

### **Exhibit: Narrative Description of Testing**

The application is being filed by Arizona State University, a public university.

This application is to support a research project which is developing new seismometers and supporting data acquisition equipment for terrestrial and planetary deployment. Testing of the seismometers takes place on a concrete pier in the basement of Arizona State University's Physical Sciences Building F-wing, room PSF-070. This will be the location of the re-radiating antenna approximately 10 feet below ground level; see attached drawing of the affected area of the Arizona State University Tempe campus. The receiving antenna will be located on the first-floor roof over the main entrance to the building.

The re-radiated GPS signals will provide accurate timing signals for comparison testing of sensor and data acquisition equipment. The re-radiator is needed because structural attenuation prevents GPS reception in the basement seismometer testing facility.

### **Exhibit: 8.3.28 Use of Fixed Devices That Re-Radiate Signals Received From the Global Positioning System**

Except as otherwise authorized under Section 7.14, federal agencies and departments may, under the following conditions, operate fixed devices that re-radiate signals received from the Global Positioning System (GPS).

a. Individual authorization is for indoor use only, and is required for each device at a specific site.

Reply: The device will be indoors in a basement, at only one specific site.

b. Applications for frequency assignment should be applied for as an XT station class with a note indicating the device is to be used as an "Experimental RNSS Test Equipment for the purpose of testing GPS receivers" and describing how the device will be used.

Reply: Not applicable.

c. Approved applications for frequency assignment will be entered in the GMF.

Reply: Not applicable.

d. The maximum length of the assignment will be two years, with possible renewal.

Reply: The application will be modified to reflect a 2 year period.

e. The area of potential interference to GPS reception (e.g., military or contractor facility) has to be under the control of the user.

Reply: The area of potential interference will be limited to a small section of the Arizona State University campus. Signs will be posted notifying users in the area of potential interference.

f. The maximum equivalent isotropically radiated power (EIRP) must be such that the calculated emissions are no greater than -140 dBm/24 MHz as received by an isotropic antenna at a distance of 100 feet (30 meters) from the building where the test is being conducted. The calculations showing compliance with this requirement must be provided with the application for frequency assignment and should be based on free space propagation with no allowance for additional attenuation (e.g., building attenuation.)

Reply: The calculations for our proposed location are provided by the equipment manufacturer in the attached spreadsheet. Repeated signal power will be no greater than -140.53 dBm at 100 feet. The attached drawing shows the proposed antenna location and 100 ft radius.

g. GPS users in the area of potential interference to GPS reception must be notified that GPS information may be impacted for periods of time.

Reply: Signs will be posted notifying users in the area of potential interference with GPS services.

h. The use is limited to activity for the purpose of testing RNSS equipment/systems.

Reply: Yes.

i. A "Stop Buzzer" point of contact for the authorized device must be identified and available at all times during GPS re-radiator operations.

The "Stop Buzzer" point of contact will be John D. West, 928-978-1825, john.d.west@asu.edu.



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Exhibit: Link Budget Calculations for this application  
 Calculated by GPS Networking, Inc.  
 (provider of the re-radiating equipment)

Change the values in the yellow boxes to calculate required readings  
 -140 or less at a range of 100 feet to meet NTIA regulations

Receive Ant Gain	Ant Cable Insertion Loss	Repeater Amp Gain	Repeater Ant Gain Best Case	Range in Feet
38	-8	24	3	118
GPS Carrier Frequency MHz		Total System Gain		Range in Miles
1575		57		0.02
Avg Receive Power L1 dBm North America				Range in Meters
-130				36.78
Free Space loss with Isotropic Antennas				Range in Kilometers
-67.53				0.04



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**Repeated Signal Power @ Range In dBm**

-140.53

Total Signal Power @ Range in Watts

8.8E-18

Radiated Power dBm

-73

Transmitted Power (W)

