Dedicated to the increase and diffusion of knowledge about how the nation's lands are apportioned, utilized, and perceived.

The Lay of the Land

The Center for Land Use Interpretation

WINTER 2018

I love the thought of a car drifting apparently endlessly through space and perhaps being discovered by an alien race millions of years in the future.
- *Elon Musk*

DESERT RAMPARTS

FORTRESSES ON THE FRINGE OF LAS VEGAS

Anne Road Detention Dam, one of the flood control structures along the periphery of Las Vegas. CLUI photo

LAS VEGAS, THE NATION'S SUPREME desert city, lies in a riverless valley, baking in the sun. When it rains, which it does especially in the summer months when intense heat off the ground pushes air masses high into the sky, storms can be sudden and strong, generating flash floods that threaten the city.

Defense against this attack has grown with the expanding urban land itself. Following a flood control master plan, there are now more than 100 detention basins in and around Las Vegas to absorb the shock of flood, and hundreds of miles of concrete channels to contain the flow through the city.

continued on page 21

AMERICAN RAILROADS

SHIFTING SCALES

Horseshoe Curve in Pennsylvania is an important historic rail site, and is visited by thousands of railfans every year. Like many famous railway sites, it looks like a model railroad, when seen from above. CLUI photo

RAILROADS WERE THE ORIGINAL MACHINE in America's garden, capturing the continent from coast to coast, making the local national. With the first transcontinental connection at Promontory, Utah, in 1869, railroad routes became the physical lines on the nation's full-scale map of itself, a nationwide network web, built by the industrialists of America's Gilded Age.

Today the system has more than 150,000 miles of track, where 1.5 million railcars are pulled around by 30,000 locomotives, controlled out of centralized operations facilities primarily by four companies—two in the east, and two in the west—as if the whole system were a giant model railroad layout. Which, in a way, it is.

continued on next page

IN THIS ISSUE

Editor's Note

This, the 41st edition of the *Lay of the Land*, is the biggest yet, consistent with much of its content, which is about big things too. Continuous economic expansion means things get bigger and bigger. Like logistics facilities, infrastructures, expanded watersheds, systems of production and distribution. While at the same time some things are shrinking, like our memory, computers, and attention spans. The way things are going it seems likely that we might physically disappear some day too, once we have finished uploading ourselves to the AI managers in the cloud. Why struggle to keep our decaying flesh animated if we can be sufficiently entertained in perpetuity in the virtual future? And if we can figure out a way to keep the data centers whirring, perhaps by creating a rhizomic sun-powered cloud of silica memory dust in space, then we'll be done with the need for terrestrial resources, and the planet can finally be abandoned. We'll get in our Teslas and follow Starman on that blissful, endless road to nowhere. In the meantime though, we'll continue to deal with things here on Earth best we can, grateful for your help. Thanks for *being t/here*!

The CLUI exhibit showed the full-scale and a small-scale version of selected railroad features like bridges, loops, and tunnels. The full-scale version was presented on a video screen, the small-scale version in an image, both described on an interpretive plaque, set like an overlook, looking up and out, and looking down and in, macro and micro. CLUI photo

continued from first page

Engaging Scale: The Railroad Landscape as Analog Macroscope, which opened at CLUI in Los Angeles last September, looked at famous railroad engineering landmarks, from the Hoosac Tunnel in New England to California's Tehachapi Loop, following the historic expansion of the country from east to west. In parallel, the exhibit featured depictions of these same monuments as represented on model railroad layouts around the country.

Unlike the massive engineering of the full-scale railroad, which required amalgams of government and corporate syndicates to make, model railroad layout building is a construction process usually pursued at the level of an individual. It involves the compression of railways and the vast landscapes in which they are embedded, in order to bring them into view. Modeling makes things smaller in order to understand them. Like an inverted microscope—a *macroscope*. ♦

MODEL RAILROAD LAYOUTS

SHRINKING DOWN TO SEE MORE

THE THOUSANDS OF KNOWN AND unknown model railroad layouts across the nation range from small modules that can fit in the back of a station wagon, to large fixed garden railroads, with miles of outdoor track. Most model railroad layouts depict fictional landscapes, evoking types of places, or historical periods, or "freelanced" depictions of prototype places. Very few show actual places in a literal way. Some layouts are created by single individuals over decades of devoted and inspired work, while others are the cooperative effort of members of small, regional model railroad clubs. Others are created by professionals for museum displays.

At the high end of museum layouts is a $1 million+, 3,500-square foot HO layout called the *Great Train Story*, in the transportation wing of Chicago's Museum of Science and Industry. It is loosely based on the 2,200 miles between Chicago and Seattle. The layout, which was created by museum staff, includes interactive buttons that allow visitors to animate scenes, as well as dramatic lighting that switches to "nighttime mode" every half hour. There are a number of these well-funded and professionally built railroad layouts at science and educational museums around the country. Many of them focus more on buildings and streets than on the railroad and non-urban landscape.

View of the *Great Train Story* at the Museum of Science and Industry, Chicago. CLUI photo

Landscapes come to the fore, it seems, especially at the highly crafted indoor layouts built by regional model railroad clubs. These layouts, built for no commercial gain and often as a team effort, often depict the region where they are based, drawing on local and direct experience of the full-scale sites. These clubs are usually open to the public in some way, even if it's only on an occasional open house day, while the rest of the time club members are at work on their respective portions of the layout, whenever they have time to do so.

Most clubs maintain public access, in part, to encourage others in the community to get involved as builders, especially younger people, as it seems the membership in model railroad clubs, and indeed model railroaders in general, are mostly middle-aged men, and are decreasing in numbers. This attrition has left many large layouts unfinished, abandoned, or destroyed when their lease or free use of space ends. Model railroad clubs sometimes become non-profits, to help with fundraising, and establish relationships with local historic organizations or transportation museums.

The layout at the Golden State Model Railroad Museum in Richmond, California. CLUI photo

If the layouts are fully evolved and complete, then the club house itself sometimes can become a museum, open to the public, if they are lucky enough to find the support to make it happen. Such was the case at the Golden State Model Railroad Museum, in Richmond, California, one of the great club-built regional railroad layouts, now open as a museum. It's actually home to three layouts, at three separate scales: N, HO, and O, each depicting a different

Northlandz, the largest indoor model railroad in the USA, is open to the public as a museum, and is still tended by its creator, Bruce Williams Zaccagnino. CLUI photo

Roy Edler's layout of the Willard railroad yard, on display in a rail car in Willard, Ohio. CLUI photo

region in California and the West. It is housed in a 10,000-square-foot shed, next to San Francisco Bay. The layouts were built and are maintained by the East Bay Model Engineers Society.

The majority of model railroad layouts are the work and vision of a single individual working in their basement, attic, or shed, over their lives or retirement. In some rare cases, their obsession can become a career and a way of making a living.

At Northlandz, in Flemington, New Jersey, Bruce Williams Zaccagnino started building his fantasy layout in 1972, and it now has more than eight miles of track over 52,000 square feet, and is the largest model railroad landscape in the USA. This is an epic manifestation of an individual's vision and lifelong labor, open to the public as an attraction with paid admission and a gift shop.

Another personal model railroad that may become a grand visionary layout, open to the public, is the Extreme Model Railroad and Contemporary Architecture Museum, proposed for North Adams, Massachusetts. Though still in the design phase, this recently announced project is the brainchild of Thomas Krens, responsible for expanding the Guggenheim Museum to places previously unknown to such things, like Bilbao, Spain, and Las Vegas.

If built as currently planned, it would relocate a layout that is currently in the basement of his house in Williamstown, into a 700-foot-long building designed by Frank Gehry. The model railroad layout would be integrated with a collection of dozens of scaled models of modern architectural landmarks from around the world (including the Guggenheim Museum in Bilbao, Spain). If it happens, it would likely be the largest model railroad layout in the country, if not the world.

Once in a while more modest privately created railroad layouts find their way out to public locations, moved in pieces to an old train station being converted into a local historic museum, for example. This happened with a N-scale layout of the Willard railyard, in Willard, Ohio, built over decades by local resident and former railroad employee Roy Edler, inside his double-wide trailer home in Willard. After it was completed, it was carefully removed (much to his wife's relief) and installed in an old boxcar, as part of a historic railroad display assembled and maintained by the Willard Historical Society.

Normally individual model railroad builders work in relative obscurity for their entire lives. Though their work may be enjoyed and visited by friends, relatives, or the occasional model railroad club members, it is typically a solitary task.

Model railroad makers do this not for attention, but for some personal need, to get their mind around a landscape, shrinking it down to a manageable scale, in order to see it. Who knows, ultimately, how many model railroad wonders exist yet to be discovered, or destroyed. ♦

These and other model railroad sites can be found in our Land Use Database at www.clui.org.

FULL-SCALE RAILROAD LANDMARKS

A NATIONWIDE LAYOUT

WHILE THE ENTIRETY OF THE American railscape could be considered as a single construction landmark—a nationwide layout—it is usually perceived as specific sites that stand out for one reason or another.

In some cases these are historically significant engineering structures, like high spindly bridges, and long stone viaducts, or important maintenance and classification yards. They can also be grades or mountain passes where work was especially difficult, or where loops and long switchback curves were necessary.

A rail site can become a site of significance because it is especially visible and scenic, possible to see or experience from a hilltop or roadway. Some of the most famous railroad landmarks are heavily visited by railfans from all over the world, and develop parking areas and overlooks, even visitor centers and viewing towers, to accommodate the crowds that come to watch the trains go through these places. If the site is abandoned or closed to rail traffic, or rail activity rare, visitors are a lot less frequent.

Following is a selection of some of the celebrated railroad landmarks in the USA, which collectively create a portrait of the full-scale railroad layout of the nation as a whole.

CLUI photo

Hoosac Tunnel, East Portal, Florida, MA

Nearly five miles long, this tunnel in the northwest corner of Massachusetts was the longest railroad tunnel in the USA for many years, and among the great engineering marvels of the 19th century. Seeking to create a trade corridor connecting Boston to the Hudson River and the Erie Canal, local railroad interests began cutting the tunnel through the Hoosac Mountains in 1851. The tunnel took more than 20 years to build, and took almost 200 lives. It has operated continuously since opening in 1875, and today is owned by Pan Am Railways, based in Massachusetts (they bought the name, colors, and logo from Pan Am Airlines). Though there is only occasional traffic through the tunnel, it remains the longest active rail tunnel east of the Rocky Mountains.

CLUI photo

Horseshoe Curve, Tunnelhill, PA

Due to its location between the midwest and eastern seaboard, and the resource-based industries it harbored, Pennsylvania has many railroad landmarks. The maximum grade for railroads is less than 2%, so the hilly terrain sometimes forced the railways to meander dramatically. Horseshoe Curve, in western Pennsylvania, is one of the more scenic and visible meanders. It opened in 1854, and was later expanded to four tracks, due to its location between New York and Chicago, and its proximity to the busy rail yards at Altoona, a few miles east. Horseshoe Curve now has three tracks, and sees as many as 50 Norfolk Southern trains a day, and several Amtrak passenger trains. It is a popular tourist attraction, a National Historic Landmark, and has a museum on site.

