MEMORANDUM

TO: Dr. Mark A. Hussey
    Interim President, Texas A&M University

SUBJECT: CBE Recommendation: Traversability Proving Ground Facility at Riverside Campus

At its June 10, 2014 meeting, the Council for the Built Environment (CBE) discussed a request from the Texas A&M Transportation Institute (TTI) to construct a Traversability Proving Ground facility at Riverside Campus.

TTI has been awarded funding by the National Cooperative Highway Research Program, and the Department of State to construct a Traversability Proving Ground Facility at Riverside Campus for testing purposes. In coordination with Riverside Campus users and Texas A&M's Office of Facilities Coordination, TTI has selected an area between 35R Section 2 and Apron 2 for this project. Construction of this facility will provide for current and future research as well as instructional opportunities. The attached document details the project and construction plans.

Recommendations from the Sub-Councils:

Facilities Utilization Review Sub-Council (FURsc) – The FURsc recommends the request by the Texas A&M Transportation Institute (TTI) to construct the Traversability Proving Ground Facility at the Riverside Campus which will provide a unique site at which vehicle performance can be evaluated on sloped terrains through full-scale crash testing. The FURsc believes the land use for the proposed Traversability Proving Ground Facility is justifiable and is consistent with the recently approved Riverside Campus Master plan. FURsc supports the project as proposed. It is recommended that, as with other similar uses that TTI maintain the facility until the current research project remains active or the Traversability Proving Ground remains a viable facility to the Agency for future research. At which time the facility is no longer viable or active, TTI will consult with TAMU Facilities Coordination to discuss returning the area to its current condition. This has been discussed and TTI agrees to this term. It is expected that the operation of this facility will be subject to the runway scheduling procedures overseen by the Office of Facilities Coordination.

Technical Review Sub-Council (TRsc) - The Technical Review Sub-council supports the proposed renovation and recommends approval, provided the following issues/concerns are addressed and funded.

• Telecommunications:
Telecommunications does not foresee any infrastructure or service-related challenges and thus, fully supports, the aforementioned projects as presented. Prior to any digging, utility locates should be requested as per university protocol.

- Facilities Services:
The project team should coordinate with Grounds Management for landscaping and irrigation concerns.

- Environmental Health & Safety:
Depending upon the size (area) of the construction site, environmental permitting may be required. Early coordination with TAMU EHS (Mr. Jeff Truss, Manager for Environmental and Hazardous Waste Management) is important to ensure that environmental permitting requirements do not unnecessarily delay the project.

- Utility & Energy Services:
The project and design team will need to follow the TAMU policy on digging on campus—prior to any excavation—https://utilities.tamu.edu/digging-campus/

The CBE voted unanimously to recommend the President’s approval, with noted caveats, TTI’s request to construct a Traversability Proving Ground facility at Riverside Campus.

Karan L. Watson  
Provost and Executive Vice President  
for Academic Affairs  
Co-Chair, Council for the Built Environment

B. J. Crain  
Vice President for Finance and  
Administration  
Co-Chair, Council for the Built Environment

Mark A. Hussey  
Interim President

Concur or not concur with CBE’s recommendation:

cc: Dennis Christiansen, Agency Director  
Sub-Council Chairs, Council for the Built Environment
March 20, 2014

MEMORANDUM

TO: Dr. Karan Watson
Provost & Executive Vice President for Academic Affairs

Ms. B. J. Crain
Vice President for Finance and Administration and Chief Financial Officer

Co-Chairs
Council on the Built Environment
Texas A&M University

Subject: Texas A&M Transportation Institute CBE Request
Traversability Proving Ground Facility at Riverside Campus

The Texas A&M Transportation Institute (TTI) has been awarded funding by the National Cooperative Highway Research Program, and the Department of State to construct a Traversability Proving Ground Facility at Riverside Campus for testing purposes. In coordination with Riverside Campus users and Texas A&M's Office of Facilities Coordination, TTI has selected an area between 35R Section 2 and Apron 2 for this project. Construction of this facility will provide for current and future research as well as instructional opportunities. The attached document details the project and construction plans.

TTI is requesting CBE approval of the site to construct the Proving Ground Facility. Upon approval by the Council, construction needs to begin in May in order for pilot testing to start in July of this year.

Your support of this project and TTI's ongoing research is greatly appreciated. We look forward to visiting with you. For additional information on this project, please contact Duane Wagner, with TTI Facilities Safety and Support Services, at 979-845-6595, or dwagner@tamu.edu, or Mr. Nauman Sheikh, P.E. Project Lead, Associate Research Engineer, at 979-845-8955 or nauman@tamu.edu.

