined compressive strength of less than 1.5 tfs and greater than 0.5 tsf. Examples of Type B soils are granular cohesion less soils including angular gravel (similar to crushed rock), silt, silt loam, sand loam and, sometimes, silty clay loam and sandy clay loam; previously disturbed soils except those that would otherwise be classified as Type C soil; soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; dry rock that is not stable; or a sloped, layered system where the layers dip into the excavation on a slope less than 4 horizontal to 1 vertical (4H:1V), but only if the material would otherwise be classified as Type B.
- Type C: Granular soils with unconfined compressive strength 0.5 tfs or less. Examples Type C soils are gravel, sand, and loamy sand; submerged soil or soil from which water is freely seeping; submerged rock that is not stable; or material in a sloped, layered system where the layers dip into the excavation on a slope of 4 horizontal to 1 vertical (4H:1V) or steeper.
- Unconfined compressive strength: The load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, or other methods.
- Wet soil: Soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

Soil Classifications:

- 1) Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, B, or C according to the definitions set forth in the preceding Soils Classification section.
- 2) Basis of classification: The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analysis shall be conducted by a

competent person using tests as outlined below or in other recognized methods of soil classification and testing.

- 3) Visual and manual analysis: The visual and manual analysis, such as noted in the next section (Acceptable Visual and Manual Tests), shall be designed and conducted to provide quantitative and qualitative information necessary to identify properly the properties, factors, and conditions affecting the classification of deposits.
- 4) Layered systems: In a layered system, the system shall be classified according to its weakest layer. Each layer may be classified individually where a more stable layer lies under a less stable layer.
- 5) Reclassification: If after classifying a deposit, the properties, factors, or conditions change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

Acceptable Visual and Manual Tests:

Visual Tests

- 1) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the each particle size.
- 2) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- 3) Observe the side of the opened excavation and the surface area by the excavation. Crack-like openings such as tension cracks could suggest fissured material. If chunks of soil fall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
- 4) Observe the area by the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.
- 5) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.
- 6) Observe the excavation and sides of the excavation for evidence of surface water, water seeping from the sides of the excavation, or the level of the water table.
- 7) Observe the area by the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

Manual tests

- 1) Plasticity: Mold a moist or wet sample of soil into a ball and attempt rolling it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a 2-inch length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.
- 2) Dry strength: If the soil is dry and crumbles on its own or with moderate pressure into grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry, falls into clumps that break into smaller clumps, and those clumps are broken with difficulty, it may be clay with gravel, sand or silt. If dry soil clumps are broken with difficulty into smaller clumps, and there is no indication the soil is fissured, it may be considered unfissured.
- 3) Thumb penetration: The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. Type A soils with an unconfined compressive strength of 1.5 tsf or greater can be readily indented by the thumb and penetrated by the thumb only with great effort. Type C soils with an unconfined compressive strength of 0.5 tsf or less can be easily penetrated several inches by the thumb. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, soon after excavation to keep drying effect to a minimum. If the excavation is later exposed to wetting (rain, flooding), the classification of the soil must be changed accordingly.
- 4) Other strength tests: Estimates of unconfined compressive strength of soils also can be obtained by use of a pocket penetrometer or by using a hand-operated shear vane.
- 5) Drying test: The basic purpose of the drying test is to differentiate between cohesive material with fissures, un-fissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately 1 inch thick and 6 inches in diameter until it is thoroughly dry:
 - a. If the sample develops cracks as it dries, significant fissures are indicated.
 - b. Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil

can be classified as an un-fissured cohesive material and the unconfined compressive strength should be determined.

- c. If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Shoring and Shielding Systems

Shoring

Shoring is a support system, and shall be installed from the top of the trench or excavation, without entry into an un-shored trench or excavation.

- The support system shall extend to within 2 feet of the bottom of the trench or excavation. The system shall be designed to resist the forces calculated for the full depth of the trench or excavation.
- When voids form in the sides of an excavation or trench, after placement of shoring using sheets, the voids shall be promptly filled with compacted material. Voids are to be filled to uniformly distribute the load onto the shoring.
- Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released using ropes or equipment to remove them from the trench.
- Tables N-8 through N-11 shall be used for an aluminum hydraulic shoring system.

Shielding

A permanent means of identifying the shield system shall be established.

- Shield systems shall not be subjected to loads exceeding those the system is designed to withstand.
- Shields shall be installed to restrict lateral or other hazardous movements if sudden lateral loads are applied.
- Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.
- Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
- Portable trench boxes or sliding boxes or sliding trench shields may be used in lieu of a shoring system or sloping. Where such equipment is used, they shall be designed, constructed, and maintained in a manner, which will provide protection equal to or greater than sheeting or shoring.
- When conditions are present and the bracing tables are not considered adequate, either an alternate shoring system must be designed or another type of protective system.
- Sloping systems, support systems, shield systems, or other protective systems not meeting the requirements of this part shall be approved by a registered professional engineer. Approval or designs shall be in written form and shall include the following:
 - a) The magnitude of the slopes that were determined to be safe for the particular project and the configurations that were determined to be safe for the project; or a plan indicating the sized, types, and configurations of the materials to be used in the protective system.
 - b) The identity of the registered professional engineer approving the designs.
 - c) A copy of the approval or design shall be maintained at the work site and made available all affected/cognizant individuals upon request.
 - d) Excavations not meeting the requirement of this part which are approved by a registered professional engineer shall be monitored as follows:
 - The registered professional engineer shall inspect the work site at the beginning of each shift, after any change in weather conditions, and after any change in the circumstances of adjacent property.
 - The registered professional engineer shall make a written report of each inspection, the report shall be kept on file at the work site, and the report shall be made available request.
 - All recommendations of the registered professional engineer regarding the excavation and soil conditions shall be followed.

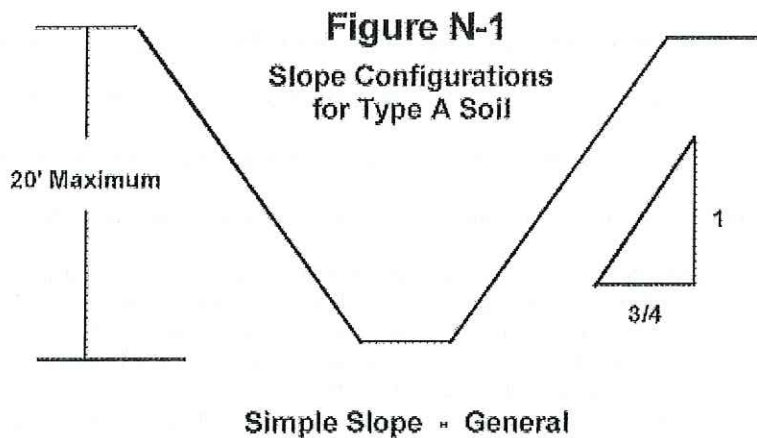
Once soil has been classified by a competent person, it may be sloped or shored in accordance with the OSHA/HIOSH diagrams below:

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V) [1] FOR EXCAVATIONS LESS THAN 20 FEET DEEP [2]
STABLE ROCK	VERTICAL (90°)
TYPE A	3/4:1 (53°)
TYPE B	1:1 (45°)
TYPE C	1 1/2:1 (34°)

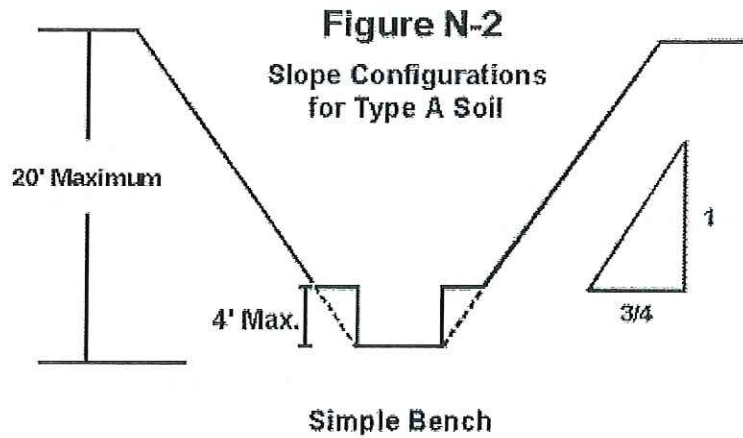
Notes:

[1]: Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

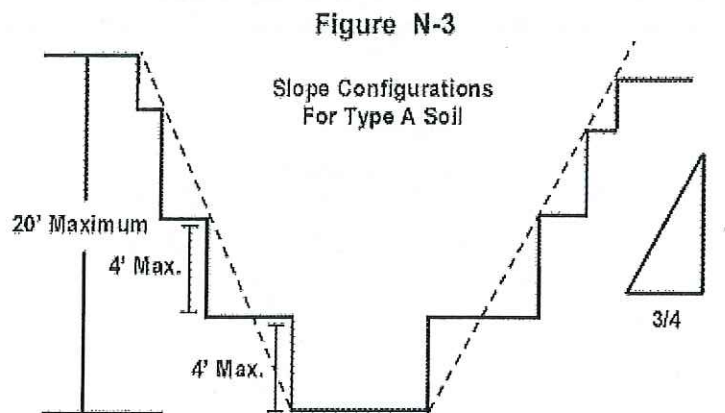
[2]: Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.



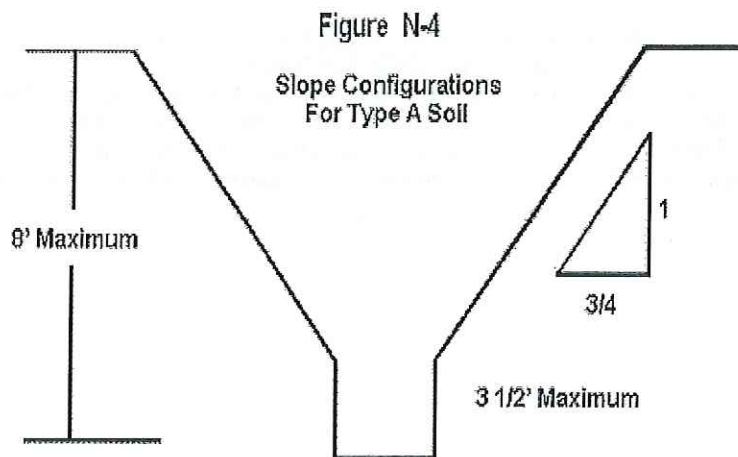
All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 3/4:1.



All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 3/4:1 and maximum bench dimensions of 4 feet.

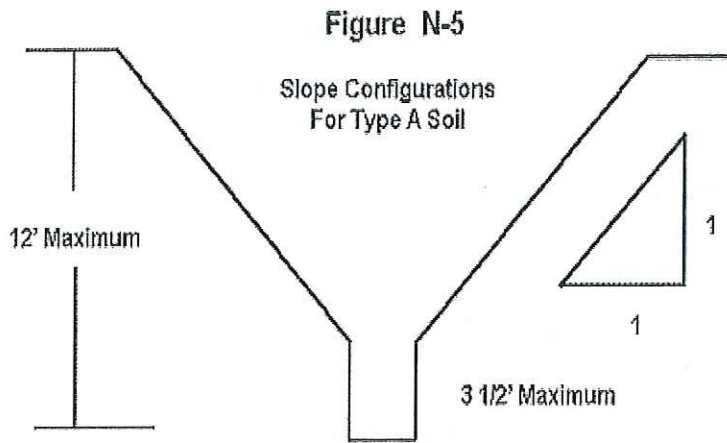


All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 3/4:1 and maximum bench dimensions of 4 feet.



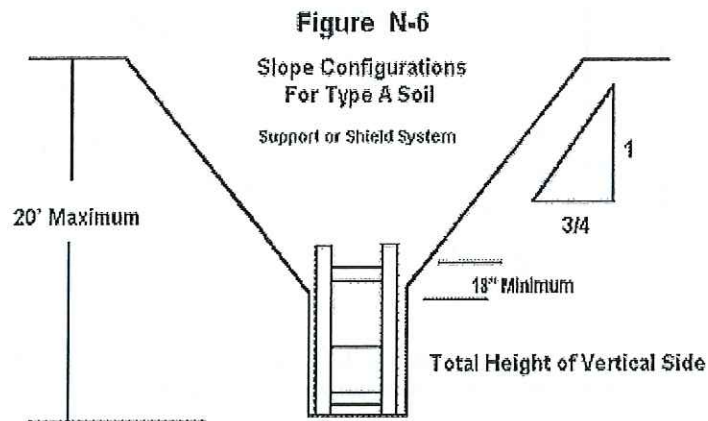
Unsupported Vertically Sided Lower Portion
Maximum 8 Feet in Depth

All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3 1/2 feet.



Unsupported Vertically Sided Lower Portion
Maximum 12 Feet in Depth

All excavations more than 8 feet but not more than 12 feet in depth which have unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and vertical side of 3 1/2 feet.

