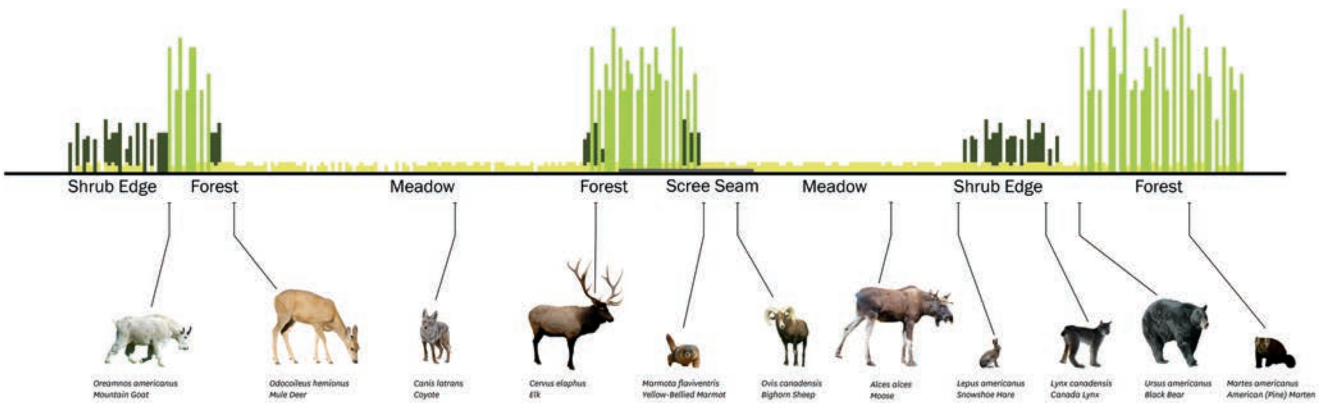


Figure 1. Cross section through typical crossing condition. Habitat bands are designed to accommodate preferences of wildlife species that are known to cross the highway at the competition site.

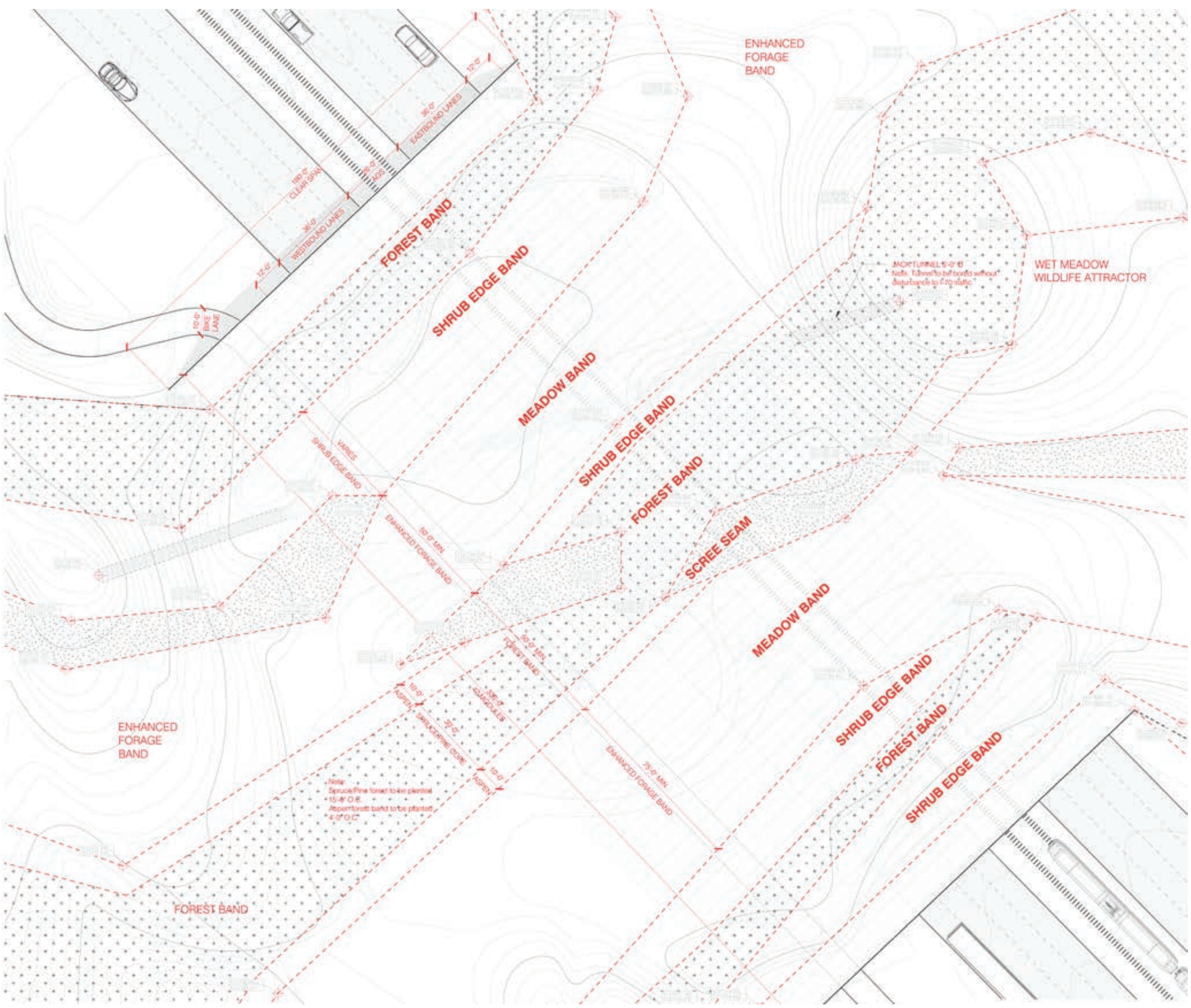


Figure 2. Plan view of a typical configuration of habitat bands.

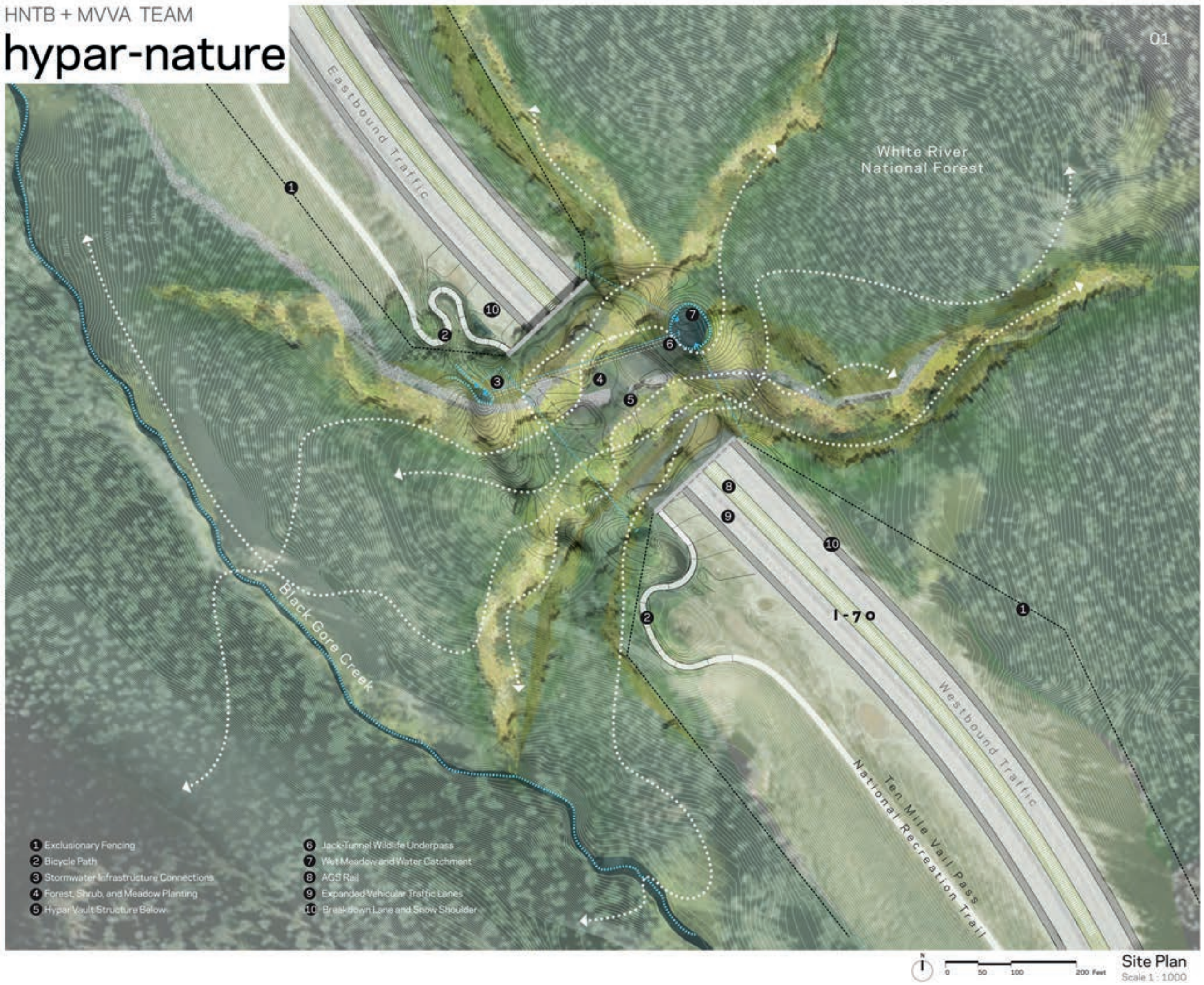


Figure 3. Aerial rendering of ARC competition proposal, identifying different types of circulation across the roadway.