Yours very truly,

Holly Crenshaw
Director
Facilities, Safety and Support Services

Don Bugh
Executive Associate Agency Director

Dennis Christiansen
Agency Director

Office of the Director
Land Use Request Submitted to the Council on the Built Environment

Justification

Researchers from Texas A&M Transportation Institute (TTI) are currently working on two research projects that need evaluation of vehicle performance on sloped terrains through full-scale crash testing. These are National Cooperative Highway Research Program (NCHRP) and Department of State (DOS) sponsored projects 479340 and 478263-00001, respectively.

TTI Project 479340 (NCHRP Project 17-55) is a 2.5-year project with $500,000 total funding. It has the objective of updating existing national guidelines for roadside slope traversability through an extensive program of computer simulations and full-scale crash testing. TTI Project 478263-00001 (for DOS) is a 1-year project with $250,000 of total funding. It has the objectives of determining whether certain slopped terrains can be traversed or “climbed” by different vehicle types.

TTI seeks approval to use Plot 3, situated between Apron 2 and Runway 35R - Section 2 of the Riverside Campus, for construction of the TTI Traversability Proving Ground. The addition of this facility will add value of more than $200,000 of infrastructure to the Riverside Campus.

Project Description

The objective of this project is to evaluate and test traversability of vehicles on sloped roadside terrains. Under TTI Project 479340 (NCHRP Project 17-55), the researchers will be updating the existing roadway design guidelines that dictate allowable roadside slopes through an extensive program of computer simulations and full-scale crash testing. The tests will involve driving vehicles on sloped terrains at various speeds and angles to simulate errant motorists leaving a roadway. Once the vehicle enters the sloped terrain, various driver inputs will be applied remotely, simulating a driver’s response to having left the road. Under these roadway departure conditions and driver inputs, the response of the vehicle (for example: rollover, spinout, side slip, etc.) will be determined for further use in the project to develop the roadside traversability guidelines.

A detailed description of this proposed facility is presented in Appendix A, titled “Construction Plan.” The construction and testing aspect of the DOS project is currently under review, thus the main focus of the construction plan presented here is for the NCHRP Project 17-55. Information for the DOS project is included in Appendix A1.

Construction and Test Area

The requested construction area for this facility is Plot 3, situated between Apron 2 and Runway 35R - Section 2 of the Riverside Campus. (Figure 1) This area is currently listed under the inventory of the Ecosystem Science and Management Department. Mr. Andy Crane manages
this area for the group, and has provided written approval for TTI’s ongoing use of this area. (Appendix A2)

![Figure 1. Plot 3 at Riverside Campus](image)

**Site Remediation**

Upon completion of the project, the test area with the sloped terrain will be maintained until TTI determines that future research using the facility is no longer viable. At that time, TTI will consult with TAMU Facilities Coordination to discuss returning the area to its native conditions, or other more suitable use of the area.

**Project Time Frame**

Upon approval by the council, construction needs to begin in May and the first series of tests are scheduled to be started in July and completed by August, 2014.
Appendix A

Construction Plan
TTI Traversability Proving Ground
Description

The researchers will perform several full-scale vehicle traversability tests under NCHRP Project 17-55. These tests will involve driving vehicles on sloped terrains at various speeds and angles to simulate errant motorists leaving a roadway and getting on a slopped roadside. Once the vehicle enters the slopped terrain, various driver inputs will be applied remotely, simulating a driver’s response to having left the road. Under these roadway departure conditions and driver inputs, the response of the vehicle (for example: rollover, spinout, side slip, etc.) will be determined for further use in the project to develop the roadside traversability guidelines.

The researchers intend to use a portion of land shown in Figure A-1 for construction of the sloped terrain. This area is Plot 3, situated between Apron 2 and Runway 35R - Section 2 of the Riverside Campus. Figure A-2 illustrates the proposed construction site layout.

Figure A-1. Site location (in red)
Shaded green area will be reserved for test vehicle approach, only for the duration of the test. No construction will occur in this area.

Figure A-2. Proposed Construction Site Layout
Details of Construction Plan

A total length of 600 ft will be needed to completely evaluate the response of the vehicle on the sloped terrain. Cross-section of the sloped terrain that will be used for this project is shown in Figure A-3.

![Figure A-3. Proposed Preliminary Design of Sloped Terrain Geometry](image)

TTI researchers anticipate maintaining the facility until the current research project remains active, or the Traversability Proving Ground remains a viable facility to the Agency for future research. At that time, TTI will consult with TAMU Facilities Coordination to discuss returning the area to its native conditions, or other suitable use of the area. The project will commence immediately upon land usage approval and the first series of tests is scheduled to be completed by August 2014.