CLUI photo

Starrucca Viaduct, Lanesboro, PA

The Starrucca Viaduct is a picturesque stone arch bridge spanning a river and valley near the New York state line in northeastern Pennsylvania. It was completed in 1848, and was the largest structure of its kind when it opened. The viaduct is still in use today, with occasional traffic by the New York, Susquehanna and Western Railway.

CLUI photo

Harriman Dispatching Center, Omaha, NE

The Harriman Dispatching Center is Union Pacific's main control center, operating most of the fleet and track of the nation's largest railroad company, Union Pacific. Called the "Bunker" by some, this building, two football fields long, is where the movement of hundreds of trains on 32,000 miles of track is controlled and monitored. It was built in a former freight depot building in 1989, and employs over 750 people, around 60 of whom are dispatchers who work in the "bunker" itself, like slower-motion air traffic controllers watching a series of 172 screens that show every switch and signal track on UP's lines. The corporate headquarters for Union Pacific is located nearby in downtown Omaha.

CLUI photo

Bailey Yard and Golden Spike Tower, North Platte, NE

Bailey Yard is the largest railway yard in the nation, where more than half of Union Pacific's rail traffic passes through at some point. The yard extends for a few miles, bulging in the middle with as many as 200 parallel tracks, where trains are assembled, reconfigured, and loaded at a rate of around 120 trains and 10,000 freight cars per day. In addition, maintenance facilities repair locomotives and railcars at the yard. The yard is a popular spot for railfans and other tourists. A visitor center, built by Union Pacific, includes a gift shop, interactive and static displays, and an eight-story observation tower in the shape of a golden spike. Due to the volume and diversity of goods handled at the yard, its activity is apparently a responsive barometer of the overall economic condition of the nation.

CLUI photo

Big Ten Curve, Leyden, CO

Rising out of the plains at the front range north of Denver, the railroad makes a long, slow curve of 270 degrees, called the Big Ten (because the radius of the track's curve is ten degrees, based on the method railways use to measure curves). Built in the early 1900s, this section of track was once the Denver and Rio Grande Western RR, and is now Union Pacific. It is also the route of Amtrak's California Zephyr, passenger service from Chicago to Emeryville, California. In the middle of the curve is a row of about two dozen hopper rail cars filled with cement. In the early 1970s they were permanently parked on a separate track inside the curve, and welded to the track, to serve as a windblock in this notoriously windy and snowy stretch of track.

CLUI photo

Devil's Gate High Bridge, Georgetown, CO

The Devil's Gate High Bridge was built in 1884, over the Clear Creek Gorge in the Rocky Mountains west of Denver. It is a narrow gauge railroad, used to access the mines and towns located along this corridor, until it was abandoned around 1938. A segment of the old line, including the bridge, was rebuilt and reactivated as a tourist railroad in the 1980s, now called the Georgetown Loop Railroad. It is located next to Interstate 70, and a steam train runs up and down the three miles of track, with an elevation change of 640 feet, three to five times a day during the summer season.

CLUI photo

Moffatt Tunnel, West Portal, CO

The Moffatt Tunnel is a six-mile-long railroad and water tunnel bored through the Continental Divide in the Rockies in the late 1920s. It bypassed more than 20 miles of slow and meandering track including loops and tunnels over Rollins Pass, between Tolland and Fraser, Colorado. Ultimately, the new route, with other smaller tunnels, cut off around 175 miles of track distance between Denver and the Pacific Coast. The tunnel took four years to make, opening in 1928, and 28 people died in its construction. The western portal is located immediately adjacent to the Winter Park ski resort.

CLUI photo

Lucin Cutoff Causeway, Promontory, UT

The Lucin Cutoff is a shortcut opened by the Southern Pacific Railroad in 1904 as a faster railroad route through northwestern Utah. By going in a nearly straight line through the middle of the Great Salt Lake Desert, this route was 44 miles shorter—and much flatter—than Central Pacific's route around the north end of the Great Salt Lake, where the first transcontinental railway connected in 1869. The cutoff included a 12-mile trestle through the main part of the lake, using thousands of Douglas fir trees from the California mountains driven into the mud, a monumental railroad engineering landmark. By 1959, it had become unstable, and was replaced with a gravel causeway, which effectively divided the lake in two halves. As one was becoming much saltier and drier than the other, its current owner, Union Pacific, cut a 150-foot-long breech in the causeway in December 2016.

CLUI photo

Tehachapi Loop, Tehachapi, CA

At the Tehachapi Loop, the railway completes a full circle, climbing 77 feet on the western slope of the Tehachapi Mountains. The loop was built in 1876, as part of the Southern Pacific's line connecting Bakersfield to Mojave in Southern California, through the lowest pass at the south end of the Sierras. Any train more than 4,000 feet long will pass over itself here, something that happens several times a day. ♦

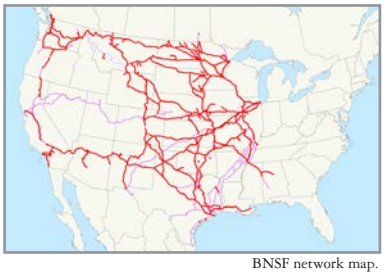
RUNNING THE RAILS

OPERATORS OF THE NATIONAL RAILROAD LAYOUT

FOUR FREIGHT RAIL COMPANIES IN the USA dominate the American railroadscape today—two operating in the eastern third of the country (CSX and Norfolk Southern), and two operating in the western two-thirds (UP and BNSF), with the Mississippi River generally dividing the east and west. In addition there is the national passenger rail company Amtrak, which uses the rail lines owned by these commercial companies. There are also two Canadian rail companies operating in the northern and eastern US (CNR and CPR), as well as smaller local and regional freight and passenger carriers operating throughout the country. ♦

Union Pacific network map.

When it merged with Southern Pacific in 1998, Union Pacific became the largest railroad company in the USA. It has 8,500 locomotives pulling trains over more than 32,000 miles of its track in the western USA, and employs 43,000 people. Union Pacific is headquartered in Omaha, Nebraska, where it operates the Harriman Dispatching Center, the largest railroad network control facility in the USA.



BNSF network map.

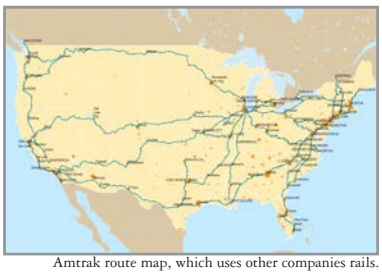
The Burlington Northern and Santa Fe Railroad Company (BNSF) was created in 1996 with the merger of ATSF and Burlington Northern. With 32,500 miles of track, its network is divided into 13 regional divisions, with its main dispatching and operations center in Fort Worth, Texas. Though it is headquartered in Fort Worth, it is owned by Berkshire Hathaway, with headquarters in Omaha, the hometown of Union Pacific.

Norfolk Southern network map.

The Norfolk Southern Railway Company is the largest rail freight hauler in the eastern USA, operating on 36,200 route miles, from Maine to Florida, and as far west as Kansas City and Dallas. It is divided into ten regional divisions, with three primary hubs: Harrisburg, Pennsylvania; Chicago; and Atlanta. Norfolk Southern is headquartered in Norfolk, Virginia.

CSX network map.

CSX shares the eastern freight market with Norfolk Southern, and operates on 21,000 route miles of track. The company was founded by the consolidation of smaller companies in 1986, and is divided into nine regional divisions, with headquarters in Jacksonville, Florida.



Amtrak route map, which uses other companies rails.

Amtrak, the national passenger rail company founded in 1971, is supported by ticket sales and the federal government. It has 425 locomotives pulling 2,100 cars, which carry around 30 million passengers a year, mostly along tracks serving the Northeast Corridor (Washington DC to Boston). Amtrak employs around 20,000 people, and is headquartered at Union Station in Washington DC.

TESLA IN AMERICA
NIKOLA, THAT IS

The largest monument to the inventor Nikola Tesla in the USA is this statue at Niagara Falls. It is in front of the Power Portal Arch, which is the original arched doorway entrance to the world's first large-scale alternating current hydroelectric power plant, the Adams Station, constructed at Niagara Falls in 1895. The plant was located above the falls at a site now occupied by a wastewater treatment plant. When the Adams Plant was demolished, this doorway was preserved, and reassembled here in a park near the falls in 1966. The statue of Tesla was unveiled in a separate ceremony ten years later. CLUI photo

ALL THIS TALK ABOUT TESLA cars and mega-battery plants makes one wonder about the original Tesla—Nikola Tesla, the increasingly not-overlooked, though still generally misunderstood electrical engineer and technological visionary. Nikola Tesla's legacy on the landscape of America is everywhere, through the network of alternating current electrical lines that literally string our nation together. The technology was first deployed at Niagara Falls, an obvious and early source of industrial energy, where the first large-scale hydroelectric plant in the nation was constructed in 1895 using equipment invented by Tesla.

Tesla came to the US in 1884, and worked for Thomas Edison's electrical lighting company in New York City. His ideas about uses of electricity differed greatly from Edison, who was developing direct current systems (DC) for the nation's electrical appliances and infrastructure. Tesla, who pioneered and advocated using alternating current (AC), soon established his own Tesla Electric Company. Tesla's labs and offices operated in a number of locations in Manhattan over the years, including 89 Liberty Street, and 46 East Houston Street. His lab at 33 South Fifth Avenue burned down in 1895, taking much of his work and papers up in smoke.

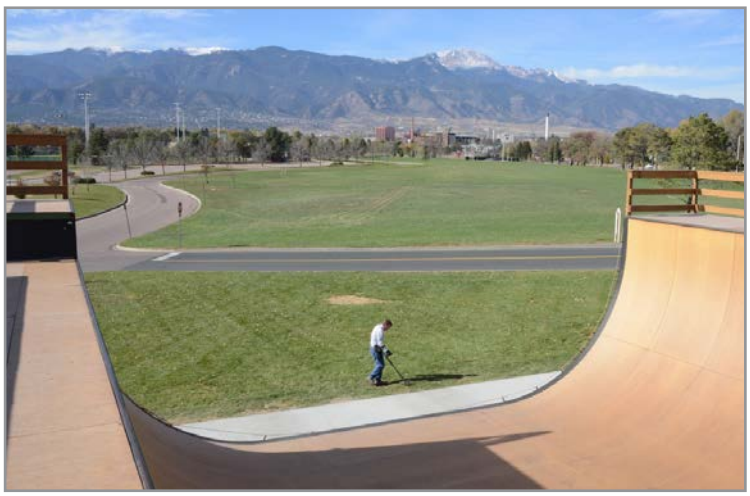
There are a few plaques commemorating Tesla around New York City, where he spent most of his life. They are at places he lived and worked, including one on the exterior wall of the Hotel New Yorker, where he lived from 1933 until 1943, when he passed away in room 3327 (which also has a plaque on its door.) Nikola Tesla Corner was officially established by the city in 1994, and is marked with a street sign at the intersection of 40th Street and 6th Avenue, next to Bryant Park, where Tesla spent time in his later years. Though he lived most of his life in New York City, his two laboratories outside the city, one in Colorado, and one in Long Island, are where his experiments took shape in their most dramatic form.

Sign in the park where Tesla's Colorado Springs lab was located. CLUI photo

Colorado Springs Lab Site

Tesla was financed by some of the major industrialists of his day. In 1899, he received $100,000 from John Jacob Astor to develop a new lighting system, but instead used the funds to establish a high voltage and high frequency lab on a remote hillside in Colorado Springs.