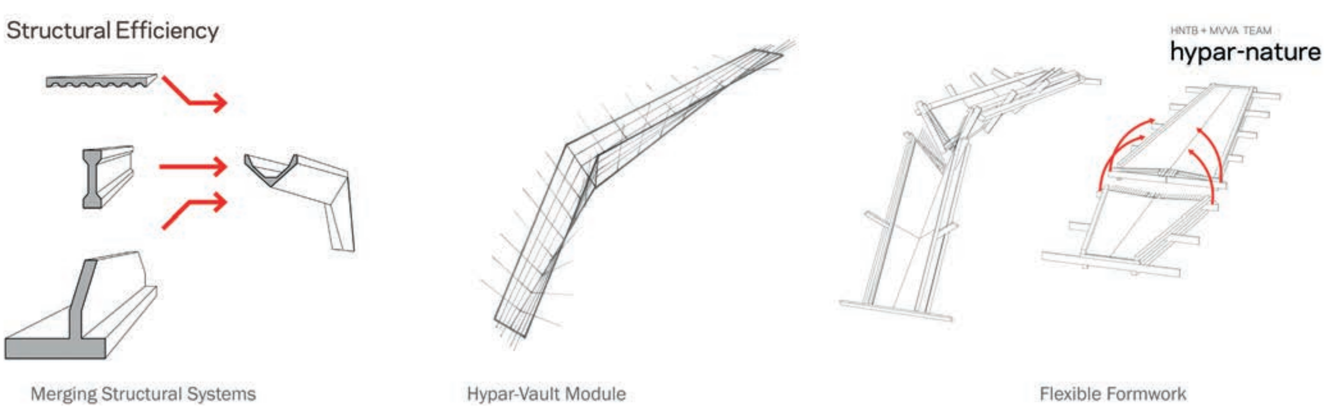


Figure 4. The curvature of the hyperbolic paraboloid form combines the tensile and compressive strength of post, beam, and decking elements. Individual hypar modules can be used in combination to create structures of varying width.

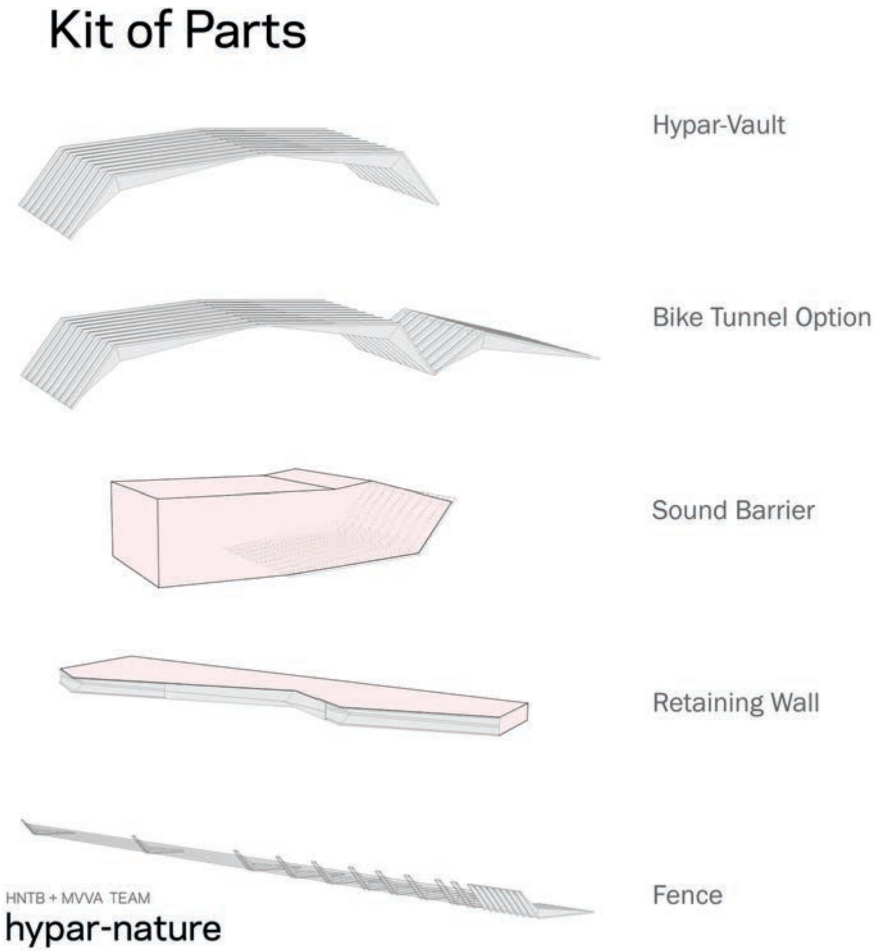


Figure 5. The competition scheme is created out of a relative simple kit of parts that could be organized in different ways to meet the specific circumstances of other locations.

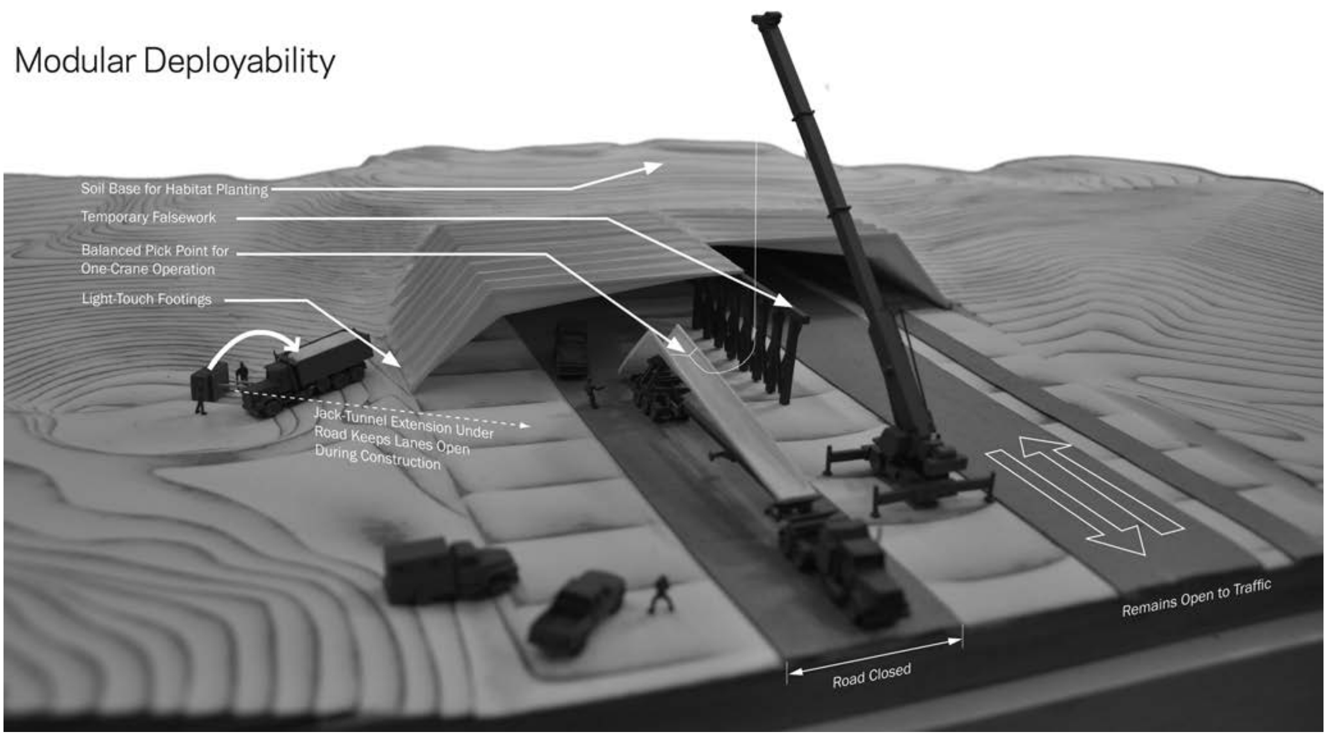


Figure 6. Precast manufacture, delivery to the site in modules, and a construction methodology that requires only one side of the roadway be closed at any given time reduces the cost and inconvenience of mobilization.