The construction of the sloped terrain facility at the new Traversability Proving Grounds will add a value of greater than $100,000 to the Riverside testing facility.

**Tentative Date(s)**

*Phase I*

Construction: Commence immediately pending land usage approval (May 2014)

*Phase II*

Testing: July 2014 through August 2014

*Phase III*

Testing: TBD as of result of Phase I and Phase II

**Location(s) to be Reserved**

See Figures A-1 and A-2.
Testing Equipment

- 1 TTI instrumented vehicle (Dodge Ram pickup truck) which will be radio controlled by TTI personnel at the required testing speed proposed in the Manual for Assessing Safety Hardware (MASH).

- 1 TTI instrumented vehicle (Kia Rio passenger car) which will be radio controlled by TTI personnel at the required testing speed proposed in the Manual for Assessing Safety Hardware (MASH).

Precautions

- The researchers will use standard TTI test protocols as defined in the Risk Management and Safety Program for Riverside Research Activities.
Appendix A1:

Construction Plan
TTI Traversability Hill
Description

The researchers intend to build an octagonal pyramid shaped hill made of 9,000 cubic yards of soil. Subsequently, the researchers will test its multiple slopes for traversability with a 4x4 GMC Yukon Denali. The proposed hill will feature different degrees of slope at different sides and will include multiple approach surfaces. Engineering analysis and preliminary testing results using a tilt table will determine the terrain slopes and approach surfaces to be considered for testing. As part of the DOS 478263-00001 study, the researchers will be evaluating the effect of a vehicle's initial velocity on its ability to traverse a sloped terrain. A live vehicle operator will be employed for quasi-static testing, which is when the testing speed will be maintained at less than 10 mph. To replicate a real life scenario with the attack vehicle having initial attack velocity (greater than 10 mph), radio controlled guidance, braking, and acceleration will be employed. This methodology has been used for several TTI vehicle full-scale crash tests. Results deriving from testing within this project will help define a standard to determine whether a sloped terrain can be traversable given its slope, height, friction, and initial speed of an attacking vehicle.

The researchers intend to use the same portion of land as used for the ditch traversal study under NCHRP Project 17-55 (i.e. Plot 3, situated between Apron 2 and Runway 35R - Section 2 of the Riverside Campus).

Details of Construction Plan

The researchers plan to build a 110 ft x 190 ft x 35 ft octagonal pyramid shaped hill made with 9,000 cubic yards of dirt, featuring different degrees of slope on different sides. Preliminary design of the hill geometry is reported in Figure A1-1. Native soil excavated from the construction of the ditch under NCHRP Project 17-55 will be utilized for the construct of the hill.

The construction of the sloped hill at the new Traversability Proving Grounds will add a total of $100,000 value to the Riverside testing facility, and a permanent facility made of native material procured directly from Riverside Campus.
Figure A1-1. Proposed Preliminary Design of Hill Geometry

Location(s) to be Reserved

Plot 3, situated between Apron 2 and Runway 35R - Section 2 of the Riverside Campus.

Testing Equipment

- 1 TTI instrumented vehicle (4x4 GMC Yukon Denali) which will be driven by TTI personnel when speeds lower than 10 mph are required for testing on the hill. When vehicle speed will be required for testing on the hill to be higher than 10 mph, radio controlled system will be used.

Precautions

- If the testing speed required for testing on the hill will be lower than 10 mph, TTI personnel will be employed to live drive the test vehicle on predefined slope and approach surfaces of the hill.
- If the testing speed required for testing on the hill will be higher than 10 mph, a radio controlled system will be employed to remotely drive the test vehicle on predefined slope and approach surfaces of the hill.
- The researchers will use standard TTI test protocols as defined in the Risk Management and Safety Program for Riverside Research Activities.
Appendix A2

TTI Traversability Proving Ground Facility Usage Approval
Duane,

There is no problem with locating the proposed ditch and hill on the two blocks.

Thanks,

Andy Crane

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From: Wagner, Duane [mailto:D-Wagner@TTIMAIL.TAMU.EDU]
Sent: Thursday, February 20, 2014 11:41 AM
To: 'r-crane@tamu.edu'
Subject: TTI Traversibility Project

Andy,

Per our phone conversation, attached is a document referencing the location of the proposed ditch and hill.

Please let me know if this area is one that your group uses. I will be happy to provide additional information and meet with you to discuss the proposed usage.

