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Signal Tracks

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There is a classic image of the undersea cable, almost identical across countless photographs taken since the late nineteenth century. In the photograph of a 1906 British cable landing, as in so many others of this period, a crowd stands on a beach, looking out to sea (fig. 1). From a cable ship on the distant horizon, a string of buoys extends to the shore. These are fastened to the cable in order to keep it suspended in the water, protecting it from a rocky seafloor. Like nodes in a network diagram, this line of dots comprises the only visual evidence of a communications system hidden below.

Fig. 1. *The cableship Colonia lands a cable at Porthcurno in the United Kingdom*, 1906, Photographer Unknown, Photograph, © Cable & Wireless Communications 2013. (By permission of Porthcurno Telegraph Museum.)

To view a cable landing is to witness the coming together of worlds. Events are staged to mark the occasion. Public figures direct the audience's attention to their nation's development, inscribing the cable with narratives of technological progress. Commemorative artifacts, from pamphlets to dinner plates, are handed out as material reminders of the occasion. When the system is initiated, discursive production typically stops. There is no 'after' to the cable landing. As the strings to the cable are cut and the line sinks to the seafloor, infrastructure recedes from view, becoming as Susan Leigh Star has articulated, "the forgotten, the background, the frozen in place." [1]

Like many infrastructure photographs, from the early industrial representations of railroads to the recent documentation of communications installations, cable landing images operate in a revelatory mode, purporting to make visible the invisible systems that support the exchanges of modern life. [2] Yet, as it culminates a narrative of the cable's planning, design, and construction, the landing image – and discourses about cable infrastructure

more broadly – rarely figures the 'operational' cable. We do not see cables as they extend inland, below beaches, mountains, and communities, or as they run out to sea, where they are threatened by anchors and fishing nets. We do not track signals routed by engineers in network operations centers and monitored by security agencies in Cold War era cable stations. Documenting the completion of a connection and embedding it into a narrative about technological possibility, the landing image deflects our attention from the cable's ongoing entanglements with nature and culture.

Rather than marking the moment of connection, what might it mean to track transmission, to follow our signals as they move across an infrastructure system, granting significance to the nodes where they continue to be shaped? Tracking signals has long formed an orienting approach for "infrastructure tourism," as Shannon Mattern has described the emergent practices of artists, activists, and authors who visit and map infrastructure sites. [3] Infrastructure tourists often focus on the large-scale, critical nodes of a system: the One Wilshire building in Los Angeles, massive data centers in rural Oregon, and expansive Internet exchanges. [4] Andrew Blum describes these places as the "monuments" of the Internet. [5] Although individual photographs of lines and nodes seem to fix them at discrete locations, the composition of these images in a series can give the viewer a dynamic sense of the network's connection. [6]

The following set of photographs, *Signal Tracks*, follows transmission between nine sites in the global fiber-optic undersea cable network, moving from cable landings in the United States, out to Australia, New Zealand, and Tahiti. Rather than focusing on infrastructure monuments, these images bring us to the network's edges in rural and aquatic environments: coastal hills where brush fires break out on O'ahu's west shore, habitats of endangered mountain beavers in the northern California woods, remote sites of World War II conflict over the Pacific.

Our imagination of digital infrastructures is often populated by an urban iconography, but these systems thread through and encompass 'natural' ecologies. The lines of cable networks have been sculpted out over time: cable landings are often laid over ships' landings; the coasts have been reconfigured into protection zones to facilitate information traffic; local practices and policies are altered to make room for cable systems. In the anthropocene, the non-human environment is increasingly managed, manipulated, and re-shaped, and as Ashley Carse has argued, nature becomes indistinguishable from the infrastructure it supports. [7] These environments do not merely hide network infrastructure. Cables have left material remnants on the cultural practices and ecological possibilities that unfold there – these beaches have become 'part of' our global cable systems.