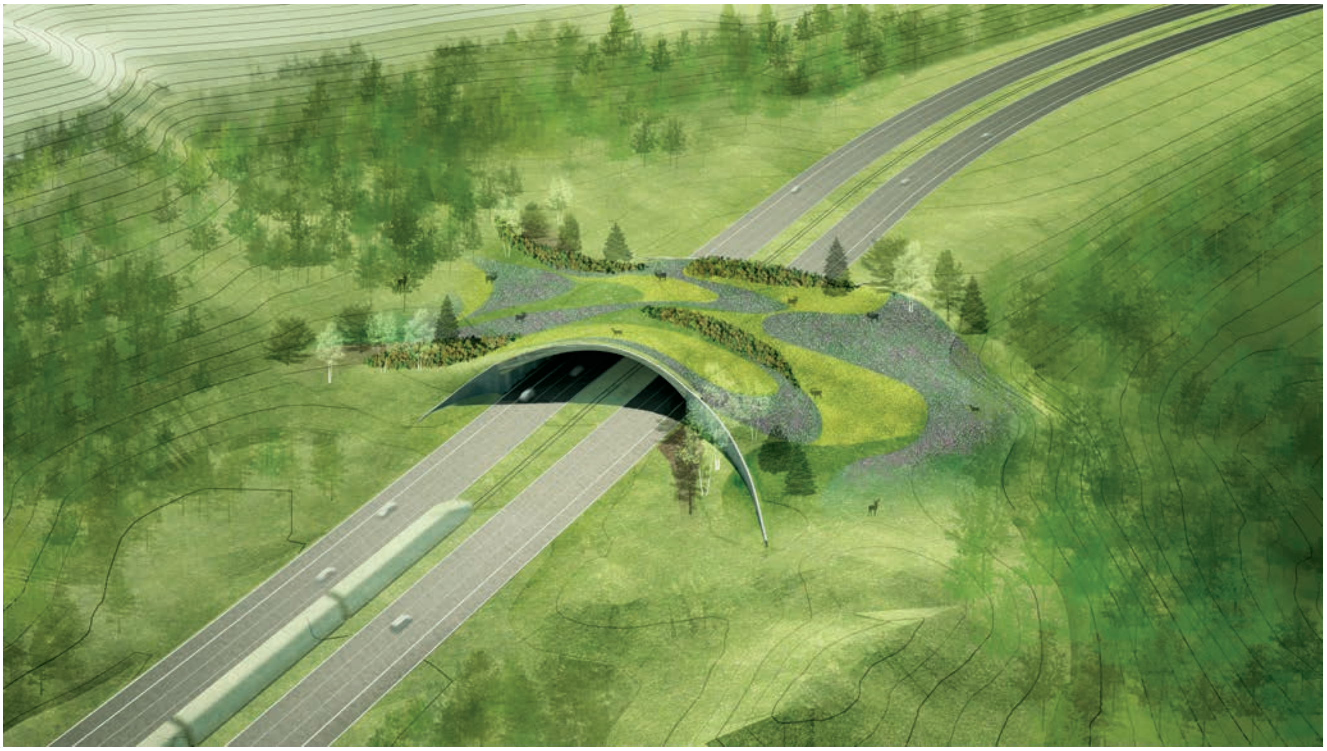
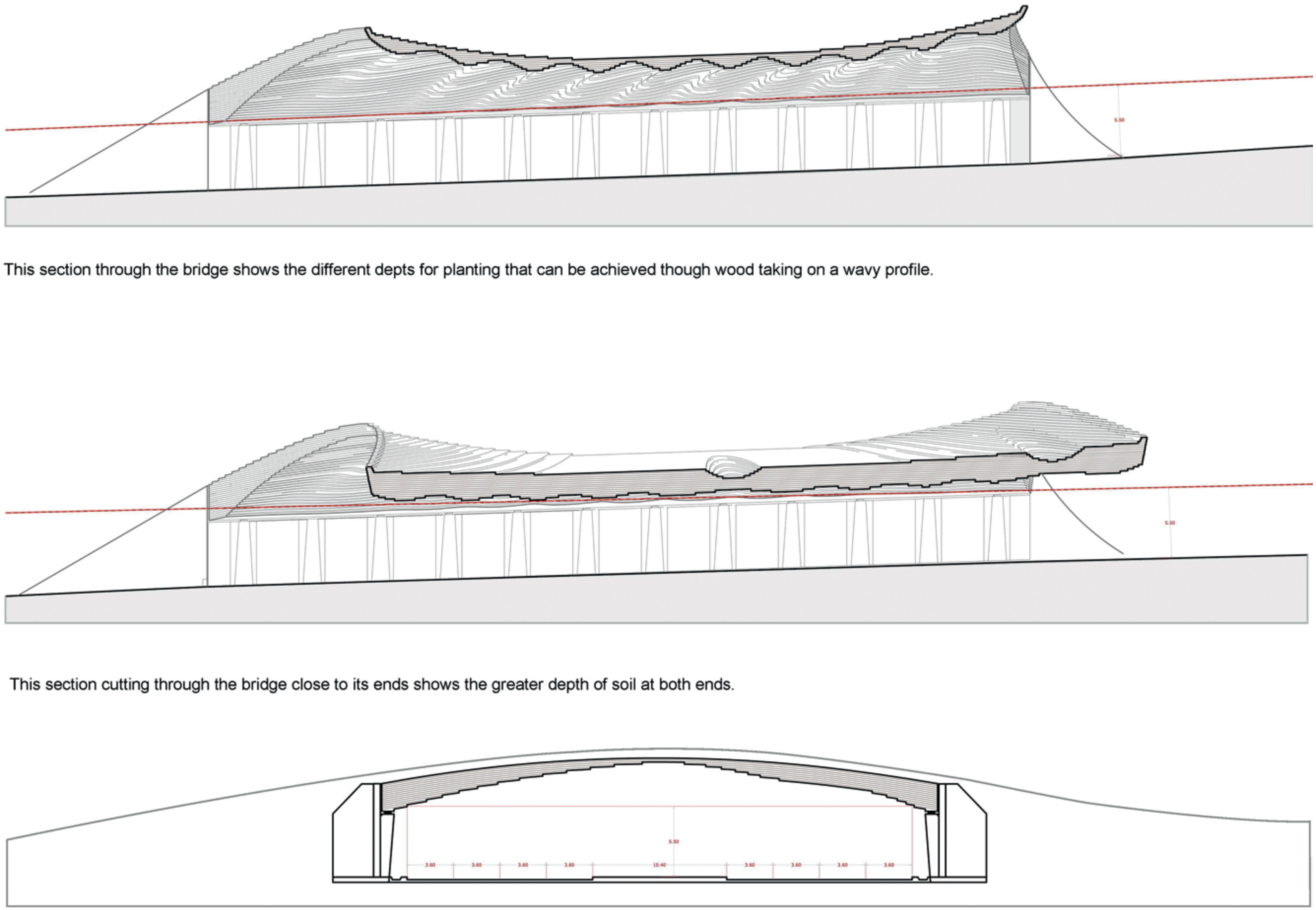


Figure 1. Aerial view of the wildlife crossing and its integration into the landscape. Our proposal extends plant communities found onsite onto the bridge and modifies their maintenance in light of the more severe bridge climate: water availability, temperature, winds, shallow soil, harsh winter climate and proximity to highway. Species have been selected for their tolerance to conditions on the bridge as well as resistance to beetles and other pests. Engelmann spruce (*Picea* engelmannii) and subalpine fir (*Abies lasiocarpa*), with the lodgepole pine (*Pinus contorta*) forests, dominate in this zone. The fairly homogeneous expanses of Engelmann spruce and subalpine forest are interrupted by stands of aspen, grasslands, meadows, or wetlands. Rich diversity and a dense cover of herbaceous and shrub species can be found in the understory of moist groves, while drier sites provide a grassy understory of thurber fescue (*Festuca thurberi*), slender wheatgrass (*Elymus trachycaulus*), and blue wild rye (*Elymus glaucus*). Our structural approach allows the surface of the bridge to undulate with the surrounding landscape and provide areas of deeper soil for trees.

Figure 2. The monolithic bridge corpus is designed as a wide continuous beam. The structural system of the continuous beam is designed with a high redundancy and robustness without any joints.