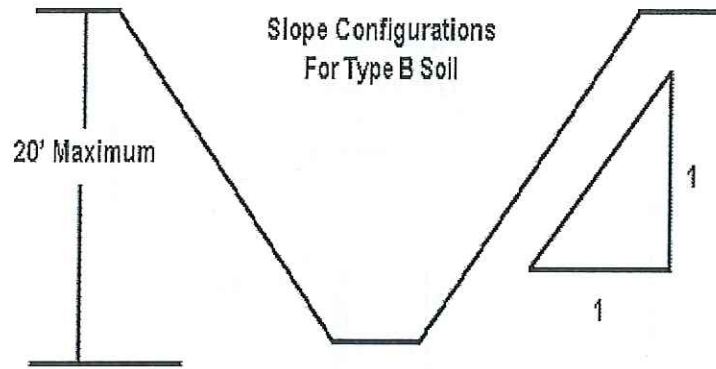


Unsupported Vertically Sided Lower Portion
Maximum 20 Feet in Depth

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4:1. The support or shield system must extend at least 18 inches above the top of the vertical side. All other simple slope, compound slope and vertically sided lower portion excavations shall be in accordance with 29 CFR 1926

Figure N-7

Slope Configurations
For Type B Soil

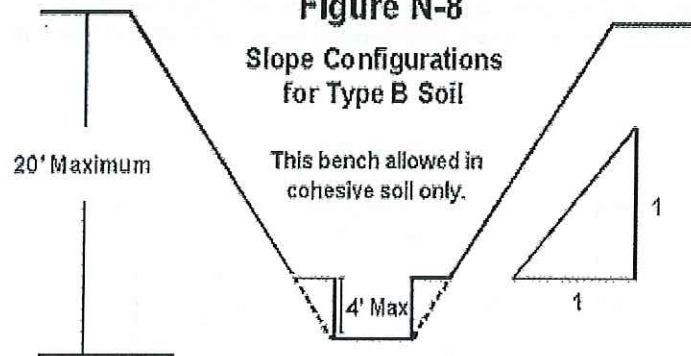


Simple Slope

All simple excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

Figure N-8

Slope Configurations
for Type B Soil

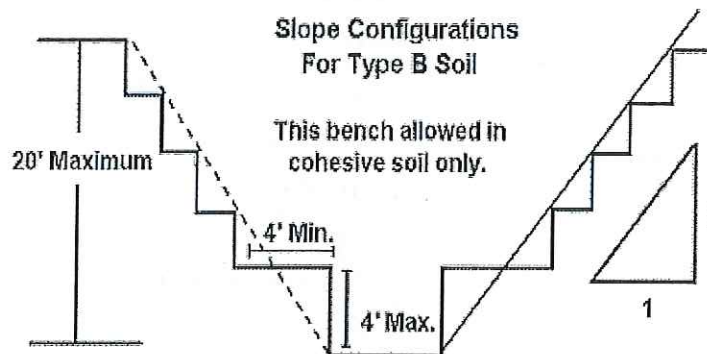


Single Bench

All excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions of 4 feet.

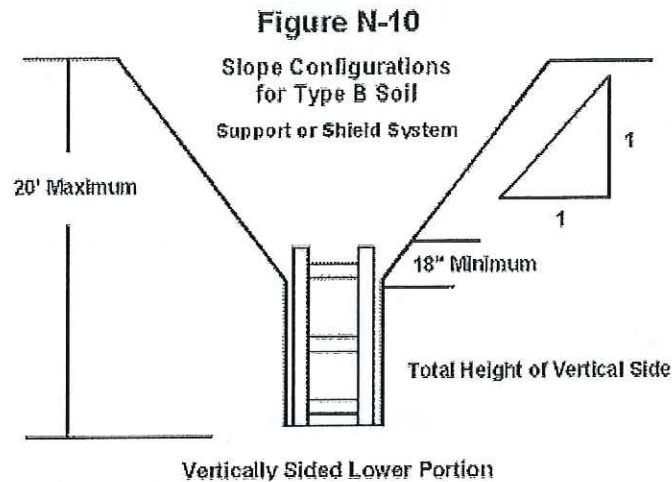
Figure N-9

Slope Configurations
For Type B Soil

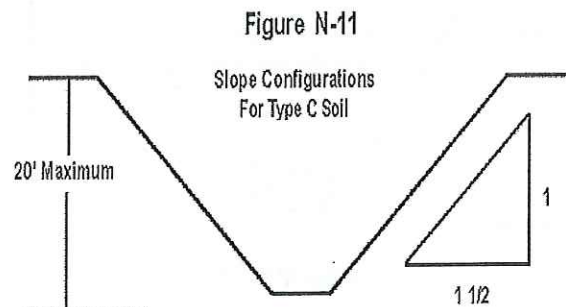


Multiple Bench

All excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions of 4 feet.

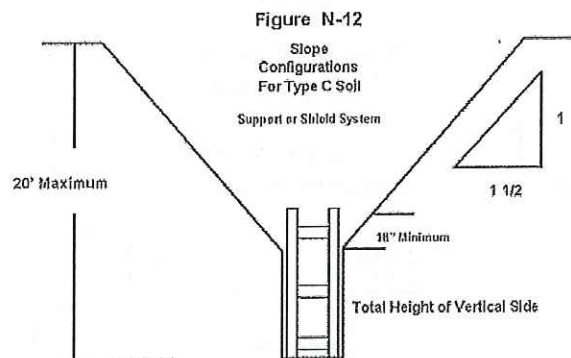


All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1. All other simple slope, compound slope and vertically sided lower portion excavations shall be in accordance with options permitted under 29CFR 1926



Simple Slope

Simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1 1/2 to 1.



All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such

excavations shall have a maximum allowable slope of 1 1/2:1. All other simple slope, compound slope and vertically sided lower portion excavations shall be in accordance with options permitted under 29 CFR 1926

TYPE C SOIL CAN NOT BE BENCHED

Figure N-13

EXCAVATIONS MADE IN LAYERED SOILS
All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below:

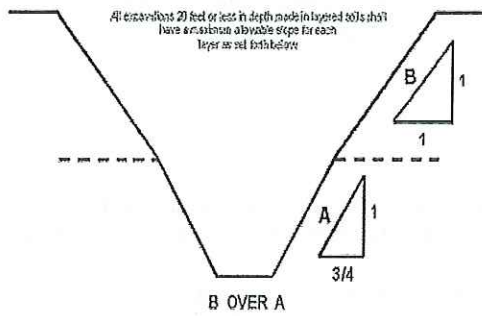


Figure N-14

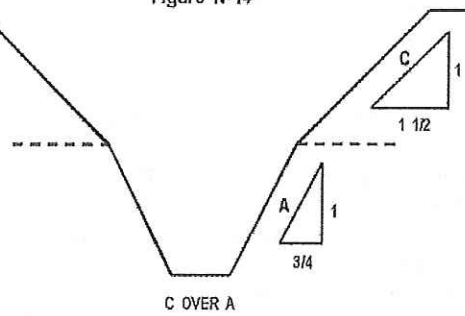


Figure N-15

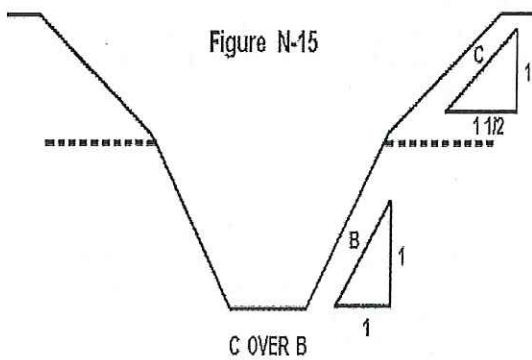


Figure N-16

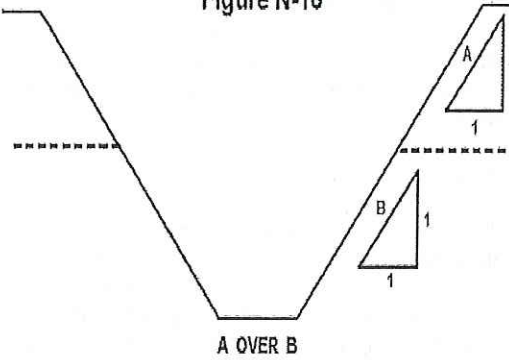


Figure N-17

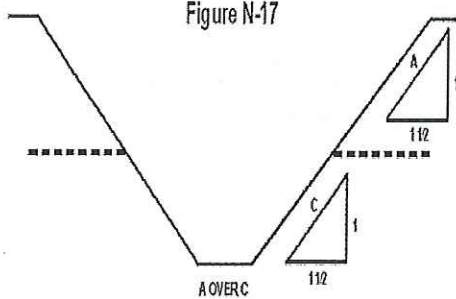
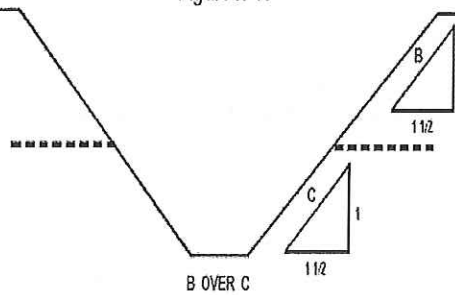


Figure N-18



Hazard Communication

GBI employees who work with, or one who is potentially exposed to, hazardous chemicals will receive initial training on the Hazard Communication Standard and the safe use of those hazardous chemicals. A program that uses both audiovisual materials and classroom type training has been prepared for this purpose. Whenever a new hazard is introduced, additional training will be provided. Regular safety meetings will also be used to review the information presented in the initial training. Management of Goodfellow Bros., Inc. are extensively trained regarding hazards and appropriate protective measures so they will be available to answer questions from employees and provide daily monitoring of safe work practices.

The training plan will emphasize these items:

- Summary of the standard and this written program.
- Chemical and physical properties of hazardous materials (e.g. flash point, reactivity) and methods that can be used to detect the presence or release of chemicals (including chemicals in unlabeled pipes).
- Health hazards, including signs and symptoms of exposure, associated with exposure to chemicals and any medical condition known to be aggravated by exposure to the chemical.
- Procedures to protect against hazards (e.g. personal protective equipment required, proper use and maintenance; work practices or methods to assure proper use and handling of chemicals; and procedures for emergency response).
- Work procedures to follow to assure protection when cleaning hazardous chemical spills and leaks.
- Where Material Safety Data Sheets (MSDSs) are located, how to read and interpret the information on both labels and MSDSs, and how employees may obtain additional hazard information.

GBI will periodically review employee-training programs and will make the appropriate changes, as necessary, on training or retraining needs. Retraining is required when the hazard changes or when a new hazard is introduced into the workplace, but it will be company policy to provide training regularly in safety meetings to ensure the effectiveness of the program. As part of the assessment of the training program, GBI will obtain input from employees regarding the training they have received, and their suggestions for improving it.

Contractors and Subcontractors:

GBI will advise outside contractors of any chemical hazards that may be encountered in the normal course of their work on the premises, the labeling system in use, the protective measures to be taken, and the safe handling procedures to be used. In addition, the safety and health manager will notify these individuals of the location and availability of MSDS's. Each contractor bringing chemicals on-site must provide GBI with the appropriate hazard information (MSDS sheets) on these substances, including the labels used and the precautionary measures to be taken in working with these chemicals.

Non-Routine Tasks:

When employees are required to perform hazardous non-routine tasks (e.g. cleaning tanks, entering confined spaces, etc.), a special training session will be conducted to inform you regarding the hazardous chemicals to which you might be exposed and the proper precautions to take to reduce or avoid exposure.

Additional Information:

All employees, or their designated representatives, can obtain further information on this written program, the hazard communication standard, applicable MSDSs, and chemical information lists from our Safety Department.

Lock Out/Tag Out Policy and Procedures

All equipment shall be shut down and immobilized prior to performing maintenance or repairs. DO NOT OPERATE tags must be placed at the control station, box or main switch by the employee who will perform the maintenance or repair, in accordance with the following instructions:

Electrical:

- 1) All electrical equipment involving the use of disconnected switches as a source of power for their operation will be turned off, locked out in the off position, and tagged with a DO NOT OPERATE tag.
- 2) After the equipment has been locked out and tagged with a DO NOT OPERATE tag, the employee will attempt to start the equipment to insure that proper switches have been locked out and the equipment will not start.

Pneumatic and Hydraulic:

- 1) All equipment operated pneumatically or hydraulically will be rendered inoperable by turning off the air or hydraulic supply to that piece of equipment and tagging the valve with a DO NOT OPERATE tag.
- 2) After the equipment has been locked out and tagged with a DO NOT OPERATE tag, the employee will attempt to start the equipment to ensure that proper switches or valves have been locked out and the equipment will not operate.
- 3) Make sure the equipment will not operate from residual Pneumatic or Hydraulic pressure.

Mobile or Vehicular Equipment:

- 1) Where the ignition is controlled by a keyed switch, the key shall be placed in the OFF position, removed, and the switch tagged with a DO NOT OPERATE tag.
- 2) Vehicles not equipped with a keyed ignition switch shall be tagged with a DO NOT OPERATE tag at the starter button or switch.
- 3) In the event the tagging and removing the ignition key are not considered adequate protection, the battery cable which is connected to the starter shall be removed at the battery end and tagged with a DO NOT OPERATE tag.

Other Requirements:

- 1) No employee shall remove a lock, lock out device, or DO NOT OPERATE tag other than his own.
 - a. In the event an employee leaves the equipment and forgets to remove the lock and tag, the employee is to return to the equipment and remove the lock and tag.
 - b. Each employee shall have his or her own lock with one key. Each employee must lock out at the disconnect switch and or valve. After locking out, put your key in your pocket.
 - c. If more than one person is working on a piece of equipment, use multiple locks out with each person using his own lock.
- 2) Your supervisor must approve any deviations from these procedures.

SITE SAFETY AND HEALTH PLAN

I have received, read and fully understand GOODFELLOW BROS., INC.'s Site Safety and Health Plan.

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EXHIBIT 3. TMT MOTOR VEHICLE SAFETY POLICY FOR MAUNA KEA



MOTOR VEHICLE SAFETY POLICY

TMT.BUS.MGT.15.064.REL01

March 19, 2019

DOCUMENT APPROVAL

Author Release Note:

Initial release of new TMT policy. Replaces "TMT Vehicle Usage Policy", TMT.BUS.MGT.05.059, TMT.BUS.MGT.10.085.

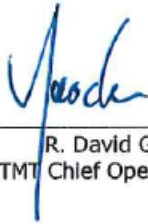
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William H. Tyler
TMT ES&H (Safety) Officer

Approval:



R. David Goodman
TMT Chief Operating Officer

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1.0 INTRODUCTION

1.1 PURPOSE

TMT employees and certain TMT contractor personnel operate TMT-owned vehicles as part of their jobs. It is TMT's policy to provide and maintain a safe working environment to protect our employees, contractor employees and the citizens of the communities where we conduct business, from injury and property loss. TMT contractors operating contractor-owned vehicles while working for TMT are expected to follow TMT policies. TMT considers the use of automobiles part of the working environment. TMT is committed to promoting a heightened level of safety awareness and responsible driving behavior in its employees and contractors. The commitment of TMT and contractor employees will prevent accidents. TMT requires the full cooperation of each driver to meet the responsibilities outlined in this document.