Thanks,

Duane

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Duane Wagner
Facilities Manager
Facilities, Safety and Support Services

Texas A&M Transportation Institute
State Headquarters and Research Building Room 147
The Texas A&M University System
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College Station, Texas 77843-3135
Tel 979.862.7917/Fax 979.862.1398

TTI | Saving Lives, Time & Resources
MEMORANDUM

To: Dr. Karan Watson  
Chair, Council for the Built Environment  

Ms. B.J. Crain  
Chair, Council for the Built Environment  

Subject: Proposed Land Use: TTI Traversability Proving Ground Facility

RECOMMENDATION

The Council for the Built Environment's (CBE) Facilities Utilization Review sub-committee (FURsc) recommends that the CBE support the request by the Texas A&M Transportation Institute (TTI) to construct the Traversability Proving Ground Facility at the Riverside Campus which will provide a unique site at which vehicle performance can be evaluated on sloped terrains through full-scale crash testing. The FURsc believes the land use for the proposed Traversability Proving Ground Facility is justifiable and is consistent with the recently approved Riverside Campus Master plan. It is recommended that the CBE support the project as proposed. It is further recommended that, as with other similar uses that TTI maintain the facility until the current research project remains active or the Traversability Proving Ground remains a viable facility to the Agency for future research. At which time the facility is no longer viable or active, TTI will consult with TAMU Facilities Coordination to discuss returning the area to its current condition. This has been discussed and TTI agrees to this term. It is expected that the operation of this facility will be subject to the runway scheduling procedures overseen by the Office of Facilities Coordination.

SCOPE

The FURsc met this morning to consider the request by the TTI to construct the subject proving ground at the Riverside Campus, as shown on the attached plat, on Plot 3, between Apron 2 and Runway 35R-section 2. The site will consist of two research support 'structures': the first is a downward sloped area adjacent to the existing concrete apron, measuring approximately 600 ft in length, 17 ft deep and the second a hill structure, constructed from the soil dug from the first facility, constructed to be approximately 110 ft wide, 190 ft long and 35 ft high.

When complete the site will support the evaluation and testing of the traversability of vehicles on sloped roadside terrains. As outlined in the attached submittal, the plan is for the test vehicles to be driven on the sloped terrains at various speeds and angles to simulate errant motorist leaving a roadway. Under these roadway departure conditions and driver inputs, the response of the vehicle (i.e. rollover, spinout, side slip, etc) will be determined for further use in the project to develop the roadside traversability guidelines.
The site proposed for this test is currently assigned to the Department of Ecosystems Science and Management, which has provided written approval for TTI's ongoing use of the area. TEEX is another of the adjacent users which all have been apprised of the project and are supportive of the proposal. Funding for the construction and maintenance of the site will be provided by the National Cooperative Highway Research Program and the United States Department of State. The construction costs have been estimated to be approximately $500,000. The project will commence immediately upon land usage approval, with the first series of tests anticipated to start in mid to late 2014.

We are pleased to offer this recommendation and welcome further inquiries related to this analysis.

Sincerely,

[Signature]

James Massey
Chairman, CBE-Facilities Utilization Review sub-council

Attachments
CC: CBE-FURse members
MEMORANDUM

TO: Dr. Karan Watson
   Co-chair, Council on the Built Environment

   Ms. B. J. Crain
   Co-chair, Council on the Built Environment

FROM: Tom Reber
   Chair, CBE Technical Review Sub-council

DATE: April 28, 2014

SUBJECT: CBE TRsc Recommendation: Traversability Proving Ground

On April 21, 2014, Mr. Duane Wagner, Facilities Manager with TTI, presented to the CBE's Technical Review Sub-council on the proposed construction of a Traversability Proving Ground facility at Riverside Campus.

The facility would be constructed in an area between 35R Section 2 and Apron 2. This facility would provide for current and future research, as well as instructional opportunities.

Recommendation
The Technical Review Sub-council supports the proposed construction and recommends approval, provided the following issues/concerns are addressed and funded.

Telecommunications:
Telecommunications does not foresee any infrastructure or service-related challenges and thus, fully supports, the aforementioned projects as presented. Prior to any digging, utility locates should be requested as per university protocol.

Facilities Services:
The project team should coordinate with Grounds Management for landscaping and irrigation concerns.
Environmental Health & Safety:
Depending upon the size (area) of the construction site, environmental permitting may be required. Early coordination with TAMU EHS (Mr. Jeff Truss, Manager for Environmental and Hazardous Waste Management) is important to ensure that environmental permitting requirements do not unnecessarily delay the project.

Utility & Energy Services:
TAMU UES personnel have reviewed the proposed location and have not identified any utility conflicts.

The project and design team will need to follow the TAMU policy on digging on campus — prior to any excavation - https://utilities.tamu.edu/digging-campus/

TAMU UES looks forward to working closely with the project and design team to ensure that all campus requirements are met and that the project is successful.

No other concerns were expressed.

Xc: CBE Technical Review Sub-council, CBE Support Staff