If the cable landing photograph suggests that we can grasp infrastructure and witness connection by documenting its physical installations, the images here offer a different approach. They direct our attention to the spaces in which connections are embedded, and ask us: what tracks do our signals leave? As they refuse our desire to pinpoint evidence of large-scale systems, might these images instead help us to develop new ways of looking at, listening for, and sensing the networks around us?

Fig. 2. Manchester, CA (1957 – present)

Stormy skies punctured by lightning might threaten to interrupt aerial movements, but the cables running under this beach remain safe from atmospheric disruption (fig. 2). Not far inland from this landing point is the first transpacific telephone cable station, built in the 1950s, which today continues to support Internet traffic.

Fig. 3. Keawa‘ula, O‘ahu, Hawai‘i (1963 – present)

The cable station at Keawa‘ula (fig. 3), like many constructed during the Cold War era was built underground in a nuclear fallout shelter. According to United States military specifications, it had walls two feet thick, showers in which employees could wash off radioactive material, and kitchens stocked with food for thirty days. The station was so far removed from the water infrastructure of the Waianae coast that its construction involved digging wells over two hundred feet down into the ground. It was intended to comprise a completely self-sustaining architecture.

Fig. 4. Takapuna, New Zealand (1912 – present)

Takapuna (fig. 4) has been a cable landing point since the beginning of the twentieth century, when an early telegraph system was relocated from the remote tip of the North Island to just outside of Auckland. Part of a general period of cable centralization in southern Pacific, this geographic shift reflected a technological transition that made fully-staffed end stations less important. While cable stations used to be visible centers of commerce and community in remote locales, today they are more often empty, bringing only one or two technicians to the area.

Fig. 5. Tanguisson Point, Guam (1964 – present)

The sun sets over the Tanguisson cable landing point on Guam, illuminating a long conduit that extends into the ocean (fig. 5). While at other locations, such as Manchester, Keawa‘ula, and Takapuna, cables have to be buried underground to protect them from potentially disruptive anchors and fishing nets, here cable systems can run directly over the beach. A deep subsea drop off into the Marianas Trench insulates them from boat traffic. Guam’s coastal geography both protects and makes visible the island’s communications networks.

Fig. 6. Nedonna Beach, Oregon, United States (2000 – present)

Conflicts with local environmentalists and fishermen at the cable landing point have made it increasingly difficult to land in California, leading some in the cable industry to believe that future Internet traffic will be routed through Oregon. The cable landing at Nedonna Beach, home to the Southern Cross cable, is one such example (fig. 6). Although its projectors attempted to land the cable in Monterey Bay, California, they were forced to re-route through Oregon, extending the network several hundred miles and increasing its cost by $100 million. Cables are woven around sites of conflict, sedimenting in places where they can go unnoticed.

Fig. 7. Narrabeen, Sydney, Australia (2009 – present)

Two surfers navigate their way out past the waves at a cable landing point in Sydney's northern suburbs (fig. 7). Unlike those in the United States, telecommunications companies laying inland cables in Australia are given immunity to state and territory legislation. This enables companies to lay cables without protracted local negotiations, such as the ones that thwarted the Monterey Bay landing, but it also means that local residents don't have a say in how systems get routed through their communities.

Fig. 8. Tamarama Beach, Sydney, Australia (2001 – present)

In Australia, protection zones have been set up to shelter cables, and much of the country's international traffic now funnels through two corridors north and south of Sydney. While some believe this is sufficient, others believe that more diversity is needed; if both of these were to be disrupted, the country's Internet would have few other exits.