Elements of this plan include:

- Assigning responsibilities
- Vehicle use
- Employee Driver's License checks and identification of high-risk drivers
- Accident reporting and investigation
- Accident Review Board
- Vehicle selection and maintenance
- Driver training standards and evaluations
- Safety regulations

1.2 RESPONSIBILITY

The TMT ES&H Officer is responsible for successful implementation and on-going execution of this program. Managers, employees and contractor personnel are responsible for meeting and maintaining the standards set forth in this program.

All contractors are responsible for compliance by their personnel for all contractor motor vehicle safety policies.

1.3 SCOPE

This policy applies to TMT and contractor personnel who operate TMT vehicles and will be reviewed by TMT Managers to ensure full implementation and compliance.

All contractors are responsible for compliance by their personnel for all contractor motor vehicle policies.

1.4 APPLICABLE DOCUMENTS

AD1 - Mauna Kea Observatories Support Services Motor Vehicle Safety Policy, January 23, 2015 Revision

AD2 - Application for Driving TMT Vehicles, TMT.BUS.MGT.15.065

AD3 - TMT Vehicle Driver's Agreement, TMT.BUS.MGT.15.066

AD4 - TMT Driver Evaluator Qualification, TMT.BUS.MGT.15.067

AD5 - Driver Evaluation for Mauna Kea, TMT.BUS.MGT.15.068

AD6 - TMT Monthly Vehicle Inspection Report, TMT.BUS.MGT.15.069

AD7 - TMT Monthly Vehicle Log, TMT.BUS.MGT.15.070

1.5 CHANGE RECORD

Revision	Date	Section	Modifications
REL01	23 April 2015	All	Initial release
REL02	19 March 2019	5.3	OMKM to be copied on reports, etc.

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 TMT ENVIRONMENTAL, SAFETY AND HEALTH OFFICER

The TMT ES&H Officer is responsible for directing TMT's Motor Vehicle Safety Policy.

2.2 TMT MANAGERS

TMT Managers will:

- A. Implement the Motor Vehicle Safety Policy in their areas of responsibility.
- B. Establish objectives and maintain records to ensure compliance with the program.
- C. Provide assistance and the resources necessary to implement and maintain the program.
- D. Investigate and report all accidents, within required timelines, involving a TMT motor vehicle. Forward all accident reports to the Vehicle Safety Coordinator.
- E. Be responsible for taking appropriate action to manage high-risk drivers as defined by this program.
- F. Provide driver training either internally or through external means for high risk drivers.
- G. Be responsible to ensure vehicles assigned to their department are properly serviced and safely maintained in accordance with specific vehicle service guides.
- H. Comply with the Comprehensive Management Plan Invasive Species Prevention including Vehicle cleaning protocols (weekly if driven down and up mountain on a regular basis), per section 8.6 below.

2.3 VEHICLE SAFETY COORDINATOR

The TMT ES&H Officer will be the Vehicle Safety Coordinator. Responsibilities include:

- A. Compile an annual report of all vehicle losses for the Project Manager's review.
- B. Review motor vehicle accident reports as part of the TMT Accident Review Board.
- C. Revise and distribute changes to the TMT Motor Vehicle Safety Policy to managers and drivers as necessary.
- D. Conduct periodic inspections to ensure all TMT Managers follow this policy and maintain appropriate records.

2.4 DRIVERS

Drivers will:

- A. Always operate a motor vehicle in a safe manner as explained in Section 10, "Driver Safety Regulations".
- B. Maintain a valid driver's license.
- C. Inspect the vehicle prior to driving to ensure it is in safe operating condition, undamaged, and free of invasive species.
- D. Report all traffic violations received while operating a TMT vehicle.
- E. Prior to driving a personal vehicle on "company business" the driver will provide a copy of the current, active auto insurance policy to the Vehicle Safety Coordinator.
- F. Fulfill all TMT requirements for driving TMT vehicles.
- G. Do not drive a TMT vehicle If you are taking prescription or over-the-counter medication that impairs your ability to safely operate a motor vehicle. Inform your supervisor prior to taking the medication so arrangements can be made to find a substitute driver.

3.0 VEHICLE USE

3.1 TMT VEHICLES

- A. Passenger Cars, SUVs, Vans: Only TMT employees and contractor employees authorized by TMT Managers will be permitted to operate these vehicles. These vehicles are not authorized for personal use. No one under the age of 25 will be permitted to operate a TMT vehicle.
- B. Rental Vehicles: Rented or leased vehicles are considered TMT vehicles for the purposes of this policy.
- C. Commercial Vehicles: Only TMT employees and contractor employees with appropriate commercial driver's license, authorization from their supervisor and qualified by state and Federal DOT when applicable, will be permitted to operate the vehicle.
- D. Personal Vehicles on Company Business: Personal vehicles are not authorized for TMT business. Exception is if employee is in authorized travel status with appropriate travel authorization granted in advance, and copy of valid insurance for the vehicle is on file.
- E. Unauthorized Use of Vehicles: TMT Managers and contractor employees will not allow an unauthorized individual to operate a TMT vehicle.

4.0 DRIVER SELECTION

4.1 DRIVER EVALUATION

Employees will be evaluated for their driving ability:

- A. All employees that will be driving in performance of TMT activities shall complete the "TMT Application for Driving TMT Vehicles" (AD02) contained in the appendix.
- B. Review and acknowledge the "Guide for Preventable and Non-Preventable Accidents" contained in the appendix.
- C. All employees that will be driving on Mauna Kea in performance of TMT activities shall additionally complete the "Driver Evaluation for Mauna Kea" (see AD05).
- D. Each employee must have a valid driver's license with a copy on file with the TMT ES&H Officer. The class of driver's license must be consistent to the class of vehicle being driven.
- E. The employee must be qualified/certified to operate the class of vehicle he/she will be driving.

4.2 DRIVER QUALIFICATION

Effective driver qualification controls are important elements of a successful motor vehicle safety program. The standards below reflect the skills necessary for satisfactory job performance while taking into consideration applicable Federal, State, and County regulations. TMT will use the criteria below to qualify drivers:

- A. Ensure a valid driver's license. This can be done by the Vehicle Safety Coordinator upon
- B. request of the department Manager.
- C. Where applicable, drivers will comply with DOT Commercial Driver License (COL) regulations.
- D. TMT Employees shall meet criteria for operating any TMT vehicle at any TMT site.

4.3 DRIVER QUALIFICATION REVIEW

Driver qualifications will be periodically reviewed.

Upon expiration of an individual's driver's license, the TMT ES&H Officer shall verify the individual has renewed their driver's license.

4.4 HIGH RISK DRIVERS

A driver may be judged as unacceptable and not allowed to operate a TMT vehicle if the driver's accident/violation history in the past 12 months includes one or more of the following moving violation convictions:

- A. Driving under the influence of alcohol or drugs.
- B. Hit and run.
- C. Failure to report an accident.
- D. Negligent homicide arising out of the use of a motor vehicle.
- E. Operating a motor vehicle during a period of license suspension or revocation.
- F. Using a motor vehicle for the commission of a felony.
- G. Operating a motor vehicle without the owner's authority.
- H. Permitting an unlicensed or underage person to drive.
- I. Reckless driving.
- J. Speeding or other moving violations: (2 or more moving violations within the past 24 months).

The judgment that an individual is unfit to drive a TMT vehicle is made by the TMT ES&H Officer. This judgment is subjective and can be the result of many factors including having too many minor preventable accidents or complaints by other employees of unsafe driving practices.

5.0 ACCIDENT RECORDING, REPORTING AND ANALYSIS

5.1 PURPOSE

TMT considers elimination of motor vehicle accidents as a major goal. To meet this objective, all accidents will be reported to the TMT ES&H Officer and will be investigated, documented and reviewed by the TMT Accident Review Board. This investigation will attempt to identify the cause and make practical recommendations for improvement.

5.2 PROCEDURES

Motor vehicle accident recording procedures consist of the following components:

- A. Documentation of causes and corrective action if applicable.
- B. Analysis of accidents to determine trends, recurring problems and any need for further control measures.

5.3 RESPONSIBILITY

Implementation of these procedures is the responsibility of both the driver and the TMT ES&H Officer.

- A. Driver: The driver shall report any accident to the TMT ES&H Officer that occurred while driving a TMT vehicle or while in performance as part of TMT employment. The driver will work with the TMT ES&H Officer in preparing an accident report.
- B. TMT ES&H Officer: The ES&H Officer will:
 - Determine the extent of the accident, especially if it involves injury or death to the driver, passengers, or other parties.
 - Immediately proceed with an investigation to determine the underlying causes as well as what can be done to prevent similar occurrences.
 - Complete and forward the accident report to the TMT Project Manager and the TMT Chief Operating Officer within one week along with any additional support data (e.g., witness statements, photographs, police reports, etc.).
 - If the scene of the accident extends beyond the travelled roadway (i.e., into the surrounding environment), report to Office of Mauna Kea Management (OMKM) and the Maunakea Rangers information related to resource impacts of the accident, if any. Also copy OMKM on any follow up actions such as spill response.

5.4 PREVENTABLE/NON-PREVENTABLE ACCIDENTS

The following definitions relate to motor vehicle accidents:

- A. A motor vehicle accident is defined as "any occurrence involving a motor vehicle which results in death, injury or property damage, unless such vehicle is properly parked. Who was injured, what property was damaged and to what extent, where the accident occurred, or who was responsible, are not relative factors".
- B. A preventable accident is defined as "any accident involving the vehicle, unless properly parked, which results in property damage or personal injury and in which the driver failed to do everything he/she reasonably could have done to prevent or avoid the accident".
- C. The determination of preventability of an accident will be determined by the TMT ES&H Officer, the TMT Project Manager and the TMT Chief Operating Officer.

Note 1: A properly parked motor vehicle is one that is completely stopped and parked where it is legal and prudent to park such a vehicle or to stop to load/unload property. A vehicle is stopped to load/unload passengers is not considered parked.

Note 2: Parking on private property will be governed by the same regulations that apply on public streets and highways. A vehicle is stopped in traffic in response to a sign, traffic signal or the police is not considered parked.

6.0 EMPLOYEE ACCIDENT REPORTING PROCEDURE

6.1 REPORTING

TMT employees will report the accident to the TMT ES&H Officer within a reasonable time after the occurrence, but in any case within 24 hours. If the vehicle was stolen or damaged while parked and you did not witness the damage, see below:

- A. If the vehicle was stolen, notify the police department immediately. Next, notify the TMT ES&H Officer and follow directions.
- B. If your vehicle is damaged while parked and you did not witness the damage, contact the TMT ES&H Officer and follow directions. Depending on the circumstances, a police report may be required.

7.0 TMT ACCIDENT REVIEW

7.1 ACCIDENT REVIEW

All vehicle accidents will be analyzed under the leadership of the TMT ES&H Officer, and a written report submitted to the TMT Project Manager for review. A determination of accident preventability should be made.

Except for minor accidents, a driver involved in an accident shall not drive a TMT vehicle until authorized by the TMT Project Manager.

8.0 VEHICLE SELECTION, INSPECTION AND MAINTENANCE

8.1 INTRODUCTION

Proper selection and maintenance of equipment are important aspects of this policy. Reduced operational costs and accidents from vehicle defects are the direct result of a well implemented maintenance policy.

8.2 VEHICLE SELECTION

Selection of vehicles begins with understanding that attempting to use the wrong equipment can result in excessive breakdowns, create hazards to personnel, and incur costly delays. TMT will purchase or lease vehicles designed for their intended use.

8.3 VEHICLE INSPECTION

TMT drivers that are assigned a vehicle for their use are responsible for their vehicles and will inspect the vehicle each month using the TMT Vehicle Inspection Report form (see AD06 and appendices) and forward the completed form to the TMT Office Manager.

The TMT Office Manager will arrange for vehicle inspections for all other TMT vehicles.

8.4 VEHICLE LOG

TMT vehicles that have not been assigned to a specific person will have a TMT Monthly Vehicle Log (see ADO? and appendices) kept in the glove compartment. The driver will fill out the TMT Monthly Vehicle Log after each use.

8.5 VEHICLE MAINTENANCE

Vehicle maintenance will be coordinated by the TMT Office Manager.

TMT drivers that have been assigned a vehicle for their use shall coordinate with the TMT Office Manager for routine maintenance.

All drivers shall report vehicle problems to the TMT Office Manager when the problem is noticed.

8.6 VEHICLE WASH AND INVASIVE SPECIES INSPECTIONS

TMT must comply with OMKM's Invasive Species Prevention program and additional requirements imposed on TMT. This includes the inspection and periodic washing of any vehicle going to Mauna Kea. Each driver must make himself or herself aware of these requirements.

8.7 RECORDKEEPING

The TMT Office Manager will keep vehicle maintenance records. All drivers of TMT vehicles shall cooperate with the TMT Office Manager in maintaining these records.

9.0 DRIVER EVALUATION AND TRAINING

9.1 PURPOSE

All drivers of TMT vehicles must have the basic skills and credentials necessary to drive vehicles, with additional evaluation for those operating TMT vehicles on Mauna Kea.

9.2 PROCEDURE

TMT and contractor employees driving TMT vehicles will receive a copy of this policy prior to driving a TMT vehicle. For TMT and contractor employees driving TMT vehicles on Mauna Kea, additional policies, guidelines, and evaluation are required.

The following must be addressed with drivers:

- A. "Application for Driving TMT Vehicles" (see AD02 and appendices) submitted to the TMT ES&H Officer for approval.
- B. Receive, understand, review and a copy of this "TMT Motor Vehicle Safety Policy".
- C. Understand and sign the "TMT Vehicle Driver's Agreement" (see AD03 and appendices).
- D. Have previously been approved to drive a TMT vehicle through the TMT ES&H Officer.
- E. Review operation and controls of TMT vehicles.
- F. Inspect vehicle using "TMT Monthly Vehicle Inspection Form" (see AD06 and appendices).
- G. Understand accident reporting and emergency procedures.
- H. Understand the proper steps for changing a tire on vehicles driven. Include: Establish safety zone and traffic control, locate spare tire, remove spare tire, understand jack use, and how to remove tire and install spare.