Though he operated the lab here for less than a year, it was at Colorado Springs that he had his major breakthroughs that hardened his theories about long-distance wireless energy transmission. He produced artificial lightning at the lab, with millions of volts arcing over more than 100 feet of open space. He also energized the earth, and lit light bulbs 100 feet away or more, proving that the earth, as well as the air, could be used as a conductor. Eventually his high draws of energy destroyed the local power station, six miles away, putting an end to his experiments there. He returned to New York, and the Colorado Springs lab remained, but was eventually torn down in 1904 and its contents sold.



Tesla's lab at Colorado Springs was built on this site, with a direct view to Pikes Peak, where he imagined setting up another tower. Now a public park, no traces of the lab remain obviously visible today, though unusual forms built to expend the energy of skateboarding youths dominate the site. Others can be seen more passively scanning the ground with electromagnetic sensors, searching for the remains of something. CLUI photo

The main lab building at Wardenclyffe, designed for Tesla by Stanford White, remains mostly intact at that site, connected to several newer industrial buildings built by photo processing and chemical companies that operated there for many decades. CLUI photo

Wardenclyffe Lab, Shoreham, NY

Soon after abandoning his Colorado Springs lab, Tesla began construction on a bigger lab to further pursue wireless energy transmission. With somewhat reluctant funding from J.P. Morgan, Tesla purchased 200 acres at Shoreham, New York, on Long Island, in 1901. Spurred on by Marconi's successful transatlantic radio transmissions later that year, Tesla moved into the lab in 1902, with its 187-foot-tall electrical transmission tower mostly completed.

Support for Tesla's project never fully materialized, as investors supported Marconi, and grew suspicious of Tesla's abilities. Some thought he was mad. Though he made one test at the tower in 1903, Westinghouse and his creditors soon took the equipment out of it. By 1905, with mounting debts, Tesla mortgaged the property, eventually losing it in foreclosure in 1915. When the tower was torn down in 1917, some said it was because it was a landmark potentially useful to enemy ships in the war. It is more likely it was simply considered an eyesore by developers eager to build housing in the area.

By the late 1930s, Peerless Photo Products had purchased the site, and operated a photochemical plant, making emulsions for film and paper. Several more buildings were constructed after the company was bought by Agfa, in 1969. Agfa stopped manufacturing there in 1987, and the site became another fallow contaminated industrial site, slowly overgrown with weeds.

Early property map showing Tesla's "wireless tower" at Wardenclyffe. CLUI photo

Contamination issues were assessed, if not addressed, by the time Agfa put it up for sale in 2012. Local educational and historical nonprofit organizations, which had been interested in the site for years, were finally able to join forces and purchase the site in 2013, after a crowdsourcing campaign, state grants, and a major contribution from Elon Musk, founder of the Tesla Company.

The plan is to establish a museum and technology center there, called the Tesla Science Center at Wardenclyffe, honoring Tesla but also supporting science education in general. Supporters include scientists from Brookhaven National Lab (a large Department of Energy site a few miles away) and Google. Elon Musk has pledged a million dollars more for the museum, and to put a charging station for Tesla cars at the site.

The site of the long gone tower was the first part of the property to be cleaned up and commemorated. The octagonal base of the tower has been cleared and delineated, and planted with grass. Volunteer crews continue to hack away at the weeds on the rest of the property, while fundraising continues for the design and construction of the museum. CLUI photo

After losing Wardenclyffe, Tesla continued to work tirelessly and to invent things, including a vertical take-off aircraft and an alleged death ray, little of which was commercially developed.

Though he moved to Milwaukee and worked for Allis-Chalmers for a few years, he was otherwise based in Manhattan, working out of rented offices at various locations. He lived in hotels, including the Waldorff Astoria and the St. Regis, moving on to others, leaving unpaid bills. He ate most of his meals alone in Delmonico's, or in the hotel. Though asocial in his behavior in some ways, he also had close friendships, including with Mark Twain, who admired him greatly.

Starting in 1934, and lasting until his death, he was supported with a monthly stipend (or consulting fee) by the Westinghouse Company. In his final years he became a vegetarian, and spent much of his time feeding and nursing pigeons, in parks, and through his windowsill. He died, penniless, in 1943 at the age of 83.

His nephew eventually took his body and belongings back to Belgrade, where much of it remains as part of the Tesla Archives and Museum there, currently the only museum (open to the public) commemorating this remarkable man. ♦

BYTES AND DUST

THE IBM-SCAPE OF UPSTATE NEW YORK

The latest Google Earth view of Apple's new headquarters in Cupertino, the $5 billion, Norman Foster-designed circular infinite loop that is replacing the company's 1980s campus a mile away (with the better address: 1 Infinite Loop Road). The new building, on the site of a former Hewlett Packard campus, is called Apple Park. The circular main building, with a diameter larger than the Pentagon, is expected to contain more than 12,000 relocated Apple employees when it is fully operational in coming months. Google image

WITH THE OPENING OF APPLE'S new futuristic headquarters in Cupertino this year, it's perhaps timely to think about how information age corporate architecture is also dissolving, like its ultimate product, into the cloud of immateriality. While dense and expensive Silicon Valley seems to have developed a pattern of building on top of previous versions of itself in some kind of infinite loop of architectural erasure, computer company campuses in other places evolve, mutate, and decay on the landscape in other evocative ways.

Let's look at IBM in upstate New York, the company that arguably started it all. Before Big Blue was run by men in suits in the suburban corporate hinterlands of Westchester County, it was a machine company in the industrial city of Endicott, in upstate New York's Southern Tier. Though remote from major cities, this was an early innovative manufacturing corridor along the Chemung and Susquehanna Rivers, from Corning to Binghamton.

Endicott is where IBM started out a hundred years ago. The Tabulating Machine Company joined the newly consolidated Computer-Tabulating-Recording-Company, an amalgamation of businesses making things like meat slicers, scales, and employee time recorders. Business machines. (The company changed its name to IBM in 1933.)

Innovative punch card machines made by the Tabulating Machine Company in Endicott had been used as early as the 1890 US Census. By the 1930s, the US government became an even bigger customer, contracting IBM to manage employment records for millions of Americans for the Social Security Administration. Counting everybody began to really count.

In World War II the company built rifles, bombsights, and other armaments, and sprawled further through downtown Endicott, still the company's primary manufacturing location at that time, though the headquarters had moved to Manhattan by then. New manufacturing plants were built at Poughkeepsie, Washington DC, and in San Jose, California, to support wartime production in the Pacific region, one of the early computing seeds planted in the Silicon Valley. After the war, stimulated by wartime innovations in electronics, mechanical computing began to give way to electronic machines, and the federal government continued to fuel and fund developments in computing, dominated by IBM. The company built the Defense Department's SAGE system with MIT's Lincoln Lab, and AT&T, the continental early warning system that was the first large-scale electronic network. In 1961, just a few years later, IBM evolved that technology into the SABRE reservations system for American Airlines.

There are dozens of crumbling former IBM buildings in Endicott, New York. CLUI photo

The old IBM logo on buildings in Endicott, New York, where the company began. CLUI photo

In the 1950s and 1960s IBM perfected magnetic tape storage systems and hard drives, and electronic processors that became the standard mainframe and time sharing computers for government and big in businesses worldwide. IBM also invented the Selectric typewriter, which dramatically increased the typed output of American offices.

In the 1970s and 1980s, IBM innovations spread further from big businesses and government realms into commercial and consumer markets with automatic teller machines, personal computers, floppy disks, magnetic card strips, relational databases, and the universal product code (UPC) system—all IBM technologies. As the PC wars played out in the 1980s and 1990s, with IBM selling off its consumer printer and personal computer divisions (becoming Lexmark and Lenovo, respectively), the company lost steam, and lots of money. In ten years, 1985 to 1995, employment dropped from 405,000 to 225,000. Its constellation of manufacturing centers and campuses contracted. Communities, especially in upstate New York, imploded.

In the 2000s, the company reconfigured itself by leaving much of its hardware history in the past, and focusing on research, software, and software infrastructure, like storage and speed optimizing. IBM has become a major cloud computing and artificial intelligence firm, a kind of Silicon Valley-like company, consuming other emergent technologies, like Softlayer, which formed the basis of IBM Cloud Services Division. Today, with 380,000 employees working in 174 countries, IBM is back as one of the largest companies in the world. Now an IT service company, working primarily with software, it is increasingly virtual, too, leaving the world of the edificial hardware it made, to dissolve into the cloud, behind a burnished and legendary brand.

IBM's Hudson Valley Emanations

IBM has sites all over the country, from Austin, Texas; Raleigh Durham North Carolina; Rochester, Minnesota; and Silicon Valley, but as a company it definitely emanated from upstate New York, and principally the Hudson valley region.

IBM Armonk, NY

IBM Corporate headquarters, Armonk, NY. CLUI photo

The top of the pyramid of IBM is the corporate headquarters in Armonk, New York, just a few miles from the Westchester County airport, in rolling, wooded, mostly affluent residential countryside, peppered with golf courses. The company moved its headquarters here from Manhattan in 1964, to land it had purchased in the 1950s—a former apple orchard, surrounded by woods. Skidmore, Owings & Merrill built a formal modernist rectangle with an open atrium in the middle, next to a giant parking lot for the 900 or so executives and secretaries commuting to work. For more than 30 years, the building served as the administrative center for one of the most powerful companies in the world, with little in the way of upgrades, except a pyramidal gazebo-like entry structure designed by I.M. Pei in the mid-1980s. It is now known as the North Castle building, as it was replaced as the official headquarters by a new structure, built on the property in 1997. This is a zig-zagging postmodern building, with lots of glass, open floor plans, and an irregular footprint aligned with the terrain, surrounded by woods. It intentionally represented a departure from the uniform corridors of identical offices at the North Castle building, the old IBM modernism that had brought the company to hard times by the mid-1990s. The new building is still the current headquarters for the company, which gave up trying to sell the old building, and now uses it for additional corporate office space. Also on the property is the Learning Center, a training center with a few hotel-style residence buildings next to the corporate headquarters. The Armonk campus is a private place, with a number of gated entrances screened off from public view by rolling terrain and trees.

IBM Yorktown, NY

IBM Yorktown, NY. Google image

Eight miles northwest, across the Westchester terrain, past Hillary and Bill's house, the Trump National Golf Course, and the Saw Mill Parkway, is the Thomas J. Watson Research Center, at Yorktown Heights. This is the headquarters for IBM research, named after the founder of IBM, Thomas J. Watson, who was CEO from 1915 to 1952, and who was succeeded by his son, Thomas Watson Jr., who ran IBM until 1971. The building is a modernist crescent shaped structure with hundreds of windowless offices, designed by Eero Saarinen and completed in 1961. Like the corporate HQ, it is not open to the public.

IBM Research is often cited as the largest industrial research company in the world. It has a few other research campuses in the USA, including at Cambridge, Massachusetts, near MIT, focusing on cybersecurity, and AI; the Almaden Research Center in the hills above Silicon Valley, which opened in 1986; in Austin, Texas, established in 1995; and in Albany, New York, focusing on nanotechnology.