25.1E-12

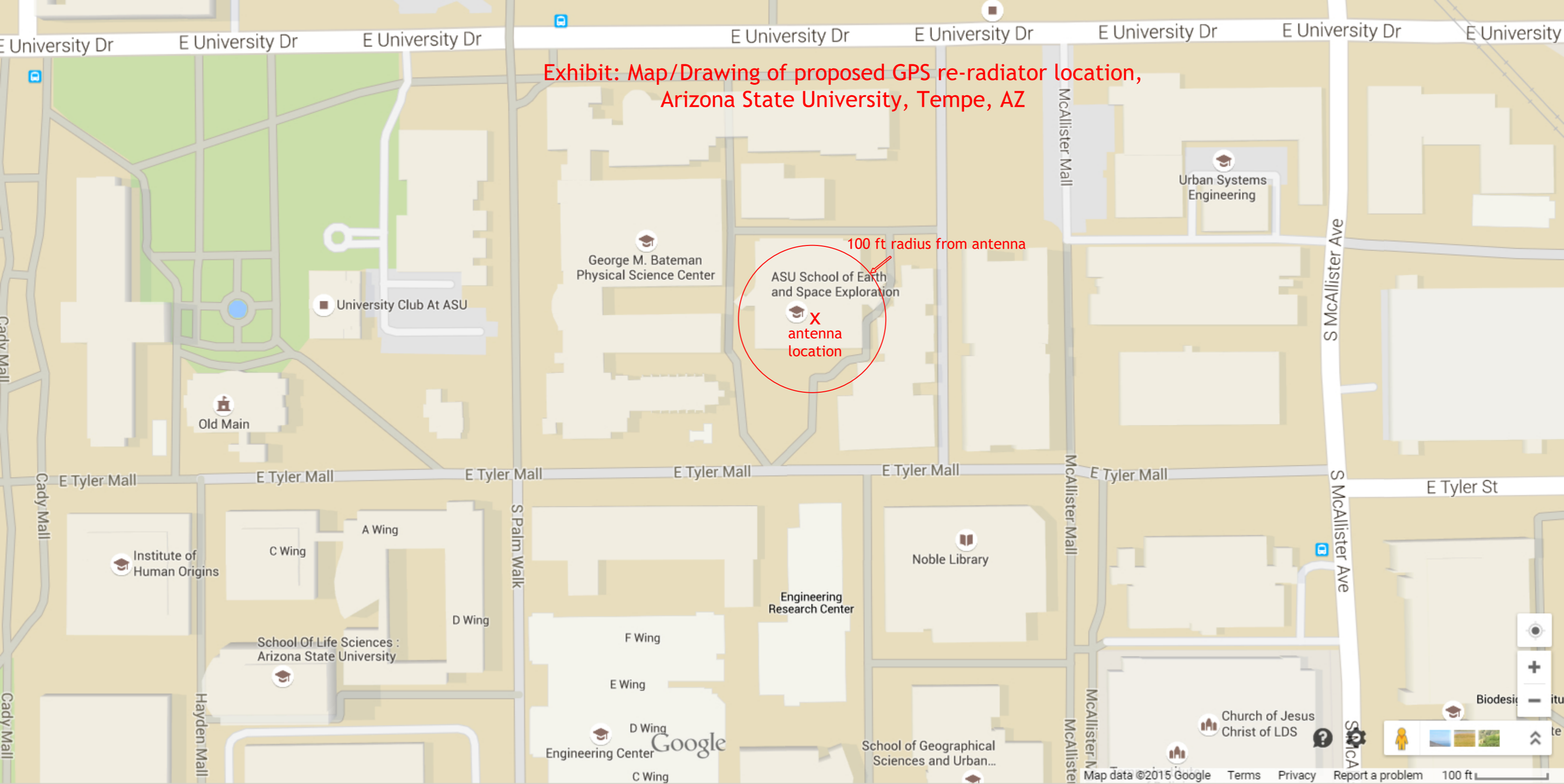
Effective Radiated Power (W)

50.1E-12

Effective Radiated Power (dBW)

-103

Exhibit: Map/Drawing of proposed GPS re-radiator location,  
Arizona State University, Tempe, AZ



100 ft radius from antenna

ASU School of Earth  
and Space Exploration  
X  
antenna  
location