Additionally, to drive vehicles on Mauna Kea:

- I. Receive driver training for Saddle Road and Mauna Kea Summit Access Road.
- J. Completed the "Driver Evaluation for Mauna Kea" (see AD05 and appendices) with a TMT qualified driving evaluator (see AD04 and appendices).

9.3 LICENSE SUSPENSION

Drivers must notify the TMT ES&H Officer if their license is suspended or revoked.

9.4 TICKETS

Drivers will report any traffic or parking violations received while driving a TMT vehicle to the TMT ES&H Officer.

10.0 DRIVER SAFETY REGULATIONS

10.1 SAFETY BELTS

Drivers and all occupants are required to wear safety belts when the vehicle is in operation or while riding in a vehicle. The driver is responsible for ensuring passengers wear safety belts. Children under four years of age or under 40-pounds in weight must be secured in a DOT approved safety seat.

10.2 IMPAIRED DRIVING

The driver must not operate a vehicle at any time when his/her ability to do is impaired, affected, influenced by alcohol, illegal drugs, prescribed or over-the-counter medication, illnesses, fatigue or injury.

10.3 TRAFFIC LAWS

Drivers must abide by the Federal, State and County motor vehicle regulations, laws and ordinances.

10.4 VEHICLE CONDITION

Drivers are responsible for ensuring that the vehicle is in safe driving condition.

10.5 CELLULAR TELEPHONES, EAR BUDS AND PAGERS

Drivers of TMT vehicles must comply with all local traffic regulations.

No receiving or placing calls or responding to cell phones or pagers while driving or operating vehicle in motion.

Drivers are prohibited from using ear buds or similar devices while operating a TMT vehicle.

10.6 GENERAL SAFETY RULES

TMT drivers are not permitted to:

- A. Pick up hitchhikers.
- B. Accept payment for carrying passengers or materials.
- C. Use any radar detector, laser detector or similar devices.
- D. Transport flammable liquids or gases unless a DOT or Underwriters' Laboratories approved container is used, and only in limited quantities.

- E. Assist disabled motorists or accident victims beyond their level of medical expertise. If someone is unable to provide the proper medical care, he/she must restrict his/her assistance to calling the proper authorities.
- F. Your safety and well-being are to be protected at all times.

10.7 TMT AND PERSONAL PROPERTY

Drivers are responsible for TMT property such as computers, work papers and equipment under their control. Loss of TMT property or equipment shall be reported within 24 hours to the TMT Chief Operating Officer (TMT COO). TMT will not reimburse the employee for stolen or damaged personal property.



Driving Experience: VEHICLE DATES (FROM, TO) TOTAL MILES (APPROX.)

Automobile: _____

Van/Pickup: _____

4-Wheel Drive/Other: _____

Have you ever driven on snow or ice?	YES _____	NO _____
Have you ever driven on steep inclines?	YES _____	NO _____
Have you ever put on tire chains?	YES _____	NO _____
Have you ever driven a vehicle with a manual transmission?	YES _____	NO _____
Do you know how to use the different mirrors on large vans and trucks?	YES _____	NO _____

Accident Record for Past 3 Years: (add additional sheets as necessary)

DATE	LOCATION	NATURE OF ACCIDENT	FATALITIES	INJURIES
------	----------	--------------------	------------	----------

List Special Training Related to Transportation: (add additional sheets as necessary)

TO BE READ AND SIGNED BY APPLICANT:

This certifies that this application was completed by me, and that all entries on it and information in it are true and complete to the best of my knowledge. I understand that any misrepresentation of information in this application is cause for immediate dismissal. I authorize TMT to investigate my background to ascertain all information of concern to my driving history, whether same is of record or not, and release those providing such information from all liability for any damages resulting from furnishing this information. Further, I understand that I will be asked to demonstrate my driving ability to perform the essential functions necessary to complete the job.

Date: _____ Applicant's Signature: _____



11.2 TMT VEHICLE DRIVER'S AGREEMENT



I hereby acknowledge that I will be driving a TMT vehicle. I understand that these vehicles are to be regularly maintained and serviced according to the service schedule outlined in the Owner's Manual.

Further, it is agreed that this vehicle will be operated in a safe manner. I agree to wear my seat (safety) belt whenever the vehicle is in motion and will require other occupants to do so. I agree to be responsible for all traffic or parking violations that occur while operating a TMT vehicle.

I agree to promptly report all accidents or incidents resulting in injury or damage to the vehicle, vehicle occupants, or other property, no matter how slight.

I understand I am required to maintain a valid driver's license. Further, I herewith grant TMT the right to investigate my motor vehicle driving record any time. My current driver's license is issued from the

State of _____ License No. _____ Expires on _____

with the following restrictions (if any) _____.

If my driving record contains two or more moving violations within a 24 month period, I may lose driving privileges, be required to attend a safe driving class on my own time and expense, and to provide the TMT ES&H Officer with confirmation of attendance.

I understand I am not to modify any TMT vehicle in any way, without written permission. This specifically applies to the installation of cellular telephones, radios, CBs, speakers, etc.

I understand the operation of this vehicle in a safe operating condition is my responsibility. If this vehicle becomes unsafe, it is my responsibility to notify the TMT Office Manager immediately.

I have read and agree to the provisions of this Driver's Agreement and the requirements of the TMT Motor Vehicle Safety Policy.

PRINT NAME

SIGNATURE

DATE

11.3 GUIDE FOR PREVENTABLE OR NON-PREVENTABLE ACCIDENTS

An accident is preventable if the driver could have done something to avoid it. Drivers are expected to drive defensively. Which driver was primarily at fault, which received a traffic citation, or whether a claim was paid has absolutely no bearing on preventability. If there was anything the driver could have done to avoid the collision, then the accident was preventable.

An accident is non-preventable when the vehicle was legally and properly parked, or when properly stopped because of a law enforcement officer, a signal, stop sign, or traffic condition.

If a stationary object is struck, then it is usually a preventable incident. If the driver rear-ends another vehicle then it is usually a preventable incident. It should be noted there are exceptions to any rule, but they are just that - exceptions!

It should be the objective of any person discussing or judging accidents to obtain as many facts as possible and to consider all conceivable conditions. Adverse weather conditions, actions of other drivers, or other such excuses must not influence the judgment of preventability. If procedures, scheduling, dispatching, or maintenance out of the control of the driver were found to be factors, that should be taken into account.

Drivers are expected to drive in a manner that allows them to avoid conflicts when they arise. Whether a driver has a 25-year safe driving record, or started driving the day before has no bearing on whether an accident is or is not preventable. Taking a fair attitude does not mean leniency. If an accident is judged non-preventable and the drivers know the accident could have been avoided, they will lose respect for the program.

11.3.1 Questions to Consider - General

When judging or discussing preventable accidents, these are some questions to consider:

- A. Does the report indicate that the driver considers the rights of others or is there evidence of poor driving habits which need to be changed?
- B. Does the report indicate good judgment? Such phrases as "I did not see," "I didn't think," "I didn't expect," or "I thought" are signals indicating there is something wrong. An aware driver should think, expect, and see hazardous situations in time to avoid collisions.
- C. Was the driver under any physical handicap, which could have been contributory? Did the accident happen near the end of a long and/or hard run? Did the driver get sufficient sleep before the trip? Is the driver's vision faulty?
- D. Was the vehicle defective without the driver's knowledge? A gradual brake failure, a car which pulls to the left or right when the driver applies the brakes, faulty windshield wipers, and similar items are excuses, and a driver using them is trying to evade responsibility. Sudden brake failure, loss of steering, or a blowout may be considered defects beyond the driver's knowledge; however,

the inspection and maintenance program should work to prevent these hazards.

11.3.2 Questions to Consider - Specific Types of Accidents

Intersections

Failure to yield the right-of-way, regardless of stop signs or lights, is preventable. The only exception to this is when the driver is properly proceeding at an intersection protected by lights or stop signs and the driver's vehicle is struck in the extreme rear, side, or back.

Regardless of stop signs, stop lights, or right-of-way, a driver should recognize that the right-of-way belongs to anyone who assumes it and should yield accordingly. In addition, a driver is expected to know the turning radius of the vehicle and be able to avoid damaging others. These accidents are normally considered preventable.

- A. Did the driver approach the intersection at a speed safe for conditions?
- B. Was the driver prepared to stop before entering the intersection?
- C. At a blind corner, did the driver pull out slowly, ready to apply the brakes?
- D. Did the driver operate the vehicle correctly to keep from skidding?

**If The Answer to Any Question Is No,
The Driver Was Not Driving Defensively And Is Responsible.**

Sideswipes

Sideswipes are often preventable since drivers should not get into a position where they can be forced into trouble. A driver should pass another vehicle cautiously and pull back into the lane only when he or she can see the other vehicle in the rearview mirror. A driver should also be ready to slow down and let a passing vehicle into the lane. A driver should not make a sudden move that may force another vehicle to swerve. Unless the driver is swerving to avoid another car or a pedestrian, sideswiping a stationary object is preventable.

Drivers are expected to be able to gauge distances properly when leaving a parking place and enter traffic smoothly.

A driver is expected, whenever possible, to anticipate the actions of an oncoming vehicle. Sideswiping an oncoming vehicle is often preventable.

The doors of a vehicle should never be opened when it is in motion and should not be opened on the traffic side, unless clear of traffic, when it is parked.

A parked vehicle can be seen from a sufficient distance; therefore, the operator of an approaching vehicle should be prepared in case the doors of the parked vehicle are opened. This type of accident is non-preventable only when the door is opened after the driver has passed it.

- A. Did the driver look to front and rear for approaching and overtaking traffic immediately before starting to pull away from the curb?
- B. Did the driver signal before pulling away from the curb?
- C. Did the driver look back rather than depend only upon rearview mirrors?
- D. Did the driver start into traffic only when this action would not require traffic to change its speed or direction in order to avoid his or her vehicle?

**If The Answer to Any Question Is No,
The Driver Was Not Driving Defensively And Is Responsible.**

Skidding

Many skidding conditions are caused by rain, freezing rain, fog, and snow, which all increase the hazard of travel. Oily road film, which builds up during a period of good weather, causes an especially treacherous condition during the first minutes of a rainfall.

Loss of traction on a grade can be anticipated, and these accidents usually are preventable. Chains or other suitable traction devices should be used, if they are available.

- A. Was the driver operating at a safe speed considering weather and road conditions?
- B. During inclement weather was the driver keeping at least twice the safe following distance used for dry pavement?
- C. Were all actions gradual?
- D. Was the driver anticipating ice on bridges, gutters, ruts, and near the curb?
- E. Was the driver alert for water, ice or snow in shaded areas, loose gravel, sand, ruts, etc.?
- F. Did the driver keep out of other vehicle tracks or cross them at wide angles?

**If The Answer to Any Question Is No,
The Driver Was Not Driving Defensively And Is Responsible.**

Pedestrian and Animal Collision

Collisions with parked cars are usually considered preventable. There are few instances where the action of pedestrians is so unreasonable that the operator could not be expected to anticipate such an occurrence.

Collisions with animals are normally preventable, unless the movement on the part of an animal was unusual and unexpected. This is also taking into consideration the fact that the driver was aware of animals in the vicinity.

- A. Did the driver go through congested sections expecting that pedestrians would step in front of the vehicle?

- B. Was the driver prepared to stop?
- C. Did the driver keep as much clearance between his or her vehicle and parked vehicles, as safety permitted?
- D. Did the driver stop when other vehicles have stopped to allow pedestrians to cross?
- E. Did the driver wait for the green light or stop for the caution light?
- F. Was the driver aware of children and prepared to stop if one ran into the street?
- G. Did the driver give all pedestrians the right-of-way?
- H. Did the driver stop for a school bus which was stopped and properly signaling that passengers were loading or unloading?

**If The Answer to Any Question Is No,
The Driver Was Not Driving Defensively And Is Responsible.**

Parked or Stopped

Accidents occurring when vehicles are properly and legally parked are considered non-preventable. Accidents occurring while the vehicle was double parked or in a "No Parking" zone are preventable.

- A. Was the vehicle parked on the proper side of the road?
- B. Was it necessary to park near the intersection?
- C. Did the driver have to park on the traveled part of the road, on the curve, or on the hill?
- D. When required, did the driver warn traffic by emergency warning devices?
- E. Did the driver park parallel to the curb?
- F. Was it necessary to park so close to an alley or directly across from a driveway?

**If The Answer to Any Question Is No,
The Driver Was Not Driving Defensively And Is Responsible.**

Non-collision Vehicle Damage, Mechanical Failure, and Miscellaneous Problems

The accident should be considered preventable if the investigation shows a mechanical defect of which the driver was aware, a defect the driver should have found by inspecting the vehicle, or the driver caused by rough and abusive handling.

When a mechanical failure is sudden or unexpected, not resulting from abuse or ordinary wear, it may be considered non-preventable. Bad brakes should not be considered a mechanical failure unless the failure was sudden and the driver could have had no previous knowledge of the condition. However, this type of failure cannot excuse a driver who does not know how to properly pre-trip inspect the vehicle or is too lazy to do the inspection correctly.

It is a driver's responsibility to keep the cargo in mind and be aware of any sudden vehicle movements, which may cause damage to the cargo. Driving off the highway to avoid a collision may be preventable. Drivers should try not to place themselves in such a position. "U" turns are a monkey wrench in the smooth flow of traffic. Accidents which occur while this maneuver is attempted are considered preventable.

- A. Could the driver have done anything to avoid the accident?
- B. Was the driver's speed safe for conditions?
- C. Did the driver obey all traffic signals?
- D. Was the driver's vehicle under control?
- E. Did the driver follow the routing and delivery instructions?