This section through the bridge shows the different depts for planting that can be achieved though wood taking on a wavy profile.

This section cutting through the bridge close to its ends shows the greater depth of soil at both ends.

This section shows the varying depth of soil from the sides to the center.

Figure 3. Sections through the bridge show the ways in which soil profile can vary in depth across the surface of the span to accommodate different kinds of plantings and to facilitate drainage.

Figure 4. The timber structure is protected by the construction design of the bridge section hydrophobizing (protecting against water). This technique provides very effective water protection and acts as a flame retardant.

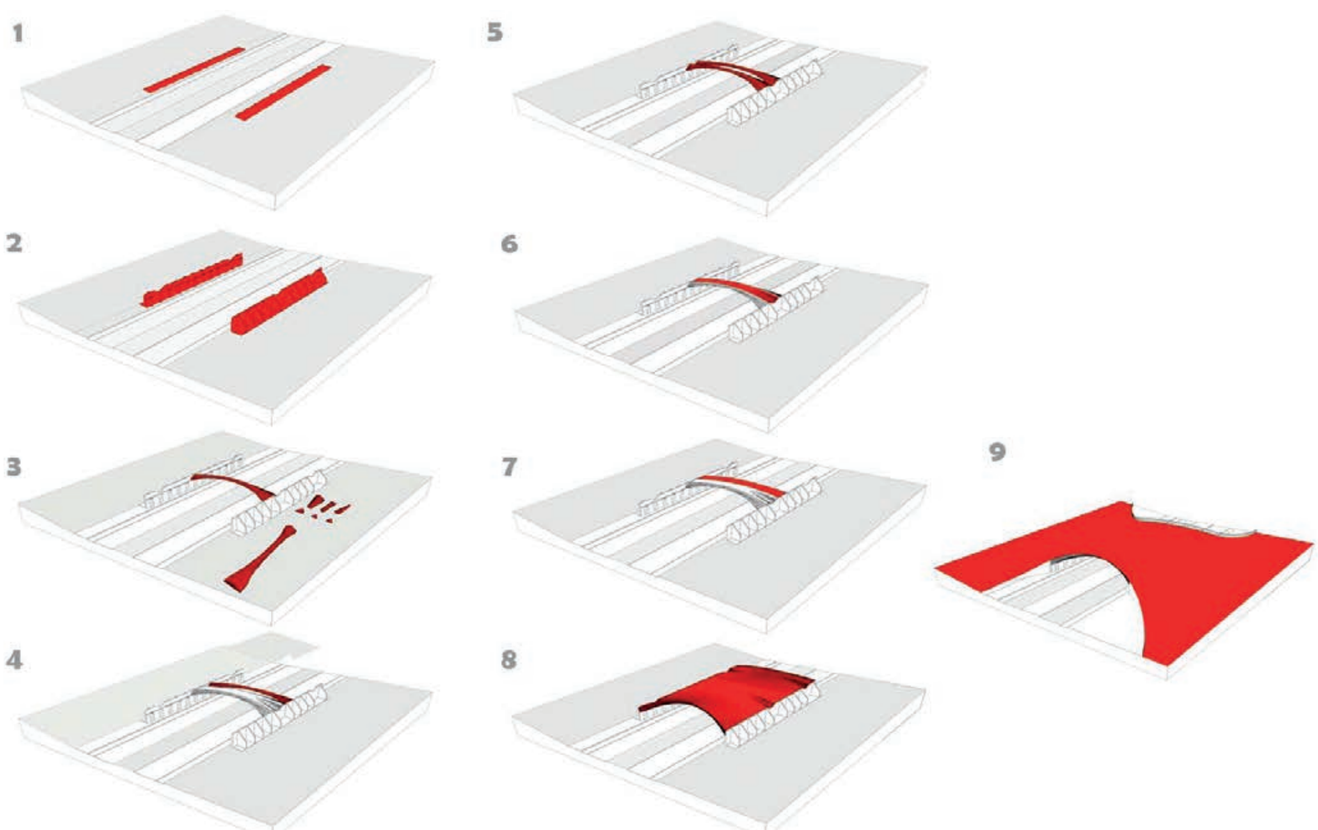
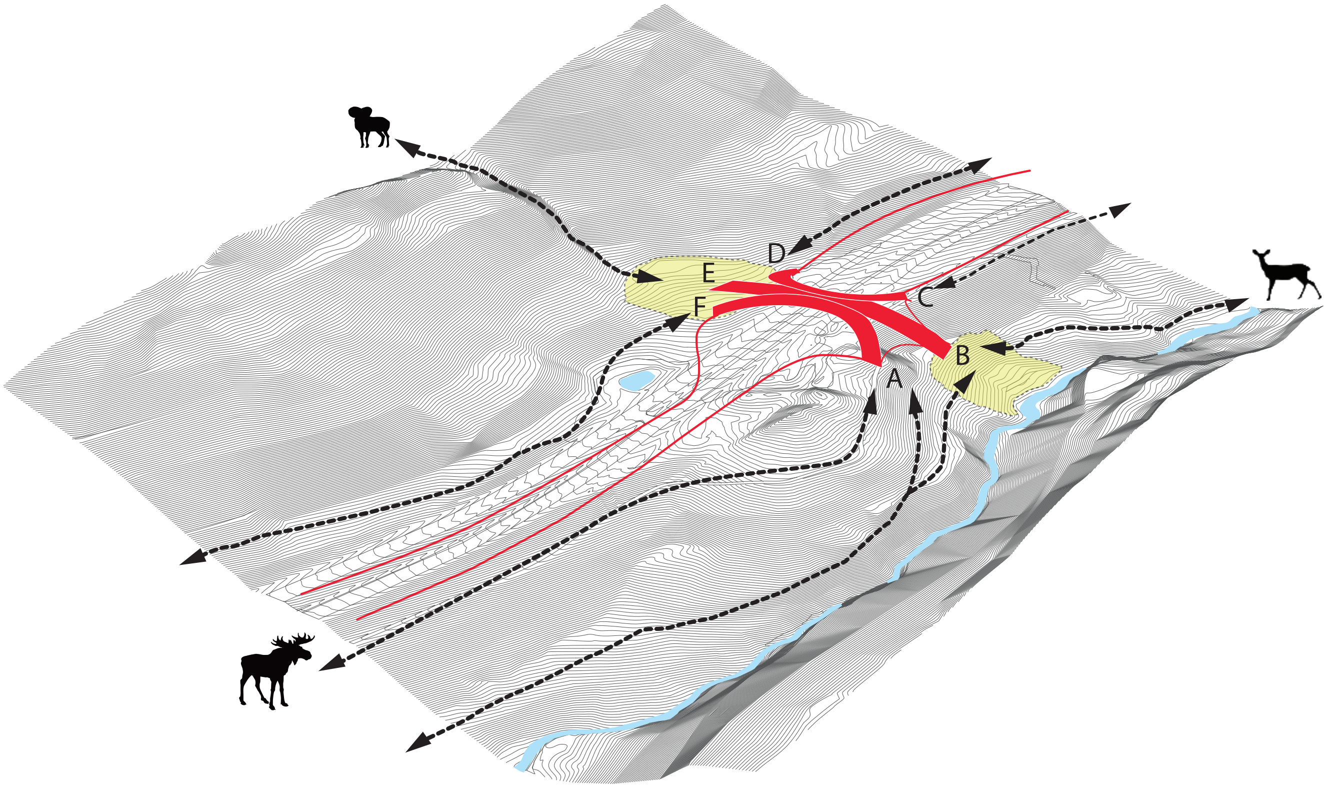


Figure 5. Construction sequence for the crossing. The steps include creation of the concrete foundation for the landings (1,2), assembling laminated wood modules on site (3), placing completed modules to create the bridge deck (4–8), and adding soil and landscaping to the surface of the span and landings (9).



