

Environmental Assessment

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It has been determined by the applicant that an EA is necessary because of the guidelines in Title 47 of the CFR, §1.1307, Table 1. Specifically, the application is for an experimental radio service with an ERP greater than 100W. There are no other criteria which require the submission of an environmental assessment.

A description of the Cosmic Ray Center (CRC) in which the transmitter will be located is found in the Project Description, see *prodes.pdf*. Across a dirt road and directly west of the CRC is an empty, unused field with dimensions of 105x88 meters. This field is the proposed site of the new antenna structure, see exhibit *CRC_and_field2.pdf*, which has the benefit of being removed from the population center and still close to available facilities. In particular, the new antenna will be very close to the CRC, where we can install the new transmitting equipment. Hosting the transmitter at the CRC will prevent the construction of a new facilities building and an extension of the power grid to the field. An approximately 60 meter trench will be dug from the CRC to the field, where only the antenna structure and protective fencing will be built. The field will be leased from a local real estate company for a period of at least three years. It is bordered on three sides by paved roads, and by a dirt road on the remaining side. It has been unused for at least 6 years.

The site is zoned as HC (Highway Commercial). Please view the exhibit *zoning.pdf* for a map showing the zoning, location and pointing direction of the antenna in the context of city limits. Surrounding structures and land use includes small farms, some commercial buildings, grain silos and a farming supplies dealer. Local and federal authorities have been generous in granting land for the use of surface detector construction, repair, and storage and the 800 km² covered by the 1.2 km grid of active surface detectors in the desert west of Delta (see *TA_aerial.pdf*) to our sister collaboration Telescope Array. Additional BLM lands are used for three fenced in compounds covering several thousand square meters each. Local land use authorities have been equally generous in granting the research group permission to build the proposed antenna structure, see exhibit *structure_city_approval.pdf*.

The antenna structure was designed by Mike Staal of M2 Antenna Systems, Inc., according to design goals specified by the research group. It will be supported by a single 60 ft self-supported mast. For reasons dictated by the nature of the experiment, a transmitting antenna with specific, narrow beam widths is necessary. The research group requested a 20 degree horizontal by 15 degree vertical (3 dB point) radiation pattern. A configuration of eight Yagi-Uda type antennas have been stacked both vertically and horizontally to achieve a practical 22x16 degree radiation pattern. Extensive computer simulation and Mike's 30 years of experience in the field have shown that this array will achieve design goals. The lowest and highest appurtenances extend both 24 ft below and above the mast height. A drawing of this structure, with dimensions, has been submitted as exhibit *54MARRAY_CONCEPT.pdf*. Please note that the antenna sketch has beam width information that contradicts what is defined here. The information above is correct.

The environmental impact of this site is limited to possible interference with federally listed or proposed endangered bird species. The possibility of interference is low because of the preferred habitats and behaviors of the listed birds. There is very little possibility of habitat breakup for other

animals since the proposed site is situated among small farms and commercial operations, and next to a highway. Local habitat destruction is also severely limited because the field is sparsely covered by short grasses and a few other indigenous plants, an environment in which a small footprint concrete foundation and surrounding cyclone fence won't disturb. A list of endangered or proposed endangered species by county is available at <http://www.fws.gov/utahfieldoffice/EndSpp.html>. The document referred to is titled "Species by County-20110909.pdf," which has been attached as a courtesy. Regarding the possible danger to local wildlife, especially birds, Kevin Fritz of the Denver Fish and Wildlife Services in the office of Migratory Bird Management commented that the upcoming tower installation seemed like a "small impact project."

Nathan Darnall, a habitat conservation migratory biologist from Utah Ecological Services, a local division of the Fish and Wildlife Services, was consulted about the possible impact on local bird species. The applicant was merely referred to the "Service Guide on the Siting, Construction, Operation and Decommissioning of Communication Towers," a guide for Fish and Wildlife service personnel in determining the threat of communications towers. This guide has also been attached as a courtesy, see *com_tow_guidelines.pdf*. Pursuant to and well within the guidelines, the proposed antenna structure is much less than 200 feet, does not require guy wires, and will be unlighted. No lighting is required for antenna structures less than 200 feet above the ground, see §17.21.

The theoretical RF radiation exposure on the ground near the proposed antenna has been calculated and mapped. Radiation pattern numbers come from the antenna design software used by M2, Inc. These numbers define the radiation magnitude for all points in space relative to the radiation pattern center, which has been given here as 60 ft. It is then a geometrical problem to determine the exposure on the ground for a given antenna height and tilt angle.

Results are given in units of mW/cm^2 for direct comparison with FCC's limits for MPE, §1.1310, Table 1. A 40 kW transmitter with a 10 degree elevation tilt was assumed; cable and connector injection losses were ignored. As can be seen in exhibit *exposure_10deg.pdf*, the small area on the ground where General Population/Uncontrolled MPE is met or exceeded (light blue/aqua) is only about 5 m on either side of the radiation center at the origin. The area in front and behind the antenna that exceeds Uncontrolled MPE has dimensions of about 24 m and 8 m, respectively. Occupational/Controlled MPE (red) covers even less area. Clearly, areas where MPE are exceeded are located well within field boundaries. To check the validity of the software, a second exposure plot with a tilt angle of zero degrees has been included (see *exposure_0deg.pdf*).