**If The Answer to Any Question Is No,
The Driver Was Not Driving Defensively And Is Responsible.**

11.4 DRIVING BETWEEN HILO AND HALE POHAKE (ON MAUNA KEA)

Drive Slowly - Stay Alert - Be Defensive - Brake BEFORE Curves

Driving Situation	Hazard	Precautionary Action
UPHILL on Saddle Road	Vehicle coming downhill may be out of control and in your lane.	Drive slowly and be alert to improve your chances of avoiding an accident. A gear less than drive should be used for quicker response to hazards ahead.
Curves in road while going downhill.	Braking while in a curve creates instability and loss of traction. This effect is exaggerated on wet pavement.	Always enter a curve at slow enough speed so brakes are not applied while in the curve. Think ahead and brake on the straight section before the curve.
DOWNHILL on first 3 miles below the VIS.	Steepest part of the road to Hilo. There are a number of sharp turns after long, steep inclines. Brakes can overheat and fail!	Low Gear must be used to minimize brake use. Use the brakes only as needed to further slow the vehicle. The road is more or level after the water reservoir. The actual gear depends on the vehicle and its load. If the brakes are needed before most turns, a lower gear should be selected.
DOWNHILL from the water reservoir to the 19 mile marker.	The speed limit is 55 mph from mile post 28 to mile post 19.	Do not use overdrive. Do not exceed the posted speed limit.

Driving Situation	Hazard	Precautionary Action
DOWNHILL from the 11 mile marker to the Gimbel Building.	Intersections and local traffic will be encountered.	Continue to drive slowly and ANTICIPATE actions of others. Respect posted speed limits.
Vehicle in front brakes or swerves.	Action taken to avoid collision can result in an accident.	Stay far behind vehicles in front. The distance to the vehicle in front should be at least 5 seconds.
Vehicle behind is tailgating.	This trailing vehicle may cause a collision if you take defensive action to avoid something.	Do not aggravate driver. Find a good place for a safe pass and slow down while moving over to the right shoulder.
Wet Pavement	Less traction between tires and road surface.	Drive SLOWER and apply the brakes before the curves.
Fog	Visibility is reduced, road is wet.	Drive SLOWER and use headlights so other can see you even in the daytime.
Spills	Oil/fuel and other spills make the road surface unsafe.	Always drive slow enough to provide a margin of safety from unexpected events.
Drowsiness	It is not unusual to be tired after a day of work at altitude.	Pull over and rest, or ask someone else to drive.
Passenger Comfort	Passengers will feel anxious about safety before the driver.	Drivers should drive slower than the speed they are personally comfortable with.

11.5 DRIVING BETWEEN HALE POHAKU AND SUMMIT (ON MAUNA KEA)

Drive Slowly - Stay Alert - Be Defensive - Use LOW Gear

Driving Situation	Hazard	Precautionary Action
Dawn and Dusk sunlight.	Sun shines directly on driver.	Drive slow. Clean windshield. Wear sunglasses. Stop, look out open window if disoriented. NO MACHISMO! Slow or stop for oncoming vehicles.
DOWNHILL on Pavement (general).	Overbraking can cause brake failure here or further down road.	Use Low Gear - make sure OVERDRIVE is turned OFF (on automatic transmissions).

Driving Situation	Hazard	Precautionary Action
DOWNHILL on Pavement (ice/snow) .	Loss of traction, wheels will lock during braking.	Use 4WD and lowest gear possible. Try not to brake (tires will lock up). Use studded tires and/or tire chains when ice is likely.
DOWNHILL on Cinder (general).	Poor traction.	4WD should be used.
DOWNHILL on Cinder (curves).	Braking while in a curve creates instability and loss of traction. This effect is exaggerated on loose cinders.	4WD, and low gear should be used. Brake before the curve, not during the curve.
DOWNHILL on Cinder (on-coming traffic).	Uphill vehicles may be in downhill lane. Road may narrow at culverts.	Drive 25 mph or less so that defensive maneuvers, including STOPS are possible.
UPHILL on Cinder (general).	Poor traction. Washboards in right lane on curves and steep sections.	4WD and low gear should be used. Do not drive in left lane, drive slower on washboards.
UPHILL on Cinder (On-coming large vehicle).	Large trucks (like water truck) coming downhill have very little ability to maneuver or even slow down.	Drive slowly and be prepared to find a wider section to allow large truck to pass. Avoid passing truck in narrow sections. Stop on side of road if necessary.
ROAD GRADER on Cinder section.	Slower grader needs to be passed.	From behind grader, be patient, do not drive too close as grader may stop. Wait for a section with no on- coming traffic. If grader is on-coming, look for a wide section and pull over.
ROAD GRADER on Cinder section.	Grader leaves a berm with some large rocks in center of roadbed. Crossing the berm can damage vehicles.	Drive slow. Determine which side of the berm is most advantageous. Avoid on-coming traffic. Look for a section of berm void of rocks to cross over.
Vehicle behind is tailgating.	This trailing vehicle may cause a collision if you take defensive action to avoid something.	Do not aggravate driver. Find a good place for a safe pass and slow down while moving over to the right shoulder.

Driving Situation	Hazard	Precautionary Action
Drowsiness	It is not unusual to be tired after a day of work at altitude.	Pull over and rest, or ask someone else to drive.
Passenger Comfort	Passengers will feel anxious about safety before the driver.	Drivers should drive slower than the speed they are personally comfortable with.

11.6 TMT DRIVER EVALUATOR QUALIFICATION

The qualifications to become an "Evaluator" are the following:

- Must be a TMT staff member in good standing
- Must be qualified to operate TMT vehicles
- Must have operated TMT or other observatory vehicles on Mauna Kea for one (1) calendar year, or have driven professionally on Mauna Kea for one (1) year.
- Must have a safe driving record on Mauna Kea for one (1) year.
- Must be approved as an "Evaluator".

I certify that the above named driver is approved as a qualified Driver Evaluator.

Approver's Name (print)

Signature

Date

11.7 DRIVER EVALUATION FOR MAUNA KEA

DRIVING BETWEEN HILO AND HALE POHAKU

(Includes Saddle Road Evaluation and Approval)

Driver Name: _____

Date: _____

Evaluator Name: _____

Check

General

Initial

☐ Present Driver's License (actual license, no copies) _____

☐ Conditions _____

(Weather, Road Wet/Dry)

Vehicle check and preparation:

☐ Vehicle description _____

(Color, Year, Make, Model, License #)

☐ Check vehicle _____

(Tires, lights, windows, dents, oil, coolant, brake and power steering fluids)

☐ Familiar with spare tire and jack location and able to change a tire. _____

Startup and driving:

☐ Adjust seat and mirrors, locate wiper and light controls and parking brake. Fasten seat belt. _____

☐ Start engine, check gauges, release parking brake. _____

☐ When leaving curb or parking stall: Check mirrors, look back. Look over shoulder and signal as appropriate. _____

☐ Acceleration and braking are smooth. Right foot used for both accelerator and brake. Observe minimum 2-second following distance. _____

☐ Able to park at HP (gearshift in P, parking brake engaged). _____

☐ Exhibit a safety conscious and responsible attitude. _____

Check

Saddle Road Evaluation

Initial

☐ Driving uphill, shift manually as appropriate to maintain engine speed. _____

☐ Be defensive, willing to pull over for overtaking vehicles. _____

☐ Stay on proper side of center line (especially on blind curves). _____

☐ Driving downhill, shift to low enough gear to prevent brake overuse. _____

☐ Braking should be minimal on uphill drive. Going downhill, braking should be smooth and generally completed before entering curves. _____

Saddle Road Approval

I agree to operate TMT vehicles in accordance with TMT policies and TMT Motor Vehicle Safety Policy:

Driver Name (print) _____

Signature _____

Date _____

I certify that the driver has performed acceptably during the Saddle Road portion of the evaluation drive:

Evaluator Name (print) _____

Signature _____

Date _____

☐ Driver's License copied and filed with TMT ES&H Officer.

DRIVING BETWEEN HALE POHAKU AND SUMMIT

(Includes Summit Road Evaluation and Approval)

Driver Name: _____

Date: _____

Evaluator Name: _____

Check **General** Initial

☐ Conditions _____
(Weather, Road Wet/Dry)

Vehicle check and preparation:

☐ Vehicle description _____
(Color, Year, Make, Model, License #)

☐ Check vehicle _____
(Tires, lights, windows, dents, oil, coolant, brake and power steering fluids)

☐ Familiar with spare tire and jack location and able to change a tire. _____

Startup and driving:

☐ Adjust seat and mirrors, locate wiper and light controls and parking brake. Fasten seat belt. _____

☐ Start engine, check gauges, release parking brake. _____

☐ When leaving curb or parking stall: Check mirrors, look back. Look over shoulder and signal as appropriate. _____

☐ Acceleration and braking are smooth. Right foot used for both accelerator and brake. Observe minimum 2-second following distance. _____

☐ Able to park at HP (gearshift in P, parking brake engaged). _____

☐ Exhibit a safety conscious and responsible attitude. _____

Summit Road

Check Initial

☐ Driving uphill. _____

☐ Use 4 low above HP gate by utility area. _____

☐ Keep to proper side of road in blind hairpin turns. _____

☐ Observe caution at narrow spots (yield to uphill traffic). _____

☐ Use appropriate gears during descent to minimize braking. _____

☐ Braking should be minimal on uphill drive. Going downhill, braking should be smooth and generally completed before entering curves. _____

Summit Road Approval

I agree to operate TMT vehicles in accordance with TMT policies and TMT Motor Vehicle Safety Policy:

Driver Name (print)

Signature

Date

I certify that the driver has performed acceptably during the Summit portion of the evaluation drive:

Evaluator Name (print)

Signature

Date

11.8 TMT MONTHLY VEHICLE INSPECTION REPORT



TMT.BUS.MGT.15.069.REL01

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TMT MONTHLY VEHICLE INSPECTION REPORT

April 16, 2015

Date: _____ License Plate: _____ Mileage: _____

Year: _____ Make: _____ Model: _____

Engine, number of cylinders: 4 6 8 Other
☐ ☐ ☐ ☐ _____

INSPECT AND CHECK ONE (Strike through item if not equipped):

<u>Lights:</u>	OK	OUT		OK	OUT
Headlights (Low):	<input type="checkbox"/>	<input type="checkbox"/>	Brake lights:	<input type="checkbox"/>	<input type="checkbox"/>
Headlights (High):	<input type="checkbox"/>	<input type="checkbox"/>	Emergency Flasher:	<input type="checkbox"/>	<input type="checkbox"/>
Headlights (Daytime):	<input type="checkbox"/>	<input type="checkbox"/>	Back-Up/Reverse:	<input type="checkbox"/>	<input type="checkbox"/>
Fog Lights:	<input type="checkbox"/>	<input type="checkbox"/>	Left Turn Signals:	<input type="checkbox"/>	<input type="checkbox"/>
Taillights:	<input type="checkbox"/>	<input type="checkbox"/>	Right Turn Signals:	<input type="checkbox"/>	<input type="checkbox"/>
Side Marker:	<input type="checkbox"/>	<input type="checkbox"/>			

<u>Tires:</u>	Good	Fair	Poor		Good	Fair	Poor
Left, Front:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Right, Front:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Left, Rear:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Right, Rear:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spare, Full-Size:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Snow Tires:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spare, Mini-Size:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Tire Chains:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tire Pressures (psi):
 LF LR RF RR

Explain any Poor answers and uneven wear: _____

Brakes: Full ☐ Low ☐

Brake Fluid: ☐ ☐

Check the master cylinder for leaks. If any unusual conditions, explain: _____

Exterior:

	Good	Fair	Poor	No Damage	Damage
Paint, overall condition:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Glass, overall: <input type="checkbox"/>	<input type="checkbox"/>
Bumpers, overall:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Explanation of overall exterior condition: _____

Nonstandard ornamentation or equipment (decals, trailer hitch, etc.)? ☐ Yes ☐ No

If "Yes", explain: _____

This report is due monthly for all TMT vehicles. A separate inspection report is required for each vehicle. This report is submitted to the TMT Office Manager. See the TMT ES&H Officer (or their designee) for the appropriate inspection training.

Exterior damage: ☐ Yes ☐ No

If "Yes", note and explain cost of repairs: _____

If "Yes", was insurance claim submitted: ☐ Yes ☐ No

If "No", explain: _____

Interior:

Overall appearance: ☐ Clean ☐ Worn ☐ Dirty
 Condition of seats: ☐ Good ☐ Sagging ☐ Broken
 Condition of upholstery: ☐ Clean ☐ Worn ☐ Dirty ☐ Tear(s) ☐ Burn(s)
 Condition of carpets: ☐ Clean ☐ Worn ☐ Dirty ☐ Tear(s) ☐ Burn(s)
 Floor mats: ☐ Yes ☐ No
 Windshield wipers: ☐ Good ☐ Fair ☐ Poor
 Knobs, handles, etc.: ☐ Good ☐ Broken ☐ Missing
 Accessories:
 Flashlight: ☐ Working ☐ Non-working
 Horn: ☐ Working ☐ Non-working
 Safety belts: ☐ Working ☐ Non-working
 Rear window defroster: ☐ Working ☐ Non-working
 Vehicle Info Packet: ☐ Yes ☐ No
 Driver's Manual: ☐ Yes ☐ No
 Condition of trunk/cargo space: ☐ Clean ☐ Dirty
 Trunk/Cargo Accessories:
 Jack: ☐ Yes ☐ No
 Jack handle and base: ☐ Yes ☐ No
 Lug wrench: ☐ Yes ☐ No
 Tire pressure gauge: ☐ Yes ☐ No

Engine Compartment:

Engine: ☐ Clean ☐ Dirty Windshield Washer Fluid: ☐ Full ☐ Low
 Coolant: ☐ Full ☐ Low Power Steering Fluid: ☐ Full ☐ Low
 Transmission Fluid: ☐ Full ☐ Low Fluid Color: ☐ Black ☐ Red
 Engine Oil: ☐ Full ☐ Low Mileage, last oil change: _____
 Condition of engine oil: _____

Note any apparent leakage: _____

Overall rating of vehicle: ☐ Excellent ☐ Good ☐ Fair ☐ Poor

This report is due monthly for all TMT vehicles. A separate inspection report is required for each vehicle. This report is submitted to the TMT Office Manager. See the TMT ES&H Officer (or their designee) for the appropriate inspection training.