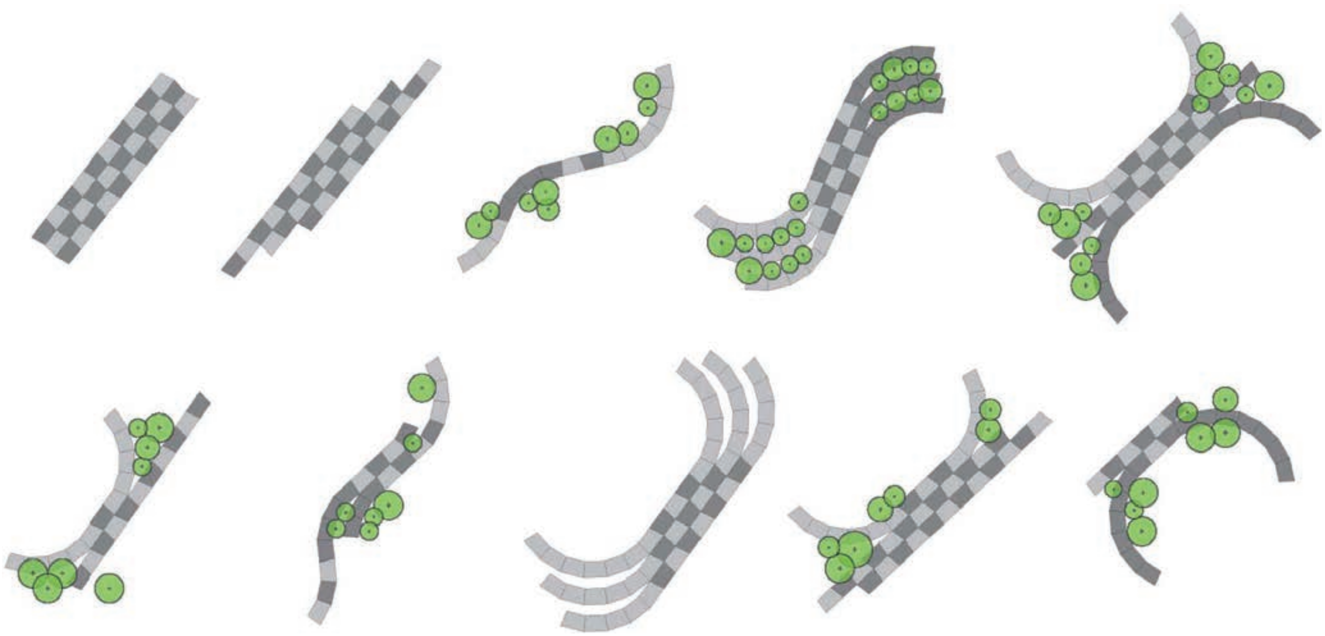
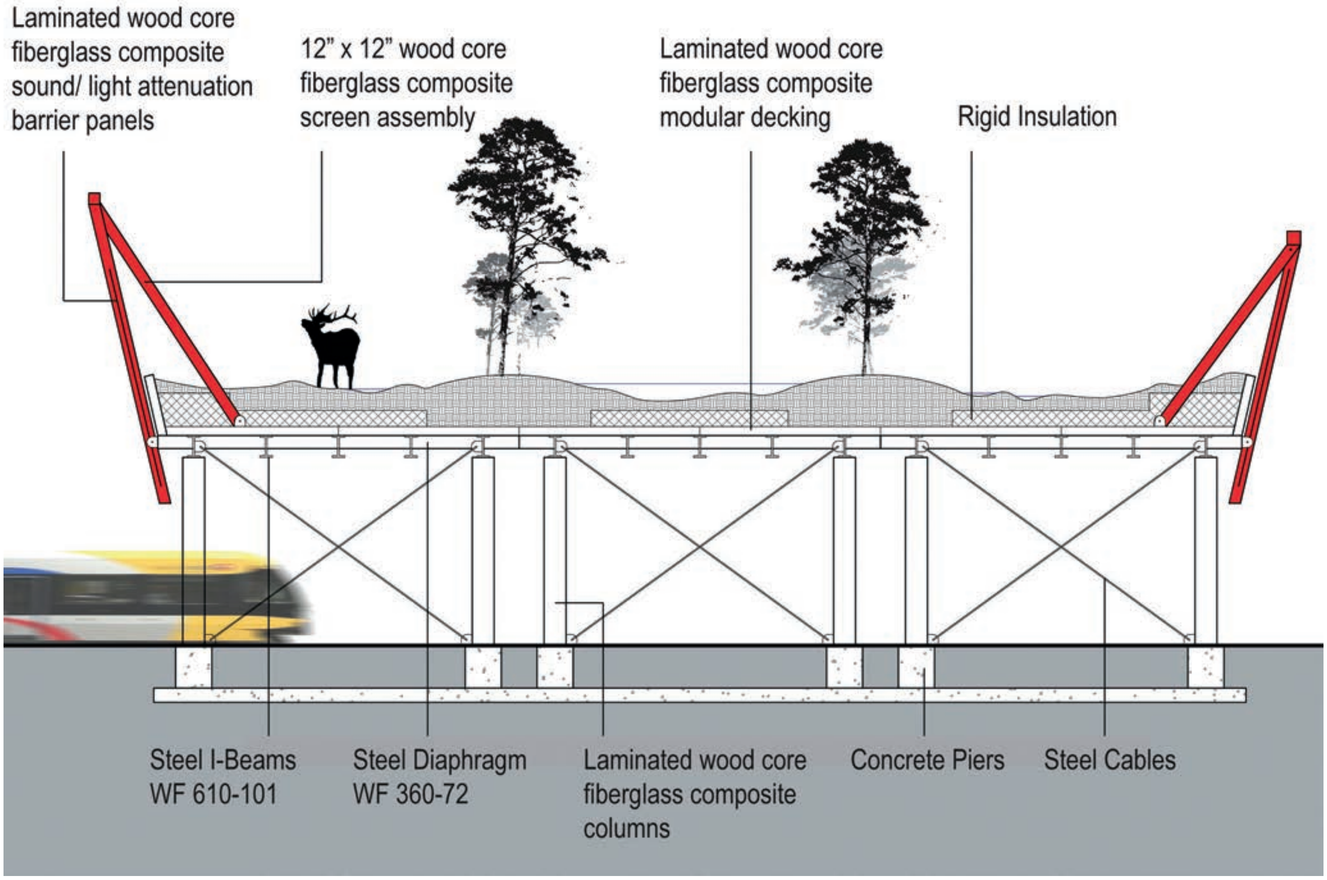


Figure 1. The identification of key movement strands and connections illustrates a necessary relationship between topography and relative ground wetness. The footprint is derived from the connections observed at the site and should most likely be different for every potential road crossing site. The rhomboid shape of our constant modular unit provides the flexibility and adaptability to any site.