IBM Yorktown, NY. CLUI photo

IBM Somers, NY

IBM Somers, NY. Google image

Ten miles northeast of Yorktown, across the waters of the New Croton reservoir, is another IBM site, the 730-acre Somers campus, which housed nearly 3,000 IBMers from various divisions of the company, including Global Services, Software, and the Systems and Technology Group.

The campus was built from 1984-1989, and was designed by I.M. Pei, with four triangular pyramid-topped buildings connected to a rectangular pyramid-topped building. IBM sold it in 2016 to 294 Route 100, LLC (the address of the property) for $32 million. It is awaiting redevelopment and is gated, closed, and mostly empty at the moment.

Closed entrance of empty Somers site. CLUI photo

IBM East Fishkill, NY

IBM East Fishkill, NY. Google image

While IBM's executive and office campuses are in Westchester, upriver things get more industrial. 17 miles northwest of Somers, at East Fishkill, is a former IBM manufacturing site, where several thousand people once worked. When it opened in 1963, it was IBM's primary semiconductor plant. Severely downsized in the 1990s, now much of the plant has been taken over by Global Foundries, which purchased IBM's semiconductor business in 2015. They operate three chip plants in the USA, at IBM's former plant in Burlington, Vermont; at a massive new plant in Malta, New York, north of Albany; and here, where more than 2,000 people work still, making microchips.

National Resources, a firm that specializes in the redevelopment of former industrial sites, recently purchased 300 acres of the 460-acre site from Global Foundries. National Resources is expected to turn their portion of the property into an *iPark*, with a "branded, mixed-use, tech/flex redevelopment, with retail, hotel and residential components," as well as distribution and fulfillment facilities. IBM still leases space at the site too, as does Pentagon Technologies, eMagin, the New York Blood Center, and Greystone Programs, which operates an autism and developmental disabilities support center. The west side of the campus is a major hazardous clean-up area.

Part of the semiconductor plant at East Fishkill. CLUI photo

IBM Poughkeepsie, NY

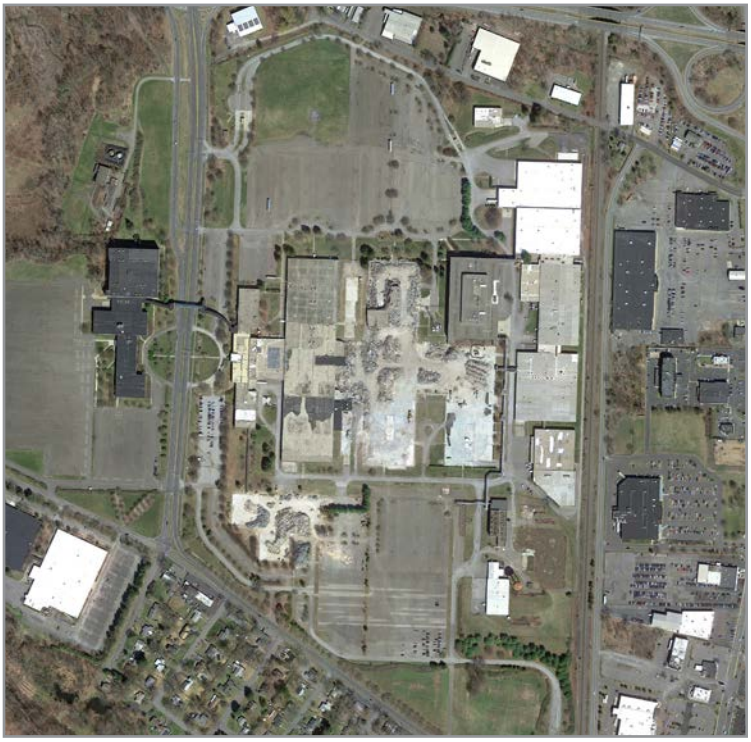
IBM Poughkeepsie, NY. Google image

While East Fishkill made semiconductors and other components, IBM in Poughkeepsie, ten miles further northwest, assembled computers, including the 700/7000 series, and many later famous mainframes. The Poughkeepsie plant is one of the company's largest and most historically important manufacturing sites.

The first part of the sprawling main plant was built in 1948, with wings added in 1952. With several more additions over the years, the plant grew to more than 50 buildings on 423 acres. Today though, many of the buildings are unused. Employment here is less than half of what it once was, and is now less than 3,000.

IBM Poughkeepsie, NY. CLUI photo

IBM North Kingston, NY



IBM North Kingston, NY. Google image

20 miles further up-river, the North Kingston plant was one of the three IBM manufacturing centers in the mid-Hudson, where more than 25,000 people were once employed overall. Unlike the other two, which stayed at least somewhat functional, IBM closed its North Kingston plant completely in 1995. Developers bought the 256-acre site, with 2.5 million square feet of empty indoor space, and starting in 1998 promoted it as Tech City. Now, after nearly 20 years, much of the site remains vacant and is being torn down.

Piles of bricks, blocks, and rubble of different textures are all over the former giant slab that was the floor of the main part of the plant, and are being ground up into aggregates of different composition and textures. This IBM plant has been reduced to its origins as earthen material, to be spread out across the region. Ashes to ashes, bytes to bits. ♦

IBM North Kingston, NY. CLUI photo

STATE OF THE RIVER
CONNECTICUTTING SOUTHERN NEW ENGLAND

The Connecticut River flowing out of the dam at the second Connecticut Lake, in northern New Hampshire. CLUI photo

THE CONNECTICUT RIVER IS THE Mississippi of New England, draining portions of five states and more than 11,000 square miles, twice the land area of Connecticut itself. Its headwaters is at the Fourth Connecticut Lake, a remote pond in New Hampshire, just a few hundred yards from the Canadian border.

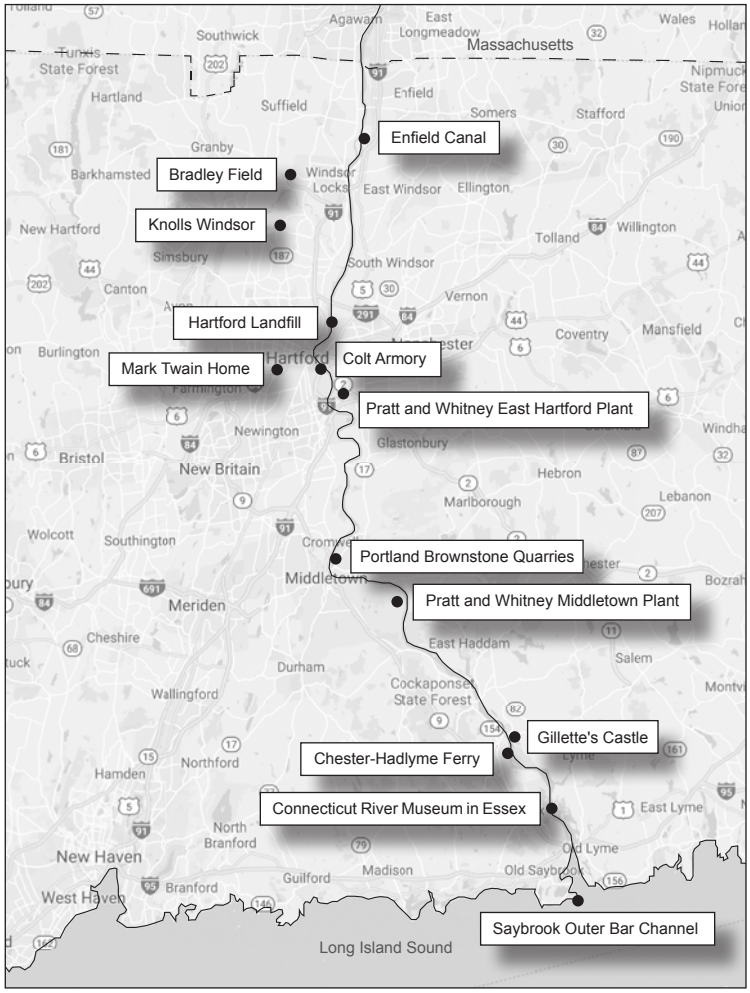
From there it flows though a series of dams and reservoirs, hydro projects in northern New Hampshire. At the 45th parallel, it becomes the great divide between Vermont and New Hampshire, until it enters western Massachusetts at Satan's Kingdom, a few miles downstream of Vermont Yankee's nuclear power plant. After powering spent mill towns and happy valleys of western Massachusetts, the river picks up the last of Springfield's effluent and enters Connecticut, its eponymous state.

The state of Connecticut was named after the river. A word that comes from the Mohegan/Pequot word *quinetucket*; it means (roughly) "long tidal river." And though the river has 15 dams along its 400-mile run, the last one is in Holyoke, Massachusetts, so it is indeed still tidal in all of Connecticut.

The river flows through the state as a lugubrious brown mass. A drain for much of New England's agricultural, industrial, and urban landscape, the river was so polluted by the 1950s that it was designated as class D water "suitable for transportation of sewage and industrial wastes and for power, navigation, and certain industrial uses." Efforts to clean it up were given a boost by the Clean Water Act of 1972, and the water is mostly class B now, safe enough to swim in, though nitrogen remains high.

Let's travel downstream through the state, looking at images and sites recently added to our Land Use Database, on the river that connects and cuts it—Connecticut.

Points of Interest along the Connecticut River



CLUI photo

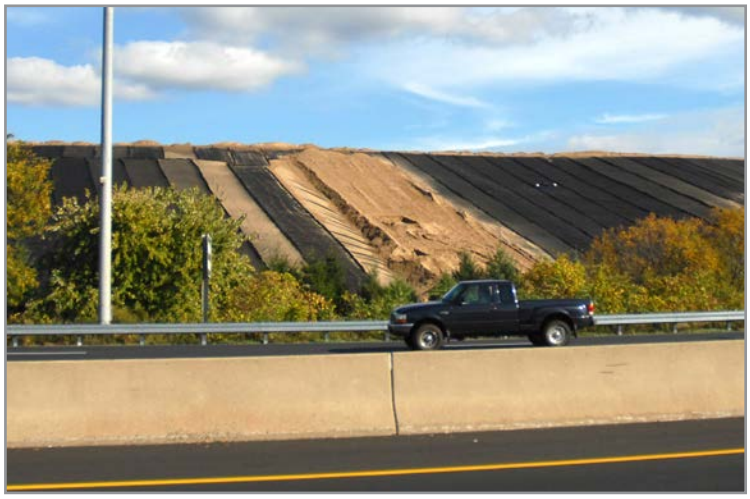
Enfield Canal

On the shoreline at Suffield are abandoned locks at the northern end of the Enfield Canal, built on the west side of the river in 1829 to allow commercial shipping further up the river, around the Enfield Rapids, a shallows still visible in the river's main channel. The canal runs for five miles to the town of Windsor Locks, at the Interstate 91 bridge. Though some of the towpath is operated as the public Windsor Locks Trail, the canal is off-limits, and controlled by Ahlstrom Nonwovens, a Scandinavian industrial fiber company that operates a mill complex at the southern end of the canal.

CLUI photo

Bradley Field

Windsor Locks is a town on the west side of the river, home of Bradley International Airport, the main airport for the Hartford area, and home of the New England Air Museum. UTC Aerospace Systems also has a major manufacturing plant here, making parts for military and civilian aircraft. The plant is a major and historic propeller factory, operated for years by Hamilton Standard, which through mergers and consolidations is now part of UTC Aerospace, which itself is a subsidiary of United Technologies, a major industrial conglomerate based in Farmington, Connecticut, with plants throughout the state.