EXHIBIT 4. HOT WORK PERMIT

HOT WORK PERMIT

All temporary operations involving open flames or producing heat and/or sparks require a Hot Work Permit. This includes, but is not limited to, Brazing, Cutting, Grinding, Soldering, Thawing, and Welding.

INSTRUCTIONS FOR FIRE SAFETY SUPERVISOR

1. Verify precautions listed at right (or do not proceed with the work).
2. Complete page 1 and retain for job files.
3. Post page 2 in vicinity of hot work.

DATE _____ JOB NO. _____

LOCATION/BUILDING & FLOOR (Be Specific) _____

DESCRIPTION OF WORK BEING PERFORMED _____

NAME OF PERSON DOING HOT WORK _____

The above location has been examined, the precautions checked on the Hot Work Checklist have been taken to prevent fire, and permission is authorized for this work.

SIGNED: _____
(Permit Authorizing Individual)

SIGNED: _____
(Person doing Hot Work)

SIGNED: _____
(Fire Watch)

TIME
STARTED: Date: _____ Time: _____ AM/PM

Date: _____ Time: _____ AM/PM

FIRE WATCH SIGNOFF

Work area and all adjacent areas to which sparks and heat might have spread were inspected during the fire watch period and were found fire safe.

Signed: _____

FINAL CHECKUP (minimum 30 minutes after Hot Work)

Work area was monitored for _____ hour(s) following Hot Work and found fire safe.

Signed: _____

FILL OUT EMERGENCY INFORMATION ON BACK OF Page 2.

OK HOT WORK CHECKLIST N/A

- ☐ Sprinklers and hose streams in service/operable. ☐
- ☐ Hot Work Equipment in good condition (e.g., power source, welding leads, torches, etc.) ☐
- ☐ Multi-purpose fire extinguisher and/or water pump can. ☐

REQUIREMENTS WITHIN 35 FEET OF WORK

- ☐ Dust, Lint, Debris, Flammable Liquids and oily deposits removed; floors swept clean. ☐
- ☐ Explosive atmosphere in area eliminated. ☐
- ☐ Combustible floors (e.g., wood, tile, carpeting) wet down, covered with damp sand or fire blankets. ☐
- ☐ Remove flammable and combustible material where possible. Otherwise protect with fire blankets, guards, or metal shields. ☐
- ☐ All wall and floor openings covered. ☐
- ☐ Walkways protected beneath hot work. ☐

WORK ON WALLS OR CEILINGS

- ☐ Combustibles moved away from other side of wall. ☐

WORK IN CONFINED SPACES

- ☐ Confined space cleaned of all combustibles (example: grease, oil, flammable vapors). ☐
- ☐ Containers purged of flammable liquids/vapors. ☐
- ☐ Follow confined space guidelines. ☐

FIRE WATCH/HOT WORK AREA MONITORING

- ☐ Fire watch will be provided during and for 30 minutes after work, including any coffee or lunch breaks. ☐
- ☐ Fire watch is supplied with an extinguisher, and/or water pump can, also making use of other extinguishers located throughout work area. ☐
- ☐ Fire watch is trained in use of this equipment and familiar with location of sounding alarm. ☐
- ☐ Fire watch may be required for opposite side of walls, above, and below floors and ceilings. ☐

OTHER PRECAUTIONS TAKEN

☐

WARNING!

HOT WORK IN PROGRESS

WATCH FOR FIRE!

IN CASE OF AN EMERGENCY:

CALL: Visitor Information Station and Rangers

AT: **808-961-2180**

WARNING!

EXHIBIT 5. GBI SPILL PREVENTION AND RESPONSE PLAN

1.0 CERTIFICATION INFORMATION

- A. **Name of Project:** Thirty Meter Telescope International Observatory
- B. **Type of Staging Area:** Temporary Construction Equipment Fueling with Proposed On-Site Fuel Trucks feed by regular commercial delivery.
- C. **Date of Initial Operation:** Beginning of Construction April 2015
- D. **Exact Location of Facility:** Hawaii Island, Maunakea, TMT Construction Site Staging Area, **Latitude** 19°49'11.68"N, **Longitude** 155°28'27.07"W
- E. **Name and Address of Owner:** TMT International Observatory, LLC (TIO) 111 Nowelo Street Hilo, Hawaii 96720
- F. **Designated Person Responsible for Oil Spill Prevention:** Dan Weisgerber, Project Manager
- G. **Past Oil Spill History on This Site:** None known
- H. **Management Approval [40 CFR 112.7]:** Full approval is extended by the management of Goodfellow Bros, Inc. at a level with authority to commit the necessary resources toward spill prevention.

Signature: _____

Ed Brown
Director of Operations, Hawaii/Oahu
Regions

- I. **Certification – [40 CFR 112.3(d)]:** I hereby certify that (i) I am familiar with the requirements of the SPCC rule; (ii) I or my agent have visited the site of the proposed facility; (iii) the Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of the SPCC rule; (iv) that procedures for required inspections and testing have been established; and (v) that the Plan is adequate for the proposed staging area.

Signature: _____

Dan Weisgerber, Project
Manager

Date: _____

2.0 REFERENCES

- A. This SPCC plan has been prepared in compliance with 40 CFR 112, also known as the SPCC Rule.
- B. Reference is also made to the State of Hawaii Department of Health Hawaii Hazard Evaluation and Emergency Response Office (HEER) Website:

<http://eha-web.doh.hawaii.gov/eha-cma/Leaders/HEER/spill-reporting-and-emergency-response>

3.0 DEFINITIONS [40 CFR 112.2]

- A. **Discharge** - Discharge includes, but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping of oil.
- B. **Oil** - Oil of any kind or in any form, including, but not limited to petroleum, fuel oil, sludge, oil refuse and oil mixed with wastes other than dredged spoil.
- C. **Spill Event** - A discharge of oil into or upon the navigable waters of the United States or adjoining shorelines in harmful quantities, as defined in 40 CFR part 110.
- D. **Site Staging Area** - Contractor's Staging Area specifically shown on Attachment 1.

4.0 [40 CFR 112.7a(1)] ENVIRONMENTAL

The TMT Site is located just southwest of the summit of Maunakea among several other Observatory Facilities. The only means of access is the Maunakea Observatory Road which can be reached using the Daniel K. Inouye Highway. See Figure 1 for map of the location.

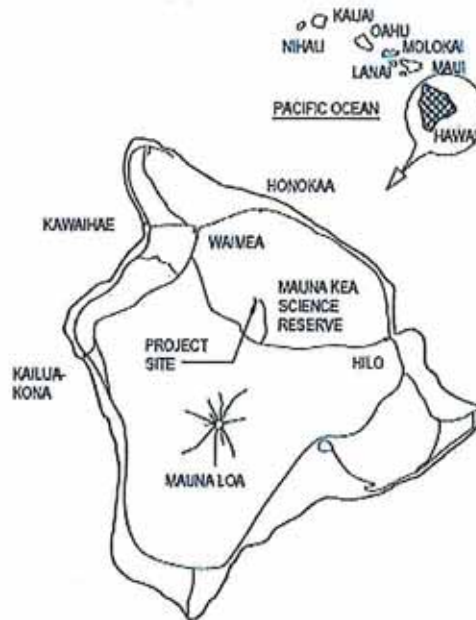


Figure 1

The TMT Site Staging Area is at elevation of 13,100 feet above sea level. Terrain is primarily rolling lava rock and cinder. The geology of the entire site is volcanic with lava/cinder of differing ages and stages of deterioration. Vegetation types are essentially non-existent. For a more thorough understanding of the location and its features, please refer to the FEIS for the TMT Observatory.

Precipitation in the form of snow, rain, and fog mist falls at an annual rate of approximately 10-30 inches per year. There are no live streams, as the majority of rainfall is absorbed into the porous cinder/lava subgrade.

5.0 [40 CFR 112.7a(1)] - DESCRIPTION AND PHYSICAL LAYOUT OF THE FACILITY

- A. The TMT Site Staging Area known as typically referenced the "Batch Plant Area". The Staging Area serves as the support area for the entire construction site, and specifically regarding the handling of oil products as follows:
- Transfer of fuel (diesel and gasoline) from commercial trucks to mechanic's trucks.
 - Fueling of equipment from mechanics trucks; this activity is done at the location of the equipment.
- B. On-site temporary storage of fuels would consist of:
- A designated area to park commercial delivery trucks for transfer of fuel from commercial trucks to onsite delivery trucks.
 - Onsite delivery trucks transporting fuel to equipment.
 - A containment berm consisting of an earthen berm and a 30-mil poly liner installed over a compacted gravel base as shown on the diagram.
 - The containment is designed with a volume to handle all tanks plus over 10% extra capacity for concurrent rainfall quantities.
 - Four "PIG" Spill Response Kits would be located immediately adjacent to the Lined Fuel Storage Containment Area. Each kit is rated for a 21-gallon clean up capacity.

6.0 [40 CFR 112.7a(2)] - DISCUSSION OF FACILITY'S CONFORMANCE WITH 112.7

Any non-conforming items have been considered in this plan

7.0 [40 CFR 112.7a(3)i-v] PROPOSED STORAGE and DISCHARGE PREVENTION MEASURES

A. Discharge Prevention Measures:

GBI will implement the following discharge prevention measures:

1. Daily inspection and maintenance of equipment. This greatly reduces the risk of any spill due to broken fuel or hydraulic lines.
2. All servicing trucks (Mechanic's Trucks) shall have spill containment materials adequate to control foreseeable spills. Such materials may include but not limited to:
 - absorbent pads
 - commercial absorbent material
 - absorbent booms
 - plastic bags with ties
 - plastic bags and sheeting
 - nitrile gloves
 - shovel

3. Fueling transfer from the commercial truck to Mechanic's truck would be performed under the direct supervision of the Commercial truck operator and the GBI Mechanic and spill containment supplies available on the Mechanics Truck would be available if needed
4. Fueling of equipment from the Mechanics Truck would be performed under the direct supervision of the Mechanic and Equipment Operator and spill containment supplies available on the Mechanics Trucks would be readily available if needed.
5. For changing of equipment fluids, spill is minimized as fluids are removed from the equipment by a pump-hose-used oil container system. Quantities of equipment fluids are lower than fueling operations and spill containment supplies available on the Mechanics Trucks would be readily available if needed.

B. Discharge Prevention Measures – With Approval of the Proposed Onsite Storage:

The measures shown above would continue to be implemented. In addition:

1. Commercial delivery truck operators will follow HIDOT regulations for delivery of product to the site.
2. Fuel records will be kept on site. Delivery and used quantities will be reconciled each time a delivery is provided.
3. Truck leak checks will be performed and recorded and records kept onsite.
4. Transfer of fuel from commercial trucks to the onsite fuel trucks would take place with the discharge end of transfer hoses inside the containment area. The transfer would be attended by the operator of the commercial supply truck and by an authorized GBI representative. Transfer procedure is carried out by the Commercial Truck Operator as follows:
 - dip truck tank for beginning tank content volume; calculate volume to fill
 - stretch hose from truck to truck and insert nozzle into tank
 - walk back to truck to start pump
 - fill truck, standing at truck holding nozzle with integral valve
 - turn off pump and retract hose
 - dip truck for ending truck content volume
 - record beginning and ending readings and volume provided
5. There is no fuel piping, buried or above-ground.
6. Discharge would be prevented in addition to the measures described above by confining the storage of fuels and petroleum based products to the Lined Fuel Storage Containment Area.
7. GBI would immediately clean up any spill inside the containment area to minimize exposure to the surrounding areas.

[40 CFR 112.7a(3)vi] CONTACT LIST AND PHONE NUMBER FOR RESPONSE

- A. Spill Response Rubric – See following page for **Spill Response Contact List**. The contact list will be posted in the contractor's onsite project office.
- B. Spill Response Team – Goodfellow Bros., Inc. provides the following properly trained spill response team to support the Installation On-Scene Coordinator.
 - 1. GBI Project Spill Coordinator – Dan Weisgerber
 - 2. GBI Erosion Control Specialist – Kent Bowers
 - 3. GBI Spill Response Contractor – DC Carter, Penco Inc.
- C. Goodfellow Bros., Inc. shall pay for the disposal of hazardous materials to the permitted facilities and submit the disposal reports to Office of Maunakea Management.

8.0 [40 CFR 112.7a(4)] EXACT LOCATION FOR REPORTING

The exact location (latitude and longitude) is listed in section 1.d of this SPCC and on the Spill Response Contact List on the following page.

SPILL RESPONSE CONTACT LIST

Spill Reporting Order	Organization	Phone Number(s)
1	TMT/M3 Project Manager Onsite	520.293.1488
2	Office of Maunakea Management <small>Office of Mauna Kea Management 200 W. Kawaiili Street Hilo, HI 96720</small>	808.933.0734
3	Maunakea Observatory Support Services	808.974.4205
4	Local Fire, Police, Ambulance	911
5	GBI Director of Operations	808.960.3782
6	GBI Spill Coordinator	808.960.3784
7	GBI Erosion Control Specialist	808.854.5414
8	GBI Contract Spill Response DC Carter - PENCO	808.842.2649
9	EPA (Federal) National Response Center	800.424.8802
10	Hawaii State Emergency Response Commission (HSERC) Hazard Evaluation and Emergency Response (HEER)	Business Hours: 808.586.4249 After hours: 808.247.2191
11	Hawaii County Civil Defense	808.935.0031 808.935.3311
12	Hawaii County Emergency Spill Hotline	808.656.1111
13	Poison Control Center	800.222.1222

LOCATION: Site Staging Area Coordinates: Latitude 19°49'11.68"N, Longitude 155°28'27.07"W
9.0 [40 CFR 112.7.n(5)] REPORTING PROCEDURES

A. REFERENCES

1. Hawaii Hazard Evaluation and Emergency Response Office (HEER) Website
<http://eha-web.doh.hawaii.gov/eha-cma/Leaders/HEER/spill-reporting-and-emergency-response>

B. REPORTING REQUIREMENTS AND REPORTABLE QUANTITIES

Hawaii Administrative Regulations require the following reporting requirements for the reportable quantities described.