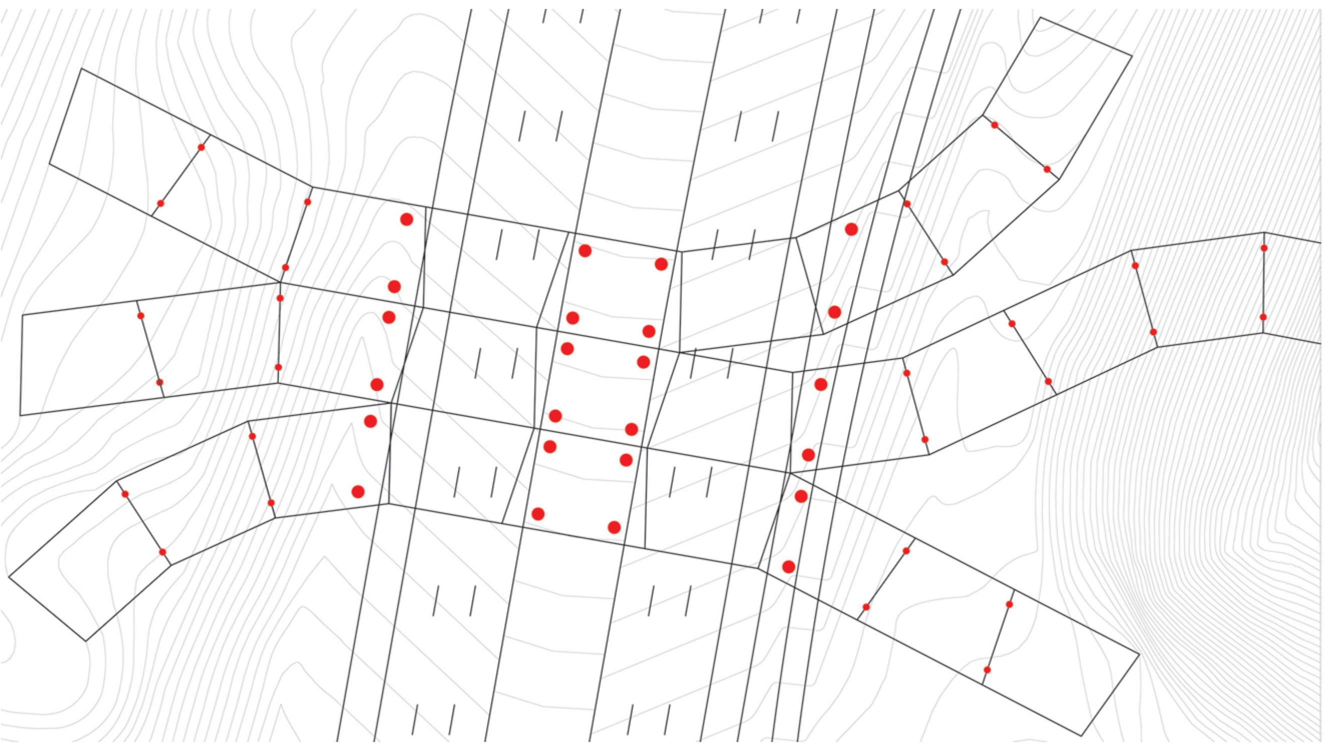
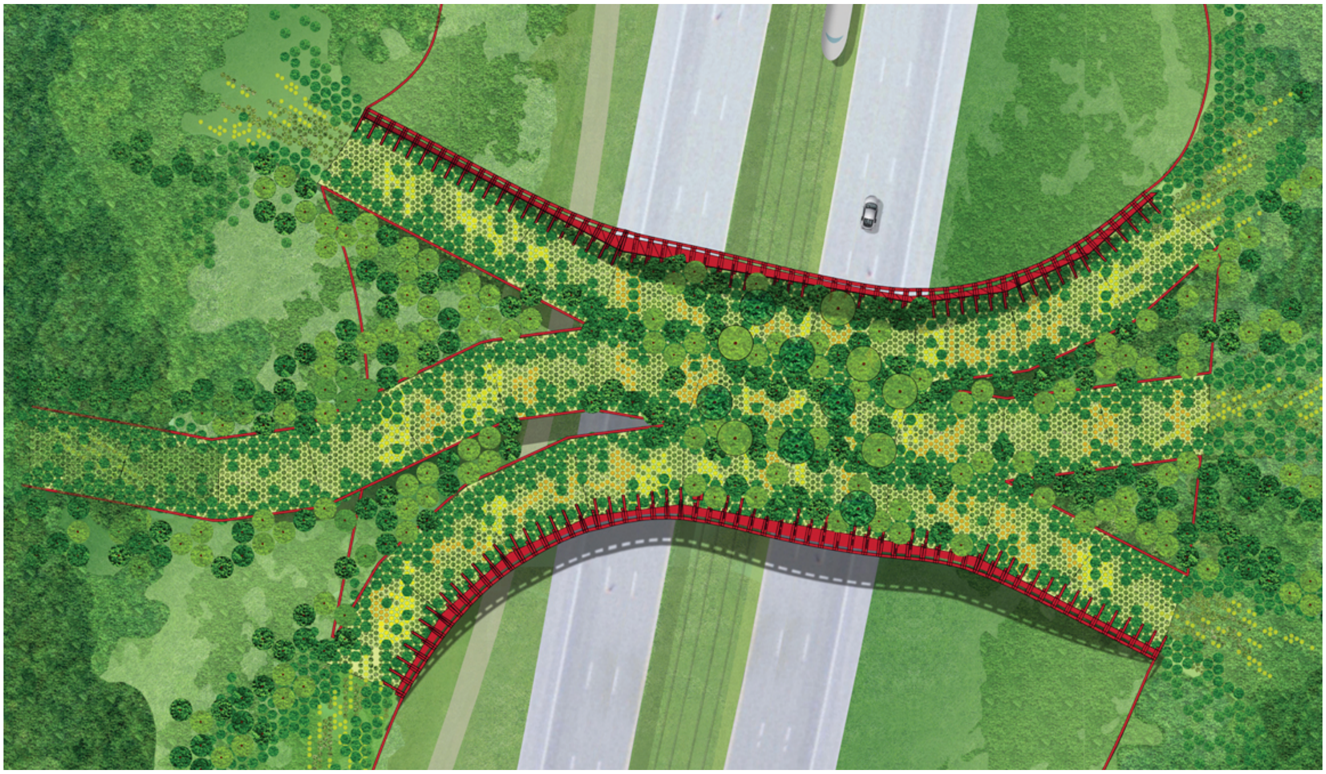
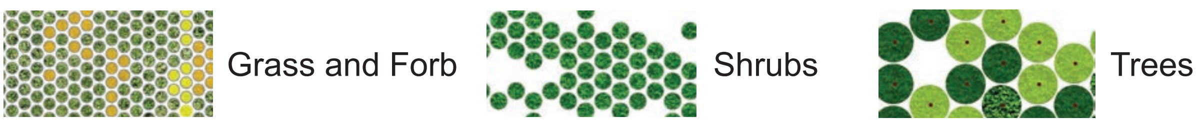


Figure 2. Structural Language of the Crossing Structure. The individual finger-like strands embedded in the forest merge above the road to offer a wider 30-m (100-ft) open span. As an increased baffle to counteract the noise and vibration of the train, we lowered the ceiling above the rail corridor, effectively increasing the depth and allowing for trees mid-span. The section shows the supports, while the plan shows these as small and large circles, revealing the low impact on the existing topography.





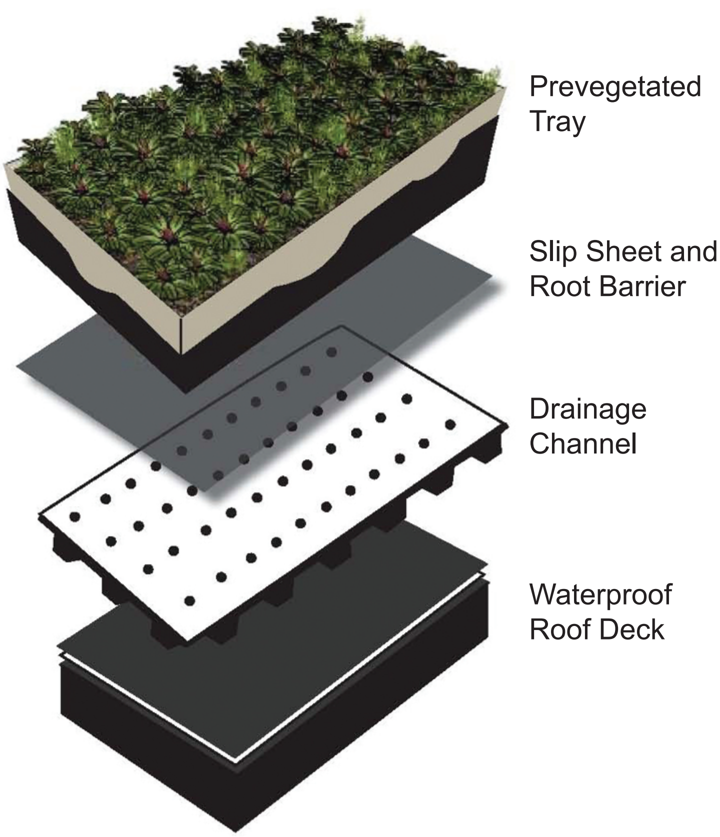
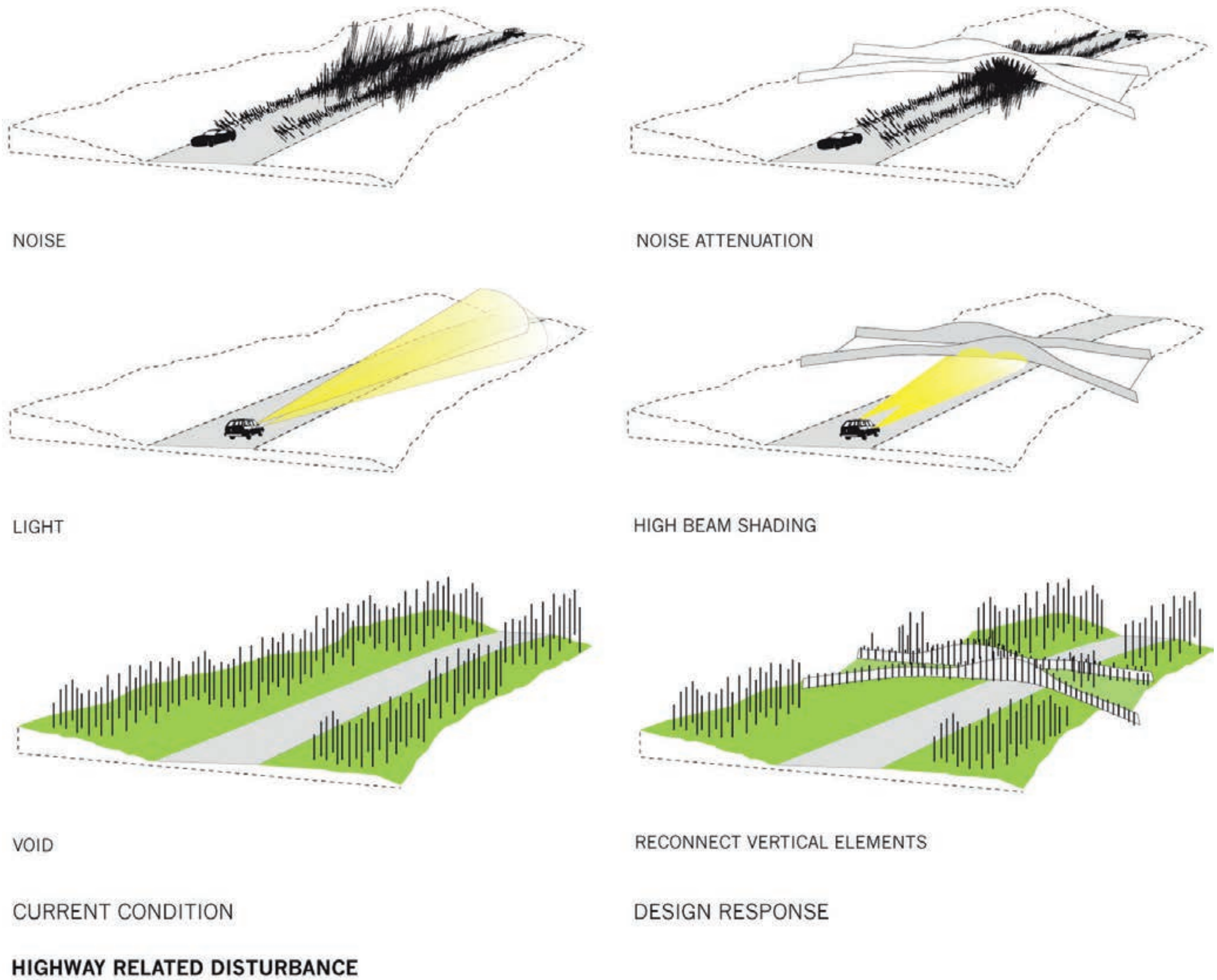