CLUI photo

Hartford Landfill

The City of Hartford started burning trash here on the riverbank in 1940, and the site evolved into the main disposal site for the city. The incinerator operated here into the 1970s, and the landfill grew, becoming a highly visible mound next to the interstate north of downtown. It received its last load of waste in 2008, and efforts have been underway since then to isolate it from the environment, including covering it with plastic and a soil cap. There is also a smaller adjacent landfill for ash from the Mid-Connecticut Trash to Energy Facility, a newer and larger incinerator located on the river south of town.

CLUI photo

Knolls Windsor

Though only abandoned parking lots and building slabs remain visible today, this used to be a major nuclear training site for Knolls Labs. From 1957 until 1993, the Department of Energy operated a full-scale nuclear reactor prototype for testing and training of Navy personnel here, part of an industrial complex located along the Farmington River, in Windsor. The site was dismantled from 1995 to 2001, followed by environmental remediation which was completed in 2006, though some of the plant is buried in mounds, still off-limits to the public. The Farmington River runs south of the airport, and drains into the Connecticut River next to the lacrosse fields at the Loomis Chaffee Preparatory School.

CLUI photo

Mark Twain Home

Like Albany, New York, Hartford is also an up-river state capitol, and was settled in the 17th century, at the most inland point for commercial navigation at the time. Like many other cities, too, modern Hartford ignored its river in the 20th century. After World War II, as its economy moved from machine tool industries to insurance companies, dumps and interstates were built along its waterfront. In the 1870s, though, Hartford was among the nation's most affluent cities, and still a river town. This was asserted by the fact that America's most famous riverman, Mark Twain, built his 25-room dream home here in 1874, where, over the following 17 years, he wrote his most famous novels about the Mississippi River. His next door neighbor was the famous abolitionist and writer Harriet Beecher Stowe, whose house is preserved along with his as a historic site.

CLUI photo

Colt Armory

The Colt Firearms Company built its main manufacturing plant on the river at Hartford in 1855. Known as the Colt Armory, the multi-building complex was one of the principal industrial villages of New England, manufacturing famous firearms over the span of American history, from capturing the West, to the Civil War, to the Gulf War, as well as providing guns for police, security, and the public. The company moved its operations to other places over the years, including to a plant in West Hartford, which it still operates, and moved entirely out of this complex in 1994. State and local developers are hoping to preserve and redevelop the historic site, including the original central building with its distinctive blue and gold onion dome. Connecticut historically has been a center for the manufacture of guns. Though some have left (Winchester, Marlin, PTR), some are still based or manufacturing here (Colt, Ruger, Mossburg, Stag Arms).

CLUI photo

Pratt and Whitney East Hartford Plant

The headquarters and one of the principal testing and manufacturing locations for Pratt and Whitney is located in East Hartford, on the east side of the river. The company started as a local machine tool company, and evolved into one of the largest aircraft engine companies in the world. Pratt and Whitney is now part of the United Technologies Company, along with Otis elevators, UTC Aerospace Systems, and other military and industrial equipment manufacturers. United Technologies is based out of Farmington, near Hartford, and does more than $50 billion of business per year, and employs around 200,000 people worldwide. United Technologies' principal R&D and test facility is located next to the Pratt and Whitney plant.

CLUI photo

Portland Brownstone Quarries

The massive quarries at Middletown, located in the middle of the state, were a major source of brownstone for buildings all over the eastern USA, as early as the 18th century. Quarried stone was transported easily by boat from the riverside quarries. The pits filled with water in the great Connecticut River flood of 1936, ending most of the quarrying. Now owned by the city, the quarries have been leased to a company that has created a recreational water park at the site. Large fuel tanks line the strip of shore between the quarries and the river.

CLUI photo

Pratt and Whitney Middletown Plant

This plant, isolated on a remote stretch of the Connecticut River, is one of the major aircraft engine plants in the nation. It was established initially as a secretive federal jet engine test facility in 1957, and was transferred to Pratt and Whitney in 1966. Engines developed and produced here are used on most contemporary fighter jets (F-15, F-16, F-117, F-22, F-35) as well as most commercial airliners (Boeing 707, 727, 747, 777, Airbus 310, 320, 330). Pratt and Whitney is one of two American jet engine companies supplying the airlines and military aircraft of the United States. The other is General Electric, one of the largest industrial conglomerates in the world, which starting in 1974 was based in Fairfield, Connecticut. GE moved its headquarters to Boston in 2016, and now United Technologies, the parent company for Pratt and Whitney, is the largest company based in Connecticut.

CLUI photo

Gillette's Castle

Gillette's Castle is one of the more unusual private residences in the nation. It was built between 1914 and 1919 by William Gillette, an actor best known for playing Sherlock Holmes on the stage. He was involved in all aspects of its design, and it has a unique, hand-carved, rough-hewn texture throughout, evoking a fairytale hybrid of arts and crafts, Middle Ages castle, gothic church, and stage set. He lived there until 1937, and it was taken over by the state in 1943, which turned it into a park. In 2002 it reopened after a four-year $11 million renovation.

CLUI photo

Connecticut River Museum in Essex

By the time the river gets to Essex, it has widened into tidal marshlands, some of which have been carved into to create marinas, filled in for palatial homes, or preserved as wildlife areas. The town of Essex is one of the only towns left that is really integrated with the river. Main Street ends at a boat ramp, next to the Connecticut River Museum. The museum is in a former steamboat warehouse building on the waterfront. It contains many remarkable displays and artifacts related to the river, including a continuous painting of the river, which runs through the stairwell, along with a hundred or so aerial photos of points of interest along the river, commissioned by the museum and taken by the photographer Tom Walsh in 2009.

CLUI photo

Chester-Hadlyme Ferry

This is one of two active ferry crossings remaining on the Connecticut River. The Chester-Hadlyme ferry began here as a private ferry in 1769, and is now operated by the Connecticut Department of Transportation. The crossing closes for the winter, forcing people to cross on bridges at East Haddam, three miles north, or Old Lyme, ten miles south, for the season. The ferry has a capacity of around nine cars, and sees around 100 cars per day. The trip takes five minutes. The other ferry operating on the river is the Rocky Hill-Glastonbury ferry, near Hartford, which is said to be the oldest continuously operating ferry service in the USA, starting in 1655. Both were going to be shut down by the state in 2011, but locals lobbied to keep them open—so far.

Photograph by Tom Walsh, Shoreline Aerial Photography.

Saybrook Outer Bar Channel

The Saybrook Outer Bar Channel is the end of the Connecticut River. It is maintained at sufficient depth to permit vessels into and out of the river from Long Island Sound. Otherwise the sediment from the river drops where it meets the ocean, and makes an extensive shallow bar. This obstacle to navigation is what kept the mouth of the Connecticut from developing a major port city, like at New Haven, New London, and Bridgeport. 70% of the fresh water coming into Long Island Sound comes out of the river here, along with the sediment and effluent from a watershed that extends to Canada. ♦

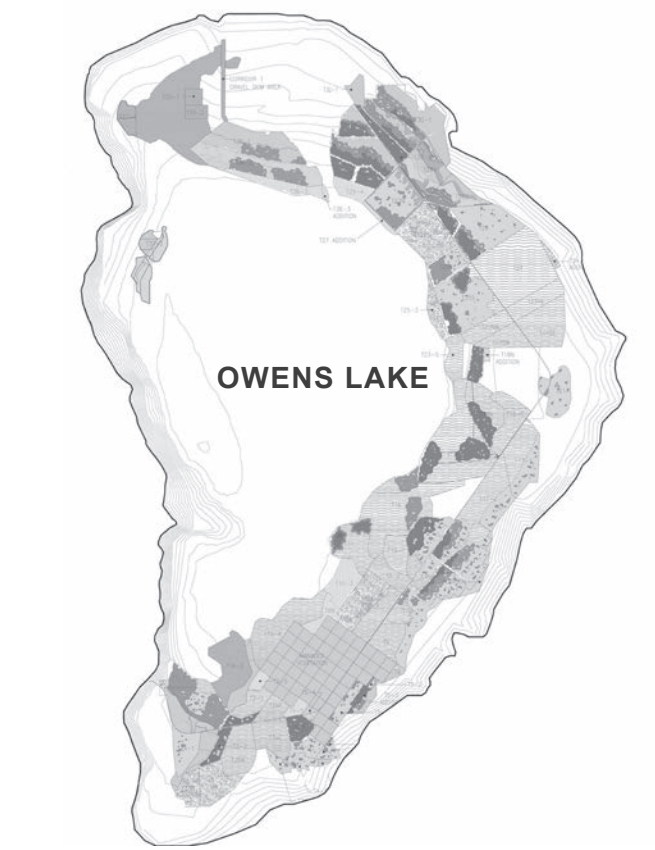
BEST AVAILABLE CONTROL MEASURES
OVERLOOKING THE NEW OWENS LAKE

FAMOUS AS THE LAKE THAT became a dangerous dustbowl after Los Angeles built its aqueduct a hundred years ago, Owens Lake has been transformed. Legally compelled into action, the Department of Water and Power has spent more than a billion dollars over the last 20 years, remaking a lake with as little water as possible.

The lake is now a constructed and managed landscape on an unprecedented scale, a cyborg, cubist version of a lake, fractured into fragments—gravel, grasses, tillage, furrows, wetlands, pools, shallows, depths, and islands—each engineered to perform a function, which collectively add up to make a lake that is acceptable to the future.

Though Owens Lake still doesn't look like much from the ground, a hazy white mass extending into the distance at the base of the eastern Sierras, its visage from above is something else, altogether.

The unique qualities of form and scale of this new terraformed landscape were shown in *Best Available Control Measures: Aerial Portraits of Owens Lake,* an exhibit of aerial video landscans made by the Center for Land Use Interpretation, as the DWP's construction project nears completion and enters the stage of perpetual maintenance. ♦



Map showing the dust control zones on California's Owens Lake.

This project was supported in part by a grant from the Andy Warhol Foundation for the Visual Arts, a grant from the City of Los Angeles, Department of Cultural Affairs, and with support from Metabolic Studio.

Zones T36-3, T36-2. Brine, shallow pond. CLUI photo

Zone T16. Curving tillage. CLUI photo

Zones T30-1. Managed vegetation, land art, shallow and deep ponds with islands. CLUI photo

Zones T16, T13-3. Shallow and deep ponds with islands, curving tillage. CLUI photo

Gravel blanket (adjacent to Zone T21). CLUI photo

Zone T1A-4. Sprinkler irrigation. CLUI photo

Zone T27N, T29-3. Sprinkler irrigation with intermittent ponds, non-uniform meandering ridges. CLUI photo

INTERMINABLE DESCENT

OVERLOOKING WATER BETWEEN LA AND OWENS VALLEY

THE LATEST CLUI EXHIBIT ABOUT the relationship of the city of Los Angeles and its antipode in the Owens Valley, titled *Best Available Control Measures: Aerial Portraits of Owens Lake,* included a self-guided tour presented on a touchscreen in the gallery and in a booklet, which people could take with them. This tour follows Los Angeles' water upstream, from the ocean to the Sierras, through a series of viewing points—overlooks—which provide a view of different water landmarks at various steps along the way.