In addition, agencies showing a number under "spill reporting order" in the **Spill Response Contact List** shall be included in any spill reporting required by the table below.

Spill Description	Agency to Contact	Reporting Requirement
<p>Reportable Quantities for Oil: [HAR 11-451-6.b.5]</p> <p>a. Any amount of oil which when released into the environment causes a sheen to appear on surface water, or navigable water of the State.</p> <p>b. Any free product that appears on ground water;</p> <p>c. Any amount of oil released to the environment greater than 25 gallons;</p> <p>d. Any amount of oil released to the environment which is less than 25 gallons, but which is not contained and remedied within 72 hours</p>	<p>Hawaii State Department of Health</p> <p>919 Ala Moana Blvd., Room 206</p> <p>Honolulu, Hawaii 96814-4912</p> <p>Attn: EPCRA Data Manager</p> <p>Phone (808) 586-4249</p> <p>Fax (808) 586-7537</p> <p>After Hours (808) 247-2191</p> <p>heer@doh.hawaii.gov</p> <p>OMKM shall be sent a copy of any written reports. See additional reporting requirements in the Spill Response contact list</p>	<p>Immediately Upon Detection</p>

C. REPORTABLE INFORMATION REQUIRED:

<http://eha-web.doh.hawaii.gov/eha-cma/documents/b7879909-9132-4d2c-bc37-de429b4ef9e9>

1. Name and telephone number of the caller.
2. Name and telephone number of a contact person, (if different from the caller) that can provide timely information as the incident is occurring.
3. Name (trade and chemical), of the hazardous substance which has been released.
4. Approximate quantity of the hazardous substance which has been released.
5. Location of the incident.
6. Date and time of spill, release, or threatened release.
7. Description of what happened (source and cause of the release).
8. Immediate danger or threat posed by the release.
9. Name, address, and telephone number of the responsible party or potentially responsible party.

10. Measures taken or proposed to be taken in response to the release as of the time of the notification.
11. Any known injuries or advice regarding medical attention necessary for exposed individuals.
12. The names and phone numbers of other federal, state, or local government agencies that have been notified of the release.
13. Any other information that may help emergency personnel respond to the incident.

10.0 [40 CFR 112.7.b] POTENTIAL FOR EQUIPMENT FAILURE

Experience shows that equipment failures such as broken hydraulic hoses could result in a minor spill with no flow overland.

11.0 [40 CFR 112.7.c] CONTAINMENT STRUCTURES

- A. No Onsite Storage Option: Not applicable

12.0 [40 CFR 112.7.d] CONTAINMENT STRUCTURES

- A. No Onsite Storage Option: Not applicable

13.0 [40 CFR 112.7.e] INSPECTIONS TESTS AND RECORDS

- A. No Onsite Storage Option: Not applicable

14.0 [40 CFR 112.7.f] TRAINING

- A. [40 CFR 112.7.f.1] GBI Mechanics and our subcontracted fuel supply operators receive HAZMAT training as required for those functions. This provides training in the operation and maintenance of equipment, in pollution control laws and regulations,

All employees reporting to work on the site will be provided orientation training, including training on the operations of the facility, monitoring, incident response and response equipment, record keeping, related laws, rules, regulations, and this SPCC Plan. Documentation of this training will be filed in the safety project files on site,

- B. [40 CFR 112.7.f.2] GBI has appointed Dan Weisgerber, Project Manager as the individual responsible for spill prevention and who reports to management.

- C. [40 CFR 112.7.f.3] GBI provides annual HAZMAT refresher training for operators and mechanics. This training is accomplished and documented as part of GBI's regular and ongoing Safety Program. GBI's Safety Manager and SSHO for this project is certified with a 40-hour HAZWOPPER.

Discharge briefings will be held annually during the duration of this SPCC plan. Discussion items will include any discharges that may have occurred, equipment failures or malfunctions, and new precautionary procedures.

15.0 [40 CFR 112.7.g] SECURITY

A. [40 CFR 112.7.g.1] Fencing

1. No Onsite Storage Option: Not applicable

B. [40 CFR 112.7.g.2] Valve Security

1. No Onsite Storage Option: Not applicable

C. [40 CFR 112.7.g.3] Pump Starter Controls

1. No Onsite Storage Option: Not applicable

D. [40 CFR 112.7.g.4] Tank Fill Port Security

1. No Onsite Storage Option: Not applicable

E. [40 CFR 112.7.g.5] Lighting

1. No Onsite Storage Option: Not applicable

16.0 [40 CFR 112.7.h] FACILITY LOADING/UNLOADING RACK

Not applicable; no rack proposed.

17.0 [40 CFR 112.7.i] FIELD CONSTRUCTED TANKS

Not applicable; field constructed tanks are not proposed for this facility.

18.0 [40 CFR 112.7.j] ADDITIONAL STATE, COUNTY, OR LOCAL REQUIREMENTS

There are no additional requirements over and above those addressed herein.

19.0 [40 CFR 112.8.a] GENERAL REQUIREMENTS OF 40 CFR 112.7

The preceding portions of this plan address 40 CFR 112.7

20.0 [40 CFR 112.8.b] FACILITY DRAINAGE

A. [40 CFR 112.8.b.1]

1. No Onsite Storage Option: Not applicable

B. [40 CFR 112.8.b.2]

Not applicable; diked area will not be drained by gravity.

C. [40 CFR 112.8.b.3]

Not applicable; diked area will not be drained by gravity.

D. [40 CFR 112.8.b.4]

Not applicable; diked area will not be drained by gravity.

E. [40 CFR 112.8.b.5]

Not applicable; diked area will be pumped and the contents hauled off site and disposed of properly.

21.0 [40 CFR 112.8.c] BULK STORAGE CONTAINERS

A. [40 CFR 112.8.c.1]

1. No Onsite Storage Option: Not applicable

B. [40 CFR 112.8.c.2]

1. No Onsite Storage Option: Not applicable

C. [40 CFR 112.8.c.3]

1. No Onsite Storage Option: Not applicable

D. [40 CFR 112.8.c.4]

1. No Onsite Storage Option: Not applicable

E. [40 CFR 112.8.c.5]

1. No Onsite Storage Option: Not applicable

F. [40 CFR 112.8.c.6]

1. No Onsite Storage Option: Not applicable

G. [40 CFR 112.8.c.7]

1. No Onsite Storage Option: Not applicable

H. [40 CFR 112.8.c.8]

1. No Onsite Storage Option: Not applicable

I. [40 CFR 112.8.c.9]

1. No Onsite Storage Option: Not applicable

J. [40 CFR 112.8.c.10]

1. No Onsite Storage Option: Not applicable

K. [40 CFR 112.8.c.11]

1. No Onsite Storage Option: Not applicable

22.0 [40 CFR 112.8.d] FACILITY TRANSFER OPERATIONS, PUMPING, AND FACILITY PROCESS

A. [40 CFR 112.8.d.1]

1. No Onsite Storage Option: Not applicable

B. [40 CFR 112.8.d.2]

1. No Onsite Storage Option: Not applicable

C. [40 CFR 112.8.d.3]

1. No Onsite Storage Option: Not applicable

D. [40 CFR 112.8.d.4]

1. No Onsite Storage Option: Not applicable

E. [40 CFR 112.8.d.5]

1. No Onsite Storage Option: Not applicable

APPENDIX A

Interim Final

Hawaii Hazardous Substance Written Follow-Up Notification Form

PLEASE PROVIDE THE FOLLOWING INFORMATION

Incident Case No.: _____

Contact Information

Caller's Information

Name: _____

Address: _____

City: _____ State _____ Zip _____

Telephone number: _____

Owner's Information

Name: _____

Title: _____

Company: _____

Address: _____

City: _____ State _____ Zip _____

Telephone number: _____

Operator's Information

Name: _____

Title: _____

Company: _____

Address: _____

City: _____ State _____ Zip _____

Telephone number: _____

Name of a contact person at the facility or vessel where the release has occurred: _____

Telephone number: _____

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Hazardous Substance Released:

Name (trade and chemical) of the hazardous substance which has been released: _____

Chemical Abstract Service (CAS) Number (if applicable): _____

Approximate quantity of the hazardous substance released: _____

Incident Information

Location of the release: _____

A brief description of the release: _____

Media into which the release occurred or is likely to occur (Indicate all those that apply):

☐ Air ☐ Soil ☐ Groundwater ☐ Concrete ☐ Asphalt ☐ Stream ☐ Ocean ☐ Other

Cause of the release: _____

Date of the release: _____

Time of the release: _____

Duration of the release: _____

Date: _____

Time that the person in charge of the facility or vessel where the release occurred obtained knowledge of the release: _____

Source of the release: _____

Response Information

Response measures taken thus far: _____

Interim Final

Any appropriate information relating to the ability of the owner or operator of the facility or vessel where the release has occurred to pay for or perform any proposed or required response actions: _____

The names of other federal, state, or local government agencies that have been notified of the release: _____

Health Information

Known or anticipated acute health risks: _____

Known or anticipated chronic health risks: _____

Advice regarding medical attention necessary for exposed individuals: _____

Potential impacts to public health or welfare: _____

Potential impacts to the environment: _____

"I certify under penalty of law that I have personally examined and am familiar with the information submitted and believe the submitted info is true, accurate, and complete."

Signature: _____ Date: _____

Printed Name: _____

Title: _____

Company: _____

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November 12, 2008



EXHIBIT 6. ROCK MOVEMENT PLAN

ROCK MOVEMENT PLAN

The Civil Package includes (a) the preparation of the Batch Plant Staging Area for use during the entire construction period, (b) the excavation of rock from the TMT site and the access road; (c) the excavation of cinder from the access road; (d) processing the excavated rock to produce engineered fill; (e) the use of the engineered fill material to grade and backfill the TMT site and the access road, including underground utilities; and (f) stockpiling excess cut material at the Batch Plant area.

1.1 LOCATION AND TYPE OF SOURCE MATERIAL

The location, type, and amount of source material and cut and fill is estimated as the following:

Type	Location	Amount on-hand at start	Amount cut during construction	Amount used as fill or stockpiled
Cinder, provided by OMKM	Batch Plant	200 cy		
Rock, sand, other aggregate from outside of summit region to be used as fill within the summit region for purposes other than concrete aggregate	Hawai'i island	0 cy		
Rock, sand, other aggregate from outside of summit region to be used as concrete aggregate	Hawai'i island	None anticipated at this time		
Rock cut	TMT site TMT building foundation		38,000 cy 8,000 cy	
Cinder	Access road		1,000 cy	
Engineered fill (from processed rock cut)	TMT site Access road			23,000 cy 6,000 cy
Excess rock	Batch Plant -			17,000 cy
Excess cinder	Stockpile Area			1,000 cy
** Quantities are approximate: Basalt Rock and Cinder when liberated from its host matrix tend to change in density; actual volume quantities may vary.				

OMKM has currently stockpiled on the Batch Plant roughly 200 cubic yards of cinder. That cinder will be utilized for preparing portions of the Batch Plant for use by the contractor.

Approximately 1,000 cy of the cut will be cinders with the estimated balance of 46,000 cy of the cut material consists of basalt (lava) rock. All cinders will be obtained in the TMT access roadway and underground utilities work on the side of the cinder cone Pu'u'hau'oki.

A roughly 29,000 cubic yard portion of the 47,000 cubic yards of excavation volume will be processed at the TMT facility site to produce engineered fill, that will be used as fill on both the

TMT site and its access road. The excess roughly 18,000 cubic yards of rock and cinder (17,000 cy of rock / 1,000 cy of cinder) will be placed in separate stockpiles at the northwesterly end of the Batch Plant area. There are no requirements for retaining weathered surface rocks; all excavated basalt rock will be used in fill or stockpiled without segregation according to source. Some of the stockpiled rock material will be used at the Batch Plant area during construction for levelling of an area for equipment, berms for supporting impermeable barriers for water storage and secondary spill containment, and other miscellaneous purposes. At the end of TMT construction (not the subject civil construction package, but in the final restoration phase when all construction is wrapping up), the stockpiled rock material will be redistributed in the Batch Plant area as part of a renaturalization of the area.

The construction drawings specify the dimensions of the cuts and fill at the site and on the access way. The stockpiled material is shown on the construction drawings for contractual purposes. This material will be used by OMKM as determined by OMKM.

1.2 OTHER ROCK IN CONSTRUCTION AREA

OMKM has other cinder stockpiles at the Batch Plant. Those stockpiles may be relocated within the Batch Plant area by the TMT project contractors; but will not be used or added to by the project unless directed to do so by OMKM. These stockpiles will always be stockpiles separate from other materials, including each other and cinder excavated from Puuhauoki by the project unless directed otherwise by OMKM. The stockpiles include:

1. Cinder designated for Pu'upoli'ahu restoration (CDUP special condition 3, not a part of this construction phase).
2. Cinder used by OMKM and MKSS for various purposes in the summit region.

1.3 ROCK EXCAVATION

Rock excavation on the Island of Hawaii is a challenging endeavor; The added challenge of altitude, environmental factors, culture/archaeological factors, adjacent facility disruption factor, and other sensitivity factors amplifies the need for skill and planning for a successful excavation effort.

The observed rock at the site is a volcanically deposited basaltic. rock varying in consistency from porous (vesicular voids) to massive (solid - "blue" rock). The ultimate compressive strength of the observed rock likely varies between 2,000 pounds per square inch (psi) to well over 20,000 psi.

1.4 ROCK EXTRACTION PROCESS

Pioneering - Prior to any rock extraction, the physical limits of the excavation and embankment (cut/fill) areas must be defined upon the existing natural ground surface. A CAT D-9 or D-10 dozer will be used to create a rough road that will encircle/define the cut/fill limits of the access road and facility site. This rough road will extend from the top of cuts into the footprint of the excavation area or from the toe of fills into the footprint of the embankment area. Where the limits of excavation prove to be too hard to define without excessive surface disturbances beyond the

grading limits, a 30-40 metric ton excavator will be used to reach from within the grading limits out to the edge to pull the rock along the grading limits back into the grading footprint.