Figure 3. Locations of vegation groups along wildlife crossing. Advantages of the pre-vegetated modules: 1. Soil stability and erosion control; 2. Drainage: each unit is designed to allow precipitation to pass through and drain under the modules, prevents soil saturation and root rot; 3. Pre-vegetated soils are stabilized by a pre-established dense fibrous root system; 4. Pre-established native species composition will not have to compete with seed rain from early successional annuals, invasive exotics and other opportunistic species that aggressively colonize disturbed soil; 5. Pre-established plant species are not as vulnerable to disturbance, such as browsing, trampling, and desiccation (established root system); 6. Provide instant habitat benefits to wildlife; 7. They are easily replaced if damaged; 8. Facilitate an adaptive management approach if monitoring documents failures in plant species success or other factors that may be affecting the success of wildlife utilization; 9. They are easily transported and installed.

Figure 4. Perspective winter view above the crossing structure reveals the scale of vegetation on and in between the strands, slipping into the forest with ease. The red curved outer edges function as attenuation barriers against noise and light, expressing their greatest impact with incoming traffic. The entire wildlife crossing structure is colored red.

Figure 5 (opposite). Disturbances and Attenuation. We determined that noise and light were the primary disturbances to address and counteract, in addition to the void created by the road that prevented a safe crossing. The footprint of the crossing structure reaches beyond the road edge to connect areas of familiarity, rest, and mobility, and therefore eliminates the stress in crossing. The sound spectrum reveals the effectiveness of the attenuation barriers in reducing the impact of noise from the road.


NOISE
NOISE ATTENUATION
LIGHT
HIGH BEAM SHADING
VOID
RECONNECT VERTICAL ELEMENTS
CURRENT CONDITION
DESIGN RESPONSE
HIGHWAY RELATED DISTURBANCE

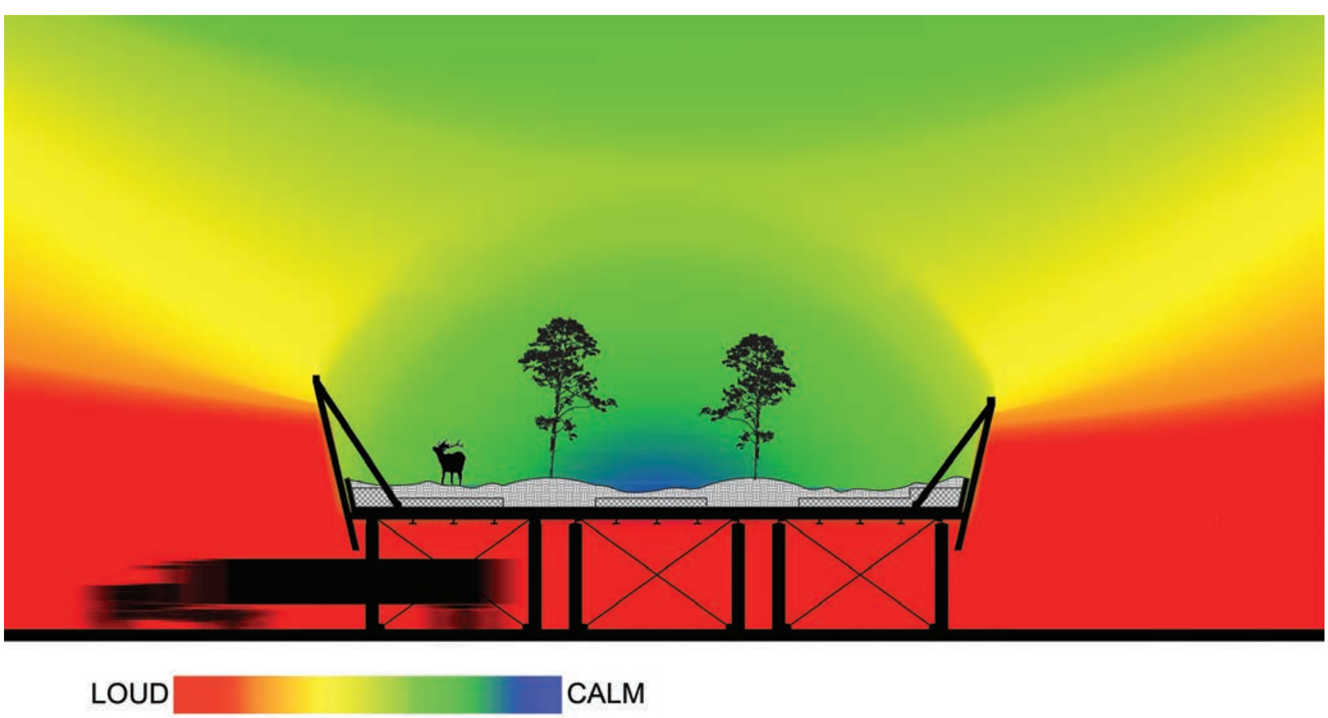

LOUD
CALM

Figure 6. Perspective view from within the crossing structure, above the road, and in the midst of this extended forest environment. Perches for birds suggest the important aspect of bird song as an element of familiarity and safety for wildlife and humans.