The tour begins where the Owens Valley water's journey ends, at the city's main sewage plant, on the beach. An elevated platform nearby, the "Outfall Overlook," provides a view of the outfall pipes as they head out to sea from the Hyperion wastewater treatment plant in El Segundo.

Where the water meets its own: Owens Valley water finally heads out sea in a submerged outfall pipe at the Hyperion Treatment Plant. CLUI photo

The Hyperion Wastewater Treatment Plant is the head of the infrastructural delta at the end of Los Angeles' constructed watershed. Here the waters of northern and central California are processed for the last time and discharged out to the sea, after all their busy work being routed through the distribution systems, industries, washing machines, and kidneys of the citizens of the city. The sprinkler heads, on the ocean floor, at the end of the Y-shaped outfall pipe, five miles out to sea, is where the water meets its own, and reenters the hydrologic cycle.

Leaving the Los Angeles basin, we travel through the Sepulveda Pass to the next basin—the San Fernando Valley, and the next overlook—the Sepulveda Dam.

The Sepulveda Dam is a flood control structure on the Los Angeles River, a buffer to hold water and to keep other parts of the city from flooding. Behind it are golf courses and recreational areas designed to flood in a large rain event. The dam basin also contains the Tillman Water Treatment Plant, the principal sewage plant for the San Fernando Valley.

The Sepulveda Dam and the Tillman Water Treatment plant are frequent film location sites, often for dystopic sci-fi films like *Escape from New York* and some of the *Star Trek* movies, which have also used Owens Lake to play dried-up alien planets. CLUI photo

Unless it's raining, the treated effluent exiting the water plant is the primary source of water for the LA River. From this mechanical headwaters, the river runs through the dam and along its concrete course, leaving the Valley, passing Griffith Park, then heading past downtown Los Angeles to its delta: the Port of Long Beach.

It makes sense that the source of the LA River is the runoff of treated Owens River water in the San Fernando Valley, since the developers of the Valley were the primary beneficiaries of the Los Angeles Aqueduct. Starting in 1915, most of the Valley joined the City of Los Angeles, in order to have access to the LA Aqueduct water, doubling the size of Los Angeles in area. Today the Valley holds half of the city's population.

Our next overlook is at the north end of the San Fernando Valley, at the Van Norman Complex, at the bottom of Newhall Pass. The Los Angeles Aqueduct terminates at the Van Norman Complex, where Owens Valley water spills into the city after its 200-mile plus trip in pipes and canals through the desert. The water comes down its final drop across the highway at the Cascades, then enters two small power plants (one for each aqueduct), then goes to a water treatment plant for distribution into the city. Van Norman is at the city's northern infrastructural gateway, where long distance electrical lines from the Owens Valley and Columbia River enter the grid, and where the LAPD trains in a simulated version of the city, next to a reservoir covered in small plastic balls to help cut down on algae formation. The Department of Water and Power has a heliport here, and their helicopters make daily flights up and down the aqueduct and powerlines through Owens Valley.

The Jensen Treatment Plant and the Van Norman Complex, at the base of Newhall Pass, the water and power gateway at the city's north end. CLUI photo

The tour continues up the 14 freeway to the next overlook, on the edge of the Antelope Valley, the next basin. This is an official overlook next to the highway, the Lamont Odette Vista Point, named after a local newspaperman. It provides a great view for motorists entering the desert from the city of Los Angeles, less than an hour away. Beneath the overlook is Lake Palmdale, part of the water supply for the city of Palmdale, fed by the California Aqueduct, which is also visible, bringing water from Northern California.

A watery view of the Antelope Valley desert, from the Lamont Odette Vista Point. CLUI photo

Lake Palmdale sits in the San Andreas Fault, which has a distinct rift zone that defines the southern edge of the Valley. Beyond is the city of Palmdale, with its airport, surrounded by the hangars of the aerospace companies at Plant 42, a major manufacturing center for military aircraft. This industry, and the community spurred by the work it provides, exists here because of imported water.

A few miles up the 14 freeway, to the bottom of the Antelope Valley, is our next overlook, the Lancaster Water Treatment Plant. The plant cleans wastewater from the city of Lancaster, most of

which is water coming from Northern California through the State Water Project aqueduct, before passing through the region's homes and businesses, and ending up here.

The partially treated water from the plant is used to fill ponds and irrigate crops. Some of it sustains the Paiute Ponds, a marsh next to the plant. The marsh is at the end of the original drainage system for the region, Amargosa Creek, which terminates in Rosamond and Edwards Dry Lakes. These flat lakebeds at the end of the drainage basin were used as airports for experimental aircraft, which developed into Edwards Air Force Base, the nation's primary aviation test site.

Continuing upslope and upstream leads to Mojave, a crossroads town in the Mojave Desert, dominated by aerospace, windmills, railways, highways, mining, and chemical industries. It is also the base for DWP's Aqueduct Division's Southern District headquarters, where approximately 65 employees operate and maintain the 160 miles of the aqueduct system between Los Angeles and the Haiwee Reservoir, at the south end of the Owens Valley. Across the highway is Mojave Airport, a major storage site for grounded airliners, and one of the few civilian spaceports in the country. Cement plants nearby provided the rivers of concrete required for the aqueduct, and continue to supply the region.

Our next overlook is at the north end of the valley, at Jawbone Canyon, where amidst the busy off-highway recreational vehicle area is the largest of the pressurized tubes dipping into and out of the canyons along the Los Angeles Aqueduct (8,095 feet, with a 850 foot drop), notable also for having burst in freezing weather in 1988. A few of these siphon points are visible along the course of the original LA Aqueduct—the largest single water project in the world when it was built in 1913, especially remarkable for being gravity powered for its entire 226 mile length. In order to flow through valleys, the aqueduct is contained in steel pipes, using the pressure developed in the down slope to force water through the up slope.

There is a visitor center at the turn-off from Highway 14, with displays and books about the region. It is operated by Friends of Jawbone, an off-highway recreational vehicle promotion and information group. Heading further up the road you come first to the 1970 aqueduct pipe, then, in another mile or two, the 1913 aqueduct, next to a DWP caretaker compound.

From the visitor center you can see, in the distance, trees lining the huge Honda test track, and extensive new photovoltaic arrays. Leaving the visitor center, continuing north, Highway 14 passes through Red Rock Canyon, where the land takes the next step upwards.

The next basin is Indian Wells Valley, and our overlook here is next to the highway and the Indian Wells themselves, a natural spring on the hillside overlooking the desert of Inyokern, Ridgecrest, and China Lake Naval Weapons Center. Years ago, a resort was established here for people to take the waters, but now the spring is used as the source for the Indian Wells Brewery, located here, which makes Lobotomy Bock, Mojave Red, and Sidewinder Missile Ale, referencing the decades of past and current missile development in the valley below.

Continuing north, out of the valley, the highway rises to meet a little lake called Little Lake, which once had a hotel and resort, now all gone. In another couple of miles is the turn off to the next overlook, Fossil Falls, at the base of a big cinder cone.

At Fossil Falls you have to imagine the water. **CLUI photo**

Fossil Falls is a remnant from a dynamic earth, when volcanoes spewed and melting mountain glaciers kept the Owens River flowing south, out of Owens Lake, and through fresh lava (as recently as 10,000 years ago) creating these strange waterfalls, now dry. Above the falls is Red Hill, a pile of ejected cinder, now mined to make building blocks in Los Angeles. Geothermal springs and earthquake lakes can be found throughout this region, where large-scale non-human forces still lurk, until the next intersection of human time and geologic time.

Our next overlook is at the Haiwee Reservoir, where the double barrels of the Los Angeles Aqueduct are loaded, they say, as both the 1913 and the 1970 aqueduct projects flow out of it, emerging from under its dam as separate aqueducts and pipes for the rest of their journey to Los Angeles. The Haiwee is a fulcrum, marking a transition from water supply—the Owens Valley, to consumption—Los Angeles, a non-stop 200 miles away (for the water). The original settlement of Haiwee was displaced when the reservoir was constructed.

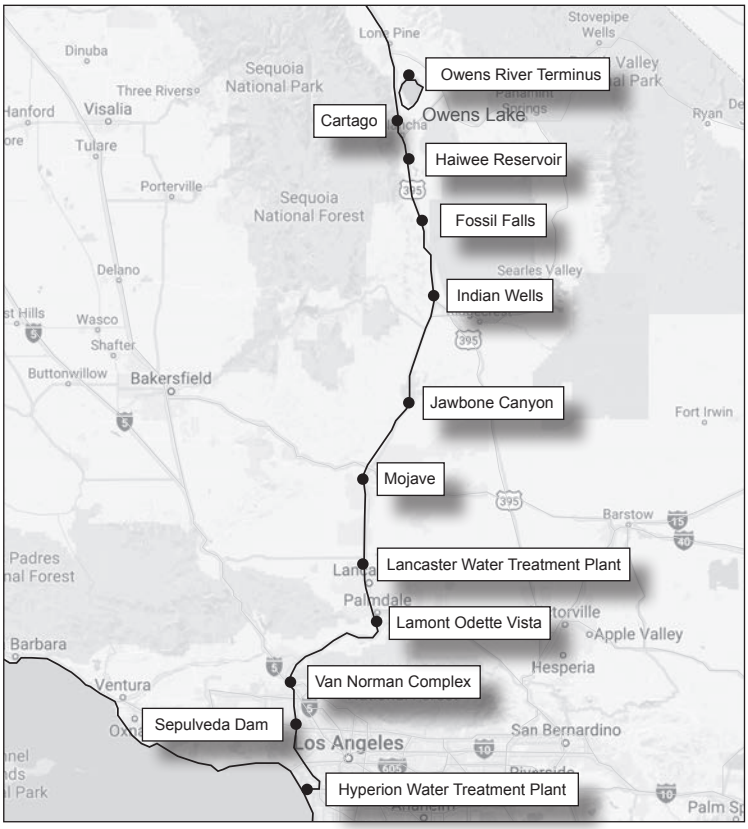
Our next overlook is from the top of a pile of potash at the town of Cartago, overlooking the southern end of Owens Lake, near the big sheds of the Crystal Geyser bottling plant, a major source for bottled water in Los Angeles.

Cartago is the former port on the southern end of Owens Lake, where silver and lead bullion from mines and smelters on the opposite shore, at Cerro Gordo, Keeler, and Swansea, came by boat to meet wagon teams which took it south from here to Los Angeles. Once connected by trade, the port communities of Cartago and Los Angeles are now connected by the Aqueduct.

After the lake dried up, Cartago ceased to be a port, and became an industrial site for the processing of potash drawn from the exposed lakebed. Next to the stack of potash, the plant is now a ruin of concrete foundations looming over the former port, which evokes its namesake, the ancient city of Carthage on the southern coast of the Mediterranean Sea.

The final overlook is the pumping plant at the north end of Owens Lake. The Owens River terminates here, where it enters Owens Lake. Upstream, the water flows out of Sierra snowpack, and passes though dams, power plants, aqueducts, and culverts, with most of it diverted into the Los Angeles Aqueduct before it gets to the old riverbed. In an effort to restore the habitat along this lower end of the river, some of the aqueduct's water is diverted back into the river channel, then removed again at a pumping station here. What remains in the riverbed trickles under the road, and fans out, to evaporate in the flats of the dry lake bed.

