

SANDSTONE BLUFF CULVERT PROTECTION EL MALPAIS NATIONAL MONUMENT, NEW MEXICO, USA

CULVERTS

Product: Gabions and Gabion Mats

Problem

Established in 1987, the El Malpais National Monument is located approximately 80 miles west of Albuquerque, NM and is jointly managed by the National Park Service and the Bureau of Land Management. Volcanic features share the landscape with Pueblo ruins and petroglyphs, and complex natural ecosystems.

A 6' 6" diameter culvert beneath Sandstone Bluff Road had experienced severe erosion due to repeated storm events. The high flows had eroded a 25' deep channel. Short term control measures had been compromised and a long term solution was required.

Solution

National Park Service engineers designed a substantial gabion culvert outfall and drop structure. In addition, gabion energy dissipation blocks and a gabion check dam downstream of the outfall structure were included to reduce the flow energy before the water flow returned to the unprotected channel. Maccaferri assisted with the design using the Macra 2 design software.

1'6" thick gabions were stacked up the banks of the outfall protection to a maximum height of 24 feet and 1.5' thick Gabion Mats with 3' x 3' cells, lined the 42' wide bed of the outfall.

The exposed faces of the gabions and Gabion Mats in the culvert outfall area were reinforced with a second layer of Maccaferri mesh. This enhances the capability of the mesh to confine the rock fill, which is important under the high shear loads.

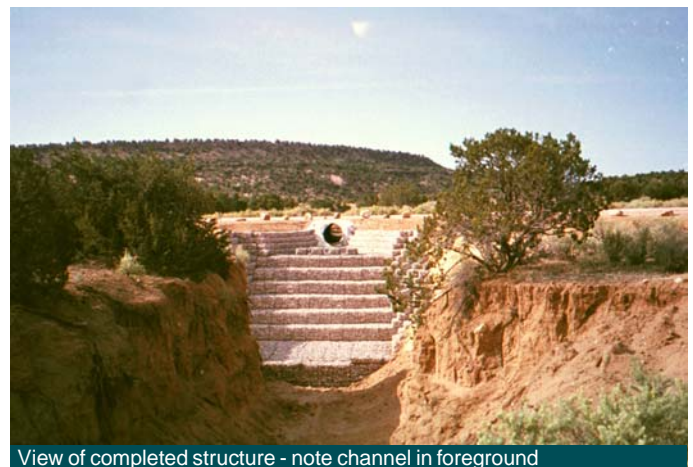
The entire installation was constructed upon MacTex MX415 geotextile. This is important to limit fine soils from washing out from beneath the structure.



The site before construction began - note erosion



View of completed culvert outfall structure



View of completed structure - note channel in foreground

Client:

US DEPARTMENT OF THE INTERIOR

General contractor:

SSS CONSTRUCTION, BERNALILLO, NM

Designer:

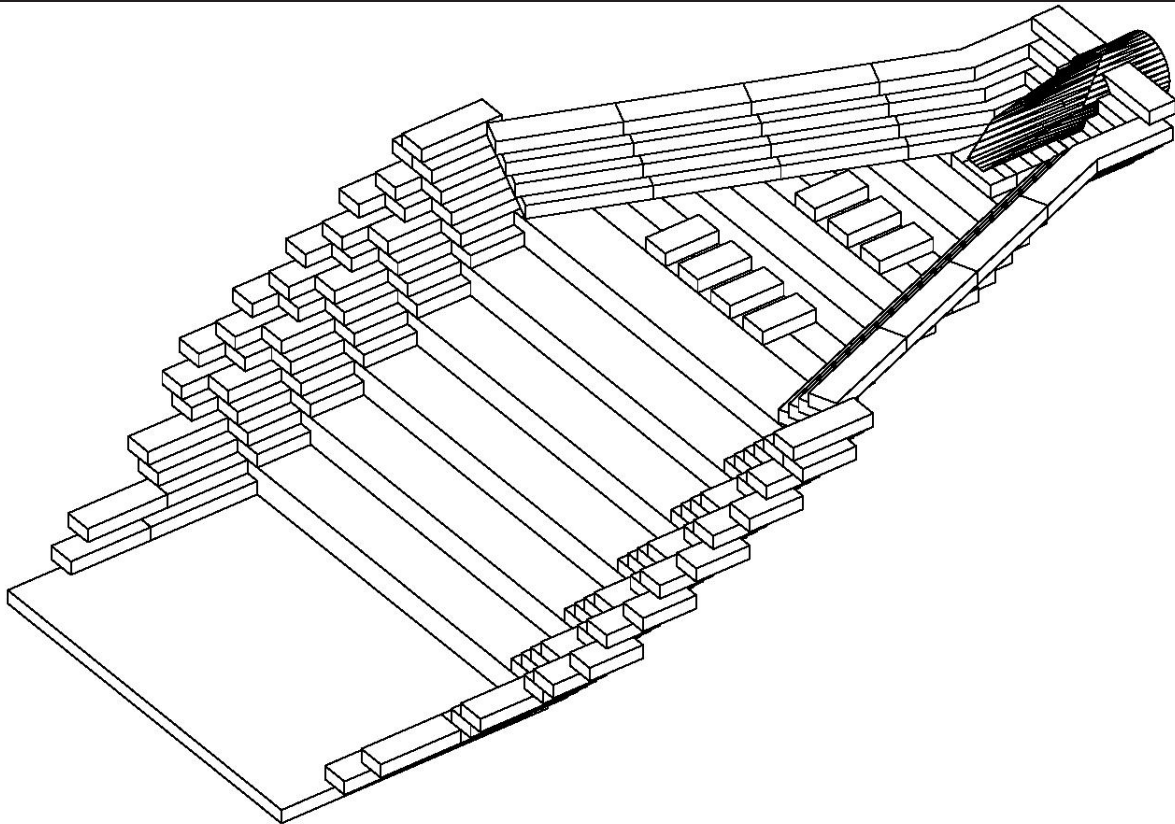
NATIONAL PARK SERVICE

Product used:

GABION, 1.5' THICK GABION MAT, MACTEX MX415

Date of building:

MARCH-JULY 2003



Isometric view of installation

A Biomac C, biodegradable erosion control blanket was installed on the exposed slopes above the culvert structure. This accelerated the re-establishment of vegetation by providing a stable medium in which vegetation can take hold. These areas were not exposed to the water flow from the culvert.

Maccaferri Inc. gabions and mattresses are manufactured strictly in accordance with ASTM A975. The double twist hexagonal mesh is very robust, and can accommodate large differential settlement without rupturing or 'unzipping'. The junction strength (or weave) between adjacent wires in the mesh is as strong as the wire itself. Stresses in the mesh can be dissipated in two dimensions throughout the mesh. This ability continues even if wires are cut or damaged.

This characteristic of the double twist hexagonal mesh is vital, particularly in critical infrastructure applications where there is the potential for differential settlement.



Gabion dissipator blocks at culvert outfall



View towards gabion check dam

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