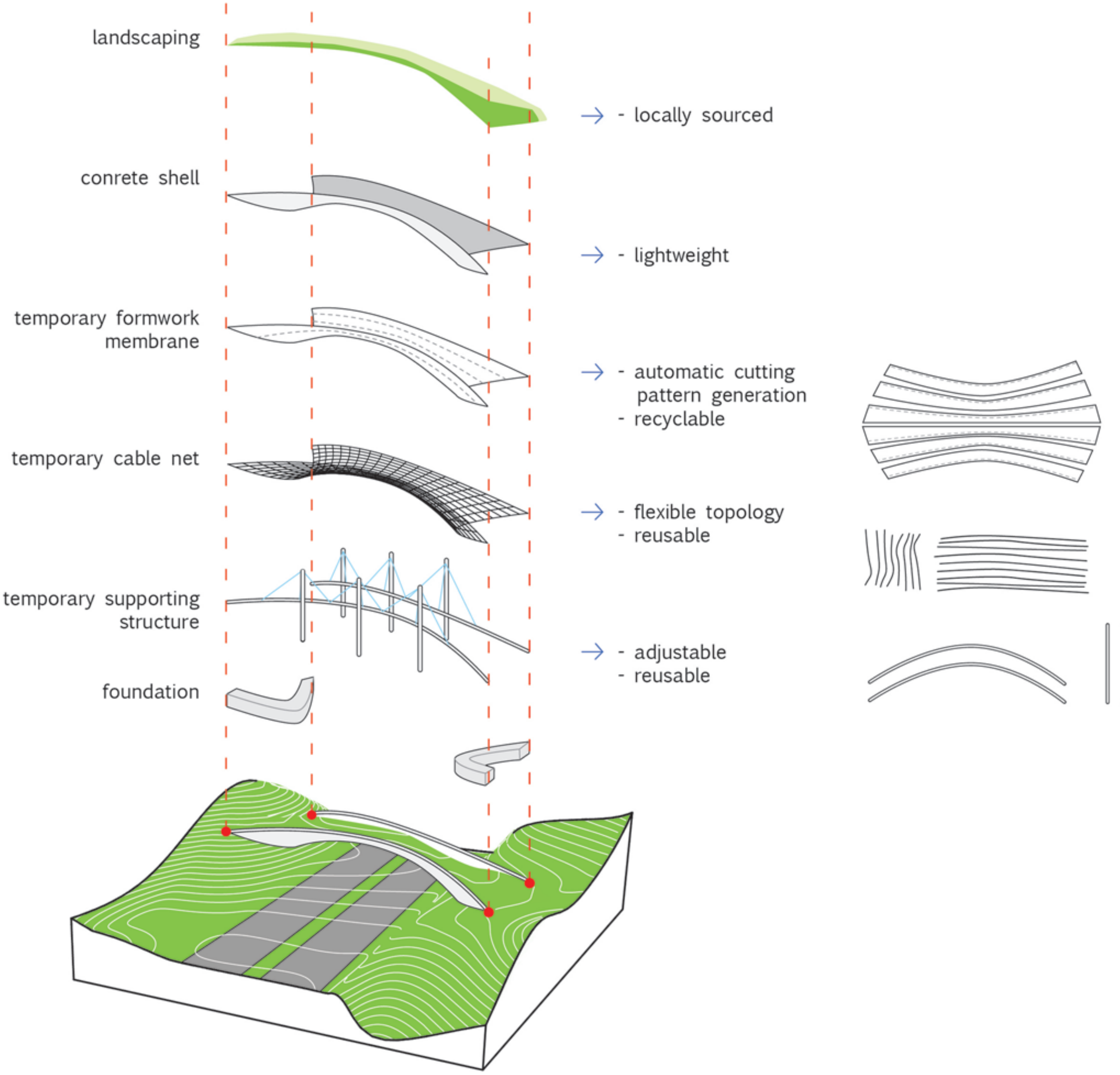


Figure 1. In designing "Landshape," the team opted for a technically innovative, double arch structure with calculations based on the weight that the crossing needs to bear and surface areas in "ideal" symmetrical proportions. The formwork is made of cable nets, over which a fabric (textile membrane) is placed. Its unique property is that the cable nets can be re-used many times in varying forms. © Zwarts & Jansma Architects.

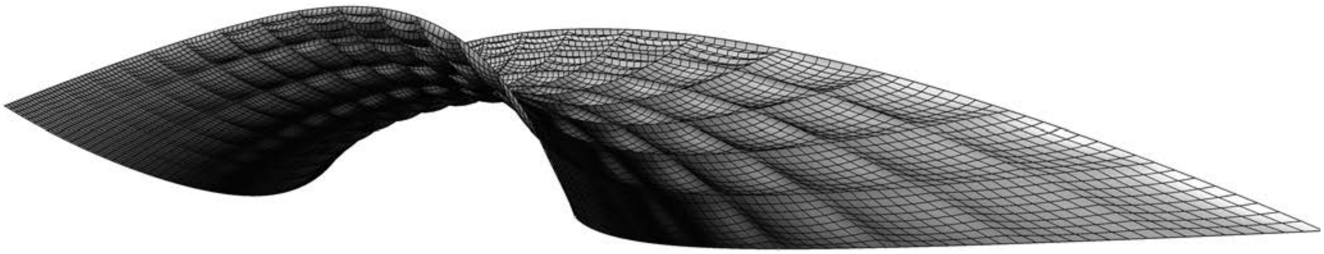


Figure 2. Drawing of the formwork made of cable nets, over which a fabric (textile membrane) is placed. © Zwarts & Jansma Architects.

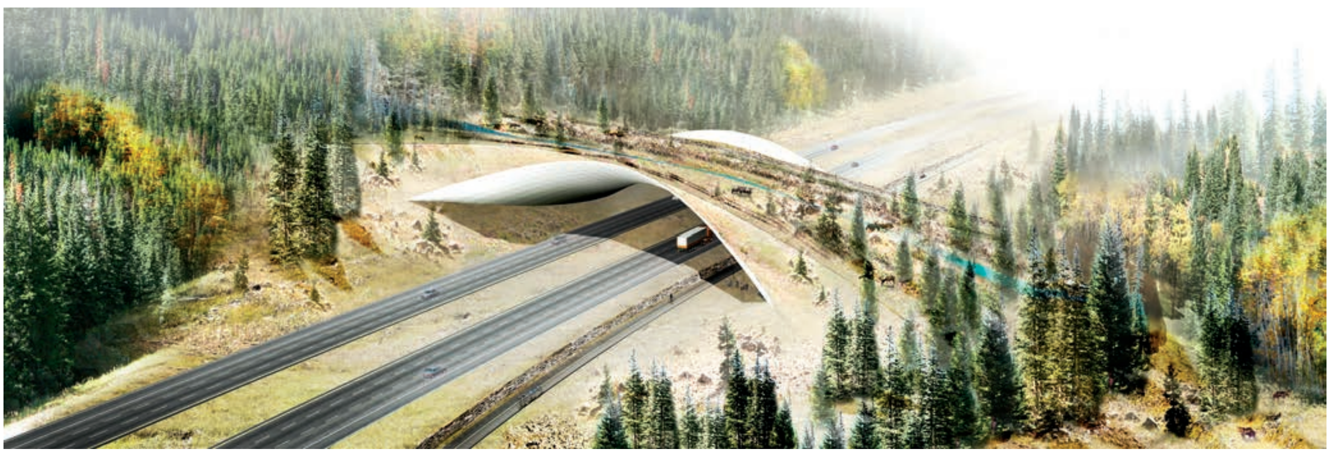


Figure 3. ARC wildlife crossing, Colorado USA. © Zwarts & Jansma Architects and OKRA landscape architects.

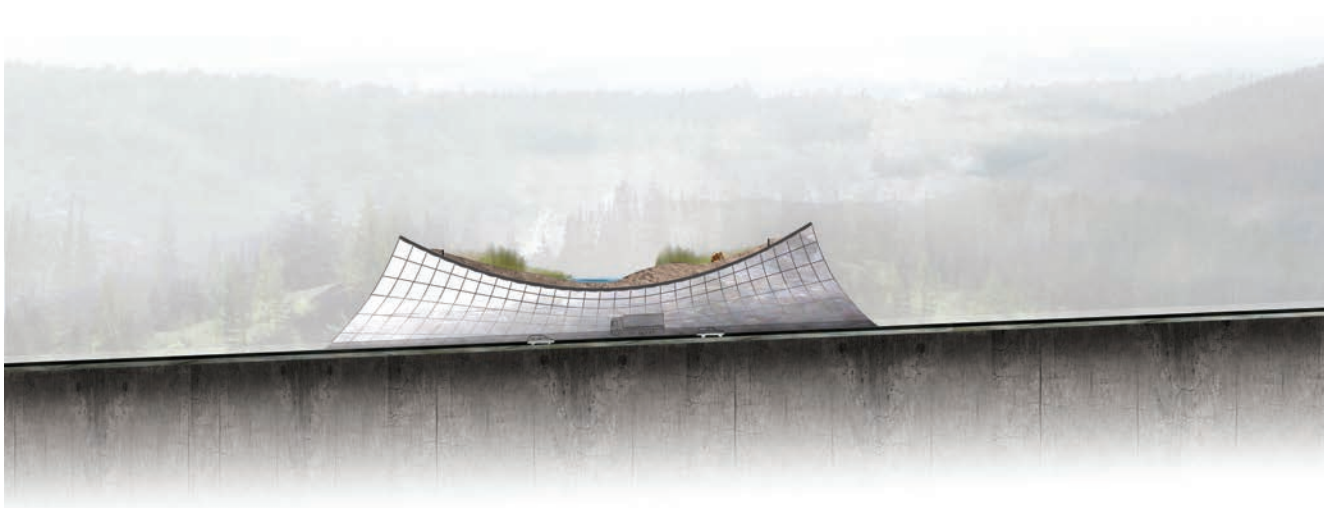


Figure 4. Section of the ARC wildlife crossing, Colorado USA. The design consists of 3 curves. The first arch is the bridge itself, while the second is the ground level of the surrounding land, which continues over the bridge, and the third is the natural vegetation that will cover the deck of the bridge. © Zwarts & Jansma Architects and OKRA landscape architects.

Figure 5. ARC wildlife crossing for Colorado, USA, showing connections to adjacent habitats and the proposed water channel in the middle of the crossing. © Zwarts & Jansma Architects and OKRA landscape architects.

Figure 6. De Borkveld wildlife crossing, Rijssen, the Netherlands. Zwarts & Jansma Architects has considerable experience designing wildlife crossings. The wildlife crossing De Borkveld, in Rijssen was completed in 2003. In 2007 the firm collaborated with OKRA landscape architects to design nine wildlife crossings for the Veluwe nature reserve. © Zwarts & Jansma Architects.