From this point, at the pump station and delta of the Owens River, you can continue east on a new road called the Brady Highway, named after James Brady, the builder of the first boat to ply the waters of the lake nearly 150 years ago. The road makes a long arc around the eastern side of the lake, and has a few new overlooks and wildlife viewing areas, while passing the pumps, berms, pipes, ponds, tillage, sprinklers, gravel fields, plastic lining, and monitoring facilities built on the lake to control the dust. You can drive the road all the way back to Highway 395, where it hits pavement again at the entrance of the Rio Tinto mining road, just north of Cartago. From there you can head south, 200 miles back to Los Angeles, with Owens Valley water flowing next to you the whole way. ♦



Los Angeles to Owens Lake, a 200-mile trip upstream. CLUI map

The end of the Owens River is the beginning of Owens Dry Lake, at the pumping station that lifts the water back into the Aqueduct. CLUI photo

DESERT RAMPARTS

continued from first page

The headworks of this system are a battery of bulwarks that ring the city at its outermost edge, beyond which little is built. These basins, dams, and dikes, some several miles long, divert the overland flow, which can come from any direction, and funnel it into the drainage system.

These outermost structures are in some ways like the walls of a medieval city, built to protect the populace within. In this incarnation these monumental forms of mounded rock and concrete, massive sculptures of aridity and stasis, are at a scale beyond human form, constructed as they are to isolate a city from its environment.

In 2017 the CLUI produced two exhibits about these constructed landforms, which though recently constructed for utilitarian reasons, can resemble the ruins of an ancient civilization. These exhibitions, comprised of aerial video, photographs, text, and maps, generated by the CLUI, were shown at CLUI Los Angeles and the University of Nevada, Las Vegas. ♦

One exhibit, shown at CLUI Los Angeles from July 7 to September, 17, 2017, was titled *Desert Ramparts: Defending Las Vegas from the Flood*, and featured static-kinetic drone video of peripheral basins and dams. A second version, pictured here, was shown at the Donna Beam Gallery at the University of Nevada, Las Vegas, September 19 to November 10, 2017. UNLV photo

DESERT RAMPARTS
Protecting Las Vegas from the Flood

These large-scale structures at the outer limits of the city are the first line of defense against flash floods, which can come from almost any direction, out of the hills and canyons surrounding Las Vegas. Ideally, in a flood event, debris is contained in these outer basins, and water is funneled into concrete channels and flows through the city. The network converges on Las Vegas Wash, which drains into Lake Mead.

1 North Las Vegas Detention Basi

2 Upper Las Vegas Wash Detention Basin

CLUI photo

3 Upper Las Vegas Wash Diversion Structure

CLUI photo

4 Kyle Canyon Detention Basin

CLUI photo

5 Anne Road Detention Basin

CLUI photo

6 Gowan Lone Mountain Drain

CLUI photo

7 Detention Basin #5

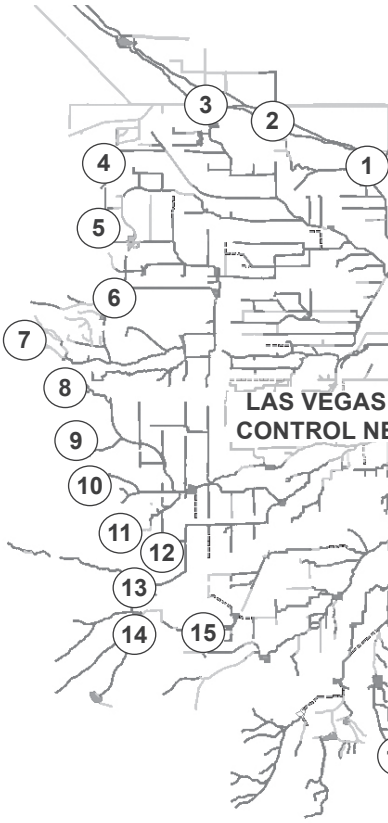
CLUI photo

8 Red Rock Detention Basin

CLUI photo

9 R-4 Detention Basin

CLUI photo

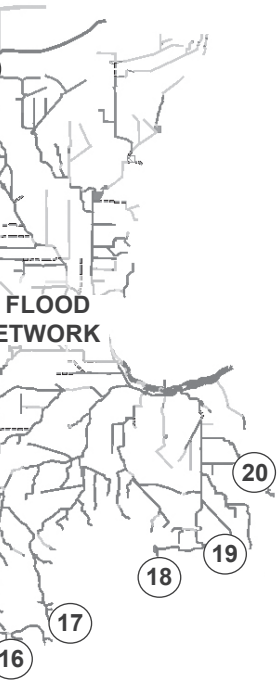


This flood control system map shows
over the past three decades, and the
fringes. The master plan for this netw
than 800 miles of channel and 121 de
cost of more than $2 billion. This plan
modifications and additions are likely,

10 F-1 Debris Basin

n

CLUI photo



the channels and basins constructed
proposed extensions further into the
ork currently calls for a total of more
tention basins to be constructed, at a
is more than 80% complete; however,
as the city continues to expand.

CLUI photo

19 Mission Hills Detention Basin

CLUI photo

17 Pittman Anthem Detention Basin

CLUI photo

15 Duck Creek Warbonnet Channel

CLUI photo

13 Upper Blue Diamond Detention Basin

CLUI photo

11 F-3 Detention Basin

CLUI photo

20 East C-1 Detention Basin

CLUI photo

18 Black Mountain Detention Basin

CLUI photo

16 Headworks Detention Basin

CLUI photo

14 Upper Duck Creek Detention Basin

CLUI photo

12 F-4 Debris Basin

CLUI photo

THERE IS SOMETHING ABOUT NEVADA
THE MOST/LEAST URBAN STATE

TO THINK THAT A CITY stops at the edge of its statistical metropolitan area, or its flood control ramparts, disregards the fact that most of what makes and sustains a city actually comes from somewhere else. The whole nation is, in a sense, a continuous urban space. Sometimes there is density, sometimes not, but it is all connected and inter-dependent.

That said, it is interesting to note that Nevada, by some ways of measuring, is the most urban state in the Union. Close to 95% of the 3 million people who live in the state live in either the Reno or Las Vegas metro areas—two cities that take up only 2% of the land in the state. Nevada is the state with the most amount of its people living on the least amount of land, making it the most urban state and most rural state at the same time.

This is one of the many paradoxes of the place. On one hand it is the most open state in the Union: 85% public land, owned and operated for us all by the Bureau of Land Management. Those fences running along the highways are there just to keep the cows off the road. Go ahead and open the gate, head on out into the landscape, and feel the freedom of your shared American land (just close the gate behind you, pardner!).

On the other hand, the state has the largest and most secretive restricted areas in the nation—go through THAT gate, pardner, and your freedom is likely to diminish considerably. This is the result of the fact that in the old days of the homesteading acts and such, they couldn't even give away much of Nevada's arid land (except to railroads and miners). The Federal Land Office ended up with so much land it had to create a new agency to manage it—the beloved and dreaded BLM.

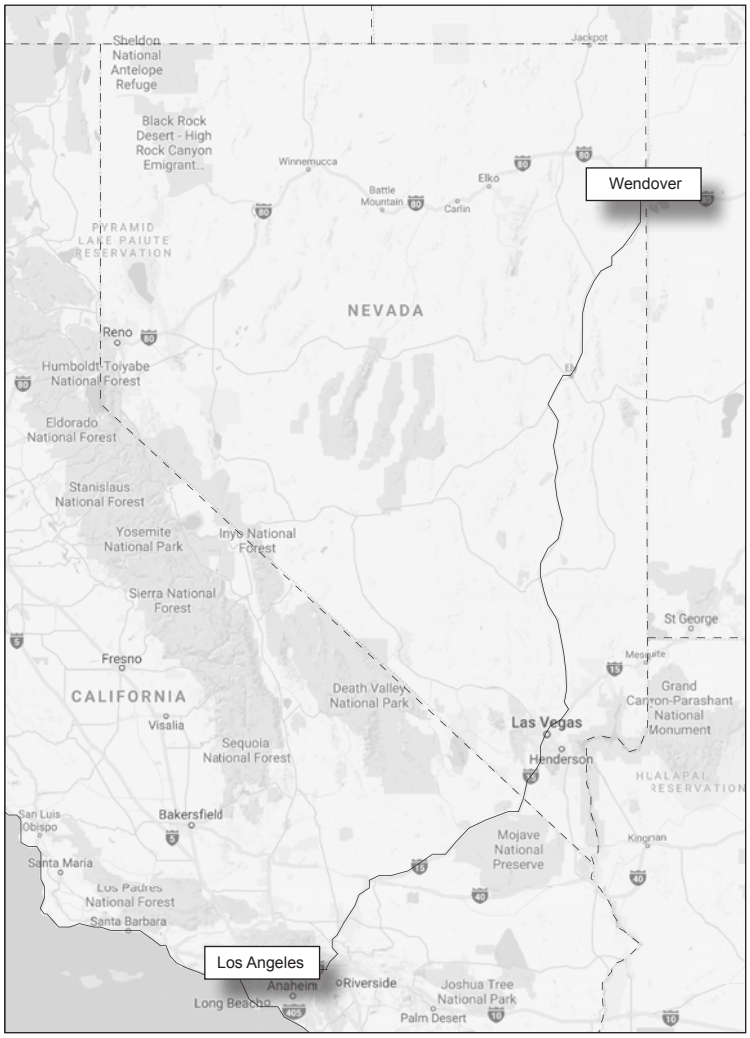
Just as post-World War II development spread across the nation, making urban space more valuable, emptiness too became a valuable commodity. As Southern California boomed in one way, with endless suburbs fillings its basins, Nevada boomed in the other, more literal direction—with the Nevada Proving Ground, ultimately home to a thousand nuclear tests, and the surrounding Nellis Range, still the largest restricted area in the nation.

Though the military testing, training, and storage grounds in Nevada serve the nation at large, Nevada's relative emptiness is now a resource for more regional urban demands.

Its proximity to the largest population centers of the west (23 million people in Southern California, and 10 million more in the Bay Area and Sacramento), make Nevada's inexpensive land and permissive development atmosphere irresistible—especially for industries that are being fed by internet economies, whose logistics and space needs are based on massive recalibrated scales that spill over the fulcrum of mountain passes and state lines. ♦

NEVADA END TO END
AN INTERPRETIVE ROAD TRIP TO WENDOVER

For more than 20 years, members of the CLUI have been driving back and forth between Los Angeles and Wendover, a little city on the edge of the Bonneville salt flats, where since 1996 the CLUI has maintained public display and information facilities, and supported creative interpretive projects through regionally and thematically focused research partnerships. The most direct way to Wendover is 630 miles, and takes around 11 hours, with a quick stop for lunch. Though there are a few routes that get you there, all require traversing the length and/or width of Nevada.



FROM THE CENTER'S CULVER CITY office it's just a couple of blocks down Venice Boulevard to hop on the interstate system, I-10 eastbound, which takes you through downtown LA and across the width of the city to Ontario. Then I-15 north over the Cajon Pass into the high desert, a transition marked by an old diner that burned down in 2016, but whose sign remains: the Summit Inn. One of a few now-gone landmarks marked along the way.