The resulting graded rough road will serve as the primary access for the major grading operations to the entire site.

Such preliminary effort in conjunction with GPS machine guidance is the single greatest protection from unnecessary site disturbance. It is the goal of all grading operations to only disturb the minimum footprint absolutely necessary to construct the planned work.

The day use of GPS or other equipment that emits radio frequencies was agreed to by observatory directors and Office of Mauna Kea Management (OMKM) in 2014. TMT will again coordinate with the observatory directors and OMKM prior to the restart of construction in 2019 and keep interested parties informed of GPS use during the construction period.

Liberation - Solid rock "liberation and "fragmentation", will be accomplished using 40-50 metric ton excavators equipped with either a single shanked ripper or hydraulic ram/hammer ("Hoeram"). This effectively "chisels" the rock into large chunks that are further "chiseled" into movable fragments of a size suitable for crushing (usually between 24 - 36 inches in the maximum dimension).

Dozing - Once the rock is liberated, it will be pushed into piles using a CAT D-9 or D-10 sized track driven bull dozer. This process removes the liberated/fragmented rock chunks out of the way of the "hoeram" operation and centralizes the rock fragments for better production handling/movement.

Excavation/Loading - Once piled a 40-50 metric ton excavator will crawl to the top of each pile and either feed the rock fragments directly into a track mounted jaw crusher or into a 40-ton all-terrain rock truck for transport or similar type of vehicle.

Bulk Rock Hauling - Excavated rock will either be relocated to a better fixed location at the site for crushing or be hauled directly to the batch plant site for stockpiling. When rock is hauled to the batch plant site is estimated that 30 to 50 loads a day will occur. At no time will any rock from any operations be hauled to a location other than the TMT site, Access Way, or the Batch Plant Area. Hauling will utilize CAT 40-ton all-terrain rock trucks or similar type of vehicle.

Aggregation/Crushing - The crushing process will "aggregate" or reduce the large rock fragments into a controlled range of sizes (well graded) with limits on the maximum and minimum particle size. This process provides a uniform quality aggregate that is easy to handle, place and compact into the required embankment areas and trenches. Aggregation/crushing will occur near the liberation site, most likely at the TMT site.

Processed Rock Hauling - Once the rock fragments are crushed into the appropriately sized aggregate they will be stockpile at the site for use. The site is small, therefore much of the material will be used immediately as it is crushed. Most of the crushed material will be used at the TMT Facility Site for embankment or fill. A small portion of the crushed rock will be used to complete the access roadway and for the underground electrical and communication duct bank. Hauling will utilize CAT 40-ton all-terrain rock trucks or similar type of vehicle.

Embankment Bed Preparation - Prior to placing any fill material the natural ground under the embankment areas will require preparation in accordance with the specifications and geotechnical recommendations. These areas will be tracked and ripped using a CAT D-10 sized dozer. The ripping operation will rip to a predetermined depth or until refusal (ripping tooth hits hard rock). This operation serves to stabilize the loose rock surface and/or expose surface voids that will need to be consolidated and compacted. Along with the CAT D-10 sized dozer, a 12-20-ton vibratory roller will be used to pre-consolidate the embankment bed.

In areas of steep slopes, the toe of each lift of fill material will be keyed into the existing slope making sure the resulting embankment is constructed to a firm and stable state in accordance with the specifications and geotechnical recommendations.

Embankment - As described above most of the produced aggregate products will be used to construct the access road and facility site embankment. The aggregates will either be "tramed" to the area of embankment from the crushed stockpiles using a CAT 950 sized loader or will be loaded into the back of a CAT 40-ton all-terrain rock truck (or similar type of vehicle) and hauled to the area of use. At this point the material will be "wetted" using a 4000-gallon tandem axle water truck. The "wetting" process will help to reduce dust, but more critically will help to compact the material into a tight mass as required by specification. This material will be placed in controlled horizontal layers of a fixed thickness each conforming to the project specifications.

Wetting – during rock movement (including liberation, hauling, compaction, and stockpiling), wetting will be done as appropriate to control dust. Rock will be wetted during potential dust-generating disturbances (liberation, crushing, loading, dumping, etc.); unpaved road surfaces on the haul route will also be wetted as appropriate. Wetting will be done using a 4000-gallon tandem axle water truck.

Finegrading - Once the bulk excavation and embankment work is complete, the resulting top surface of these areas is typically referred to as "subgrade". This subgrade is broken into several different types of areas, each requiring a separate approach to achieve the desired look and specified planar tolerances:

- Fill slopes are the surfaces created along the edges of embankments, the surface extending from the top edge of the embankment to the natural ground surface lying beneath the embankment material. These surfaces will typically be "over" constructed by a small amount and then trimmed back using a 20-30 metric ton excavator to create a uniform look. This however may not be the final aesthetic objective, a more natural look can also be achieved much the same way the golf courses and resort recreation areas are grading on the Westside of the Big Island. Many of the golf courses and roadways within resort areas on the Westside of the Big Island are constructed in A'a and Pahoehoe lava flows – such construction often requires a more natural look be established in disturbed areas when complete. Such a requirement is referred to as "re-naturalization".
- Cut slopes are the surfaces created along the edges of excavations, the surface extending from the bottom edge of the finish excavation flat surface to the natural ground surface where the excavation first began. These surfaces, especially in solid rock, will be over excavated small amount to make sure the desired planar grade/look

is achieved. This however may not be the final aesthetic objective, a more natural look can also be achieved much the same way golf courses and resort recreational areas are graded on the Westside of the Big Island. Many of the golf courses and roadways within resort areas on the Westside of the Big Island are constructed in A'a and Pahoehoe lava flows – such construction often requires a more natural look be established in disturbed areas when complete. Such a requirement is referred to as “re-naturalization”.

- Facility site this subgrade surface is the flat area defining the entire site the TMT facility will be located. This area will be fine-graded using a CAT D-6 dozer, CAT 140H motor grader or similar type of equipment followed by a 20 ton vibratory roller.
- Access Roadway this subgrade surface is the roadway surface from edge of cut slopes to the top fill slopes with the exception of special areas such as ditches and swales. This area will be fine-graded using a CAT D-6 dozer, CAT 140H motor grader, or similar type of equipment followed by a 20 ton vibratory roller.
- Ditches/Edges/Swales this subgrade surface is the edges of cut slopes, fill slopes, roadway, or the facility site that require special care to define a surface designed to concentrate and route storm water. These areas will be fine-graded using a small excavator or backhoe, hand operated vibraplates or tampers, and hand racking.

1.5 ROCK MOVEMENT MONITORING

See BMP Section 4.6.2 for OMKM requirements - GBI will fully comply

1.6 SPECIFIC ROCK MOVEMENT REQUIREMENTS

See BMP Section 4.6.3 for OMKM requirements - GBI will fully comply

1.7 MATERIALS CONTROL

See BMP Section 4.6.4 for OMKM requirements - GBI will fully comply

1.8 AGGREGATE MATERIALS

- See BMP Section 4.6.5 for OMKM requirements - GBI will fully comply

All the required granular rock material needed for the mass grading, fine-graded surfaces; aggregate cushion/base material and/or utility backfill aggregate will be manufactured using rock excavated from the subject site. At no time will any rock material excavated from the site be removed from the summit area. The only areas recognized as authorized areas of use are the TMT facility site itself, the access road being improved for the project, and the batch plant area. Should there be a need for imported aggregates that cannot be anticipated at this point extensive measures will be taken to make sure OMKM requirements and protocols are followed.

1.9 SPECIFIC EQUIPMENT LIST

The following list summarizes the equipment to be used. Equivalent or similar substitutions may occur.

Pickup Trucks [F150 - 4WD] and/or other Transport Vehicles for Personnel [i.e. 4x4 Van, etc.]
Laboer's Utility Truck [F350 - 4WD w/Utility Bed, Compressor, and Gear]
Cat Backhoe [420 Class] or Mini Excavation [80 size]
Mechanic Truck / Service Vehicle
Tandem Axle Rear Dump Truck
Tandem Axle Water Truck [4000 Gallon capacity]
John Deere or Hitachi Excavator [470 class w/Hoeram and Buckets]
John Deere or Hitachi Excavator [470 class w/Hoeram and Buckets]
Cat D-10 Dozer
Tamrock Ranger Line Drill
Cat 740 Artic Off-Road Truck
Cat 740 Artic Off-Road Truck
Trailer Mounted Genset [36 kW Size]
Office Trailer [10x32 Size]
Office Trailer [24x60 Size]
John Deere or Hitachi Excavator [200 Class w/Hoeram and Buckets] or [300 class w/Hoeram and Buckets]
Cat Articulated Loader [950 Class] or [938 Class] based on availability
Cat D-6 Dozer
Roller [20-ton Class]
John Deere or Hitachi Excavator [300 class w/Hoeram and Buckets]
[Crushing plant components or entire may vary based on availability]
Cheiftain Warrior Screening Plant w/Possible Telestack Conveyor
Nordberg LT105 Track Mounted Crusher
Nordberg HP300 Track Mounter Cone Crusher



EXHIBIT 7. WASTE MINIMIZATION PLAN

Contents

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1.0 COMMITMENT TO WASTE MINIMIZATION

1.1 Statement of commitment

"Goodfellow Bros., Inc. is committed to the reduction of waste company wide. Each of our projects and their related clients' waste handling requirements can significantly vary; therefore we will strive to address "waste minimization" as it is termed on a project-by-project basis.

As a company and member of our world community, we strive to be efficient in all our activities and one the best ways to maintain a sustainable company enterprise is through waste elimination in its many forms.

The following plan has been developed specifically for the TMT International Observatory Civil Package Project and will address sources and streams of waste unique to our involvement on this project"

1.2 Waste Minimization and Reduction Team

Dan Weinberger, Project Manager -----	Highest ranking person for GBI on project
Guy DeBartolo, Project Engineer -----	Technical/Engineering lead for project
Sam Peck, Project Foreman -----	Field supervisor over all labor

2.0 SCOPE AND OBJECTIVE

2.1 Scope

This plan identifies the various elements and materials of waste and creates a framework from which our selected project team can achieve measurable results in terms of reduction/minimization.

This waste minimization plan is a construction mitigation plan specifically for the Civil Package. An operational waste minimization will be prepared prior to the start of operations.

2.2 Objective

We aim to increase our awareness of and through such awareness significantly reduce the amount of waste normally experienced on such a project.

3.0 ITEMS/ACTIVITIES TARGETED FOR WASTE REDUCTION

3.1 Waste Stream Identification

<u>Waste Stream Name</u>	<u>Waste Cause</u>	<u>Waste Mitigation</u>
<u>Standard Industrial Content</u>		
Gasoline and Diesel	Excessive Consumption	Efficient planning to reduce travel
Oils/Filters	Excessive Consumption	Vehicle specific maintenance
Electricity	Excessive Consumption	Energy efficient appliances and power management
Office Supplies	Needless Use	Paperless workflow
Timber/Wood	Poor material selection	Avoid using any of these materials. Use recyclable where possible
Water	Poor planning / Leaks	Target use on an as needed basis and monitor storage area/transport vehicles for leaks
Cardboard	No reuse or selection of reusable medium	Preplanning and focused effort to choose reused products
Plastic	No reuse or selection of reusable medium	Preplanning and focused effort to choose reused products
Soft Plastic	No reuse or selection of reusable medium	Preplanning and focused effort to choose reused products
<u>Construction Materials</u>		
Geotextile	Poor planning and inaccurate quantity for ordering	These materials will be ordered using engineered plans with fixed dimensions; as such waste will be controlled using historic factors, only ordering the exact amount needed.
Survey Stakes and Ribbon	Poor material selection and Poor Planning of Work	These materials will be used to guide the work making sure the graded surfaces end up in the right locations both vertically and horizontally. All such material will be removed at the end of the project and reused if possible.

Construction Fencing	Poor material selection and Poor Planning of Work	These materials will be used to create a temporary construction boundary encircling the work areas. This material is mostly steel and aluminum and can/will be recycled.
Concrete (ductbank)	Poor planning and inaccurate quantity for ordering	The remoteness of this project forces an extra level of effort to order exact quantities of such material acting to manage waste issues. Excess will be hauled back to the concrete plant.
Concrete (curbs/gutter/headers)	Poor planning and inaccurate quantity for ordering	The remoteness of this project forces an extra level of effort to order exact quantities of such material acting to manage waste issues. Excess will be hauled back to the concrete plant.
Precast concrete vaults	Poor planning and inaccurate quantity for ordering	These materials are manufactured to exact dimensions in a controlled environment. Exact numbers are ordered and used. No waste is anticipated.
Reinforcing Steel	Poor planning and inaccurate quantity for ordering	This material will be ordered in exact amounts and no waste is anticipated.
Aggregate Products	Poor planning and inaccurate quantity for ordering	All aggregates products manufactured will be used in the building of the work, excess will be stockpiled at the batch plant area for use at a later time in the project's life cycle.
Cable Guard railing	Poor planning and inaccurate quantity for ordering	This material will be ordered in exact amounts and no waste is anticipated.
Asphalt Cement Pavement Mix	Poor planning and inaccurate quantity for ordering	The remoteness of this project forces an extra level of effort to order exact quantities of such material acting to manage waste issues. Excess will be hauled back to the asphalt mix plant.
Marker Poles	Poor planning and inaccurate quantity for ordering	This material will be ordered in exact amounts and no waste is anticipated.
Pavement Markings	Poor planning and inaccurate quantity for ordering	This material will be ordered in exact amounts and no waste is anticipated.

4.0 GOALS FOR WASTE REDUCTION

- 4.1 The goals for this project related to Waste Minimization/Reduction will be the single greatest measure for such an effort.
- ✓ Effectively plan and utilize the trips travelled to the project by the various vehicles as to transport items efficiently with the least amount of trips possible.
 - ✓ We will strive to have minimal trash or rubbish hauled to the municipal dump.
 - ✓ We commit to recycle and/or reuse all excess materials generated from this project.

Appendix A. TMT Project Contact List

Available upon request, contact Sandra Dawson at sdawson@tmt.org or (808) 937-4250.