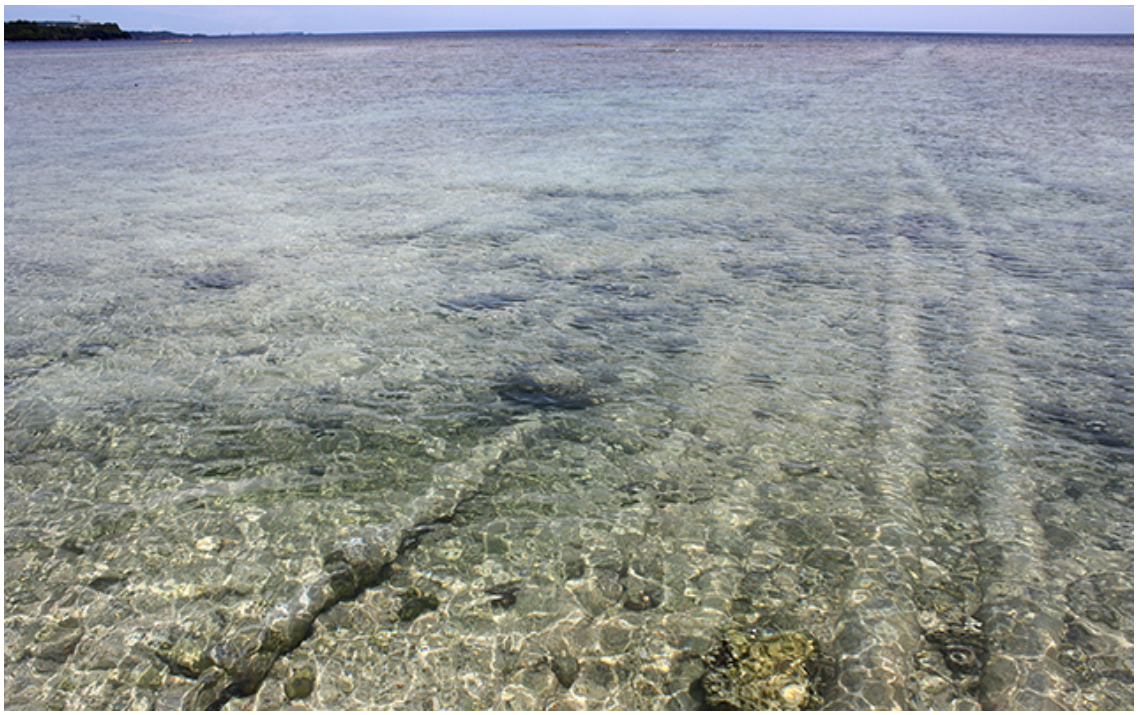

Fig. 9. Tumon Bay, Guam (1964 – present)

At Tumon Bay, Guam, tourists regularly step over an undersea cable conduit without looking twice, intent on getting to the ruins of an antiaircraft gun at the far end of the beach (fig. 9). Guam has long held strategic military value in part due to its position as a cable hub and the lines here continue to support the island's military bases. On the other side of the cable conduit is the Hotel Nikko, one of the early Japanese five-star hotels in the area – a structure also dependent on the island's advanced communications networks. These cables, silently shuttling signals between the United States, Australia, and Japan, have implications for the islands on which they stop in between. They can bring in economic investment, military conflict, tourists, and migrants.

Fig. 10. Papenoo, French Polynesia (2010 – present)

The Honotua cable, which carries almost all of Tahiti's international traffic, is embedded in local language and mythology (fig. 10). In Tahitian, "hono" is a link and "tua" means the back, backbone, or far ocean. The cable's name reiterates its function: to link across the far ocean. At the cable landing site, a member of a technical team describes the legend of the Tahitian Queen who long ago lived at this beach and had traveled to the landing site at Hawai'i: the cable, he recounts, follows her direct path only by coincidence. The cable is fortuitously connected to their genealogy, he says, and it will carry them into the future.

Figures 2, 3, 4, 5, 6, 7, 8, 9, 10: *Signal Tracks*, 2009 to 2011, Nicole Starosielski, digital photography,

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Bio

Nicole Starosielski is an Assistant Professor in the Department of Media, Culture, and Communication at New York University. Her research focuses on the global distribution of digital media, and the relationships between technology, society, and the aquatic environment. Her current book project, *The Undersea Network*, charts the cultural and environmental dimensions of transoceanic cable systems, beginning with the telegraph cables of the first global communications network and extending to the fiber-optic infrastructure supporting international Internet traffic.