For this first part of the trip, imagine Los Angeles as a big wad of gum in your mouth. Reach in there and pull part of it out, and keep pulling, as far as you can. That part in your fingers is Las Vegas. The thin strand between them is Interstate 15 through the Mojave, a narrow strip of urbanity. The desperado highway—it even has its own radio station.

40 miles past Summit Inn is the outlet center at Lenwood, just before Barstow, with a large cluster of franchises before the retail desert begins, a hundred miles through the heart of the Mojave, alleviated only by Baker, where the Mad Greek overlooks the Tallest Thermometer and the Alien Fresh Jerky guy hopes to build his UFO Hotel.

At the next transitional lip of the land is the rare earth mine at Mountain Pass, a big pit and chewed up landscape on the north side of the Interstate. Rare earth elements are essential to many precision electronics, including cell phones, and Chinese companies dominate the industry, controlling 90% of the market. Mountain Pass is the only rare earth mine in the USA, and it seems to open and close following China's manipulation of the market. After a big ramp-up and modernization program, Molycorp reopened the mine in 2012, then closed it in 2015, undercut by low rates for Chinese product. Unable to continue to pay off its modernization, Molycorp declared bankruptcy. The mine was bought at auction in July 2017 by a Chinese-led consortium, which may open the mine again in the future, depending on US regulatory decisions.

From the pass, the highway plunges into the Ivanpah Valley and crosses a big dry lake at its bottom. The scene is dominated now with the surreal sight of the Ivanpah Generating Station, the largest solar power tower-type energy plant in the country, with three large towers lit up to searing white hot on their tops by rings of thousands of sun-tracking mirrors. Next to that is the Primm Valley Golf Club, on the site of a former gas-fired power plant, erased years ago. Next to that, a new photovoltaic power plant, generating another 100 megawatts, when the sun shines.

On the other side of the interstate, out in the middle of Ivanpah Dry Lake, is a fenced-off oval, enclosing nearly a thousand acres of playa. For years this was the waste pond for the rare earth mine at Mountain Pass, draining to this lowest point via a pipeline from the mine several miles away. Toxins built up in the pond, including radiation from the uranium-heavy minerals at the mine, and ultimately drainage was stopped. The site was partially remediated, but remains off limits, a no-man's land basin at the core of a bigger basin. This is the end of California.

Welcome to Nevada

The north end of Ivanpah Dry Lake crosses the state line with the interstate on top of it, at Primm, Nevada, where the only development on the California side of the line is the California state lotto store. When the lotto prize climbs into the hundreds of millions, as it seems to a few times a year, a strange reversal of normal gambling vectors occurs, with so many Nevadans lining up to buy lotto in California that a line extends across the state line back into Nevada.

Excuse me, your Cadillac's on fire. CLUI photo

Past Primm, with its Buffalo Bill rollercoaster and the Bonnie and Clyde Death Car at Whiskey Pete's, and its echoes of Jean Baudrillard's mumbled Semiotext(e) performance there at two in the morning in 1996, it's another 12 miles of empty interstate to the next residence-less community at Jean, with its recreational airport used by gliders and skydivers, Gold Strike Casino, and a minimum security state prison camp. Here 240 women are doing time, occasionally dispatched to fight fires and clean up highway trash, across from a plastics and paper packaging plant, the only industrial business in Jean, a plant which possibly made some of the very trash they are dispatched to pick up from the highway.

Across the interstate is a big flat pad, behind a Terrible Herbst gas station, where Nevada Landing, a large casino shaped like a sternwheeler riverboat, once stood. It disappeared nearly overnight in March 2008, torn down by its owners, MGM, though there is hardly any reason now to remember it. Its large sign remained next to the highway, by itself, for more than a year after the desert ghost ship sailed off.

Interstate 15 continues north, past Ugo Rondinone's *Seven Magic Mountains* sculpture. The sculpture is on a road that parallels the interstate, a road that is the nascent Las Vegas Boulevard, emerging out of the dirt next to the highway, becoming paved, on its way to becoming the axis along which the largest hotels in the world hang like gargantuan baubles on the string of the Strip.

The first signs of the city advancing is at Sloan, where one of the main sources of aggregate for the region is seen reducing a mountain north of the highway, and where a new Army Reserve Center has a yard full of well maintained new vehicles, ready to go. Next to the highway is a recreational speedway, where the public can drive a Lamborghini or a Ferrari as fast as they can, for $79 per lap. Then the highway, with Las Vegas Boulevard still riding shotgun on its right, curves left, to align with the Cartesian grid, due north, for its run through the first half of the Las Vegas Valley. Though some people disparage elevated freeways through urban areas, sometimes, such as in Las Vegas, they are just the right thing, and you wish there were more of them, flinging people around at great speed, soaring among the strange buildings, as if in a futuristic flying pod at an amusement park ride connecting amusement parks. So long as the freeways stay free, and provide a quick exit when the time comes to go.

North of North Las Vegas

Along the Interstate 15 corridor north of Las Vegas, the residential tapers off into an industrial and logistical zone, with the usual truckyards, junk yards, food distribution centers, and prisons. Also along here is the Department of Energy headquarters, and Nellis Air Force Base, with their engineering contractors and fuel depots, and another large National Guard readiness center.

Tubes under looped track at Las Vegas Motor Speedway. CLUI photo

Entrance to Hyperloop One development site. CLUI photo

Things changed a couple of decades ago at the northern end of the corridor, with the development of the Las Vegas Motor Speedway and related specialty automotive companies—one of the largest contiguous expanses of asphalt in the west, more than a full square mile of parking, which continues across the interstate with an automotive auction lot more than a mile long with space for more than 10,000 cars.

The speedway (owned by a company based in Charlotte, North Carolina, NASCAR ground zero) is also the location for the Electric Daisy Carnival, the largest electronic dance music festival in the country, held annually in the early summer, with as many as 350,000 people raving over three days and nights, in a massive conflation of heaven and hell.

Further north up the interstate is the Ritchie Brothers equipment auction lot, marking the outer edge of the sprawl of many urban centers of the nation, after which one arrives at a remote and remarkable industrial development on the rim of the bowl of the Las Vegas valley—a place aptly named Apex.

Apex has a Georgia Pacific wallboard plant that plasters Las Vegas, next to a major limestone mine and plant operated by Lhoist, a Belgian mineral conglomerate. Across the highway is the main landfill for Las Vegas' municipal waste, operated by Republic Services (the smaller of the two giant waste hauling and disposal companies operating throughout the USA). Republic Services has nearly 200 active landfills across the country, but the landfill at Apex, at more than 2,000 acres, is said to be the largest active landfill in the country.

Heading to Wendover, one turns off Interstate 15 at the Apex Exit, (in front of the entrance to the dump) and heads north on the two-lane blacktop Highway 93, into Apex—yet another large Nevada settlement without a single residential building. The highway passes through an electrical production center, with four separate gas fired power plants (the Harry Allen, Silverhawk, Apex, and Chuck Lenzie generating stations), spurred into production by the fake Enron energy crisis, and three industrial scale photovoltaic solar power plants, one of which covers more than two square-miles.

The grounds of a former Kerr McGee rocket fuel plant and propellant storage facility are being redeveloped into more industrial park space. A portion of the property was developed into the Blue Oasis shrimp farm, intended to supply some of the 20 million pounds of shrimp that are consumed in Las Vegas annually, 90% of which comes frozen from Asia. The operation closed in 2012 after a year. On the edge of the site is a major test and development area for a hyperloop project. Hyperloops, of course, are large diameter vacuum tubes, which propel pods inside them by air pressure, at very high rates of speed. Similar to the pneumatic tube system still found in some large retail operations, where capsules are used to move cash to and from cashiers, hyperloops upsize this technology to move people, as well as goods, inside the pods. While this sci-fi steampunky notion has been around for a while, it was revisited as a possibly viable technology a few years ago by Elon Musk, who proposed building a 350 mile-long hyperloop to connect northern and southern California, sending travelers through the tube at speeds exceeding 600 miles per hour. Though he built some test facilities at his SpaceX plant in Hawthorne, California, several other companies have emerged to commercially develop the technology, and are now in the early stages of projects in Europe, Asia, and the Middle East.

Hyperloop One's test site at Apex is the longest full-scale tube in the country, and is getting longer. CLUI photo

With two test areas and a 1,500-foot-long full-scale tube section, this site at Apex is currently likely the largest test site for a hyperloop system in the USA. It completed its first full-scale test run in May 2017. Richard Branson, whose Virgin brand operates an airline and is developing the commercial space flight center in New Mexico (and whose private Virgin Island was Obama's first stop after the presidency), recently joined the team of investors, and the Apex project is now known as Virgin Hyperloop One, and is based out of Los Angeles.

The sign at the entrance of Coyote Springs, when being built in 2008. Ten years later the sign remains one of the few completed parts of the project. CLUI photo

Heading north on Highway 93 from Apex, one gets a sense that there is a lot of space yet to fill in Nevada. In 25 miles though, this impression is challenged with the huge sign and earthmoving projects at Coyote Springs.

In 1988, the BLM transferred around 40,000 acres of open land here to the Aerojet Corporation, in exchange for protecting 5,000 acres of land the company owned in the Florida Everglades. Aerojet originally intended to build a rocket manufacturing and testing site here, but instead it sold the land to developers to make a planned community. It was to be one of the largest master-planned developments in the nation, with 160,000 homes, schools, casinos, and retail, ultimately covering 65 square miles of virgin terrain, costing upwards of $30 billion to build. So far though, no houses have been built.

The golf course, designed by Jack Nicklaus, opened in 2006, but the rest of the development has been stalled due to financial problems, political corruption charges, and challenges from environmental groups. Water distribution and flood control structures continue to be installed, including a two-mile-long upslope flood control basin to protect the development from flash floods (which have occurred here in dramatic ways, even in the past ten years). The green and watered holes of the rambling golf course are surrounded by a network of terraced and leveled house sites, as if watering the course would somehow grow the houses too. It's no doubt a strange empty place to play the game.

As if the region weren't tubular enough, sections of precast drainpipe sit around the Coyote Springs development, awaiting burial in flood control channels. CLUI photo

Ten miles further north through open land on Highway 93, the Great Basin Highway, another curious development comes into view on the west side of the road, the Western Elite Landfill, another major landfill for the Las Vegas region. While the big Republic pile at Apex takes household trash from the city, and is open to the public, Western Elite is, as its name implies, more exclusive, only taking industrial wastes from previously approved haulers. Though it is an hour away from the city, it is the primary landfill for Las Vegas' construction debris. It also accepts tires, shredded vehicle residue, asbestos, and grease traps.

As Las Vegas' primary construction waste site, the Western Elite Landfill is where many demolished casinos end up. The fence of the mile-long perimeter of the site is salvaged neoclassical railings from a demolished Las Vegas casino. CLUI photo

15 miles further up Highway 93, the highway enters the surprisingly wet Pahranagat Valley, a narrow wedge of green with lakes, trees, and agriculture, surrounded by the sagebrush ocean of Nevada. The green corridor extends for 30 miles through Alamo and Ash Springs, where hot spring pools lurk in the bushes next to the highway.

The ET Fresh Jerky stand at the otherwise empty crossroads at Crystal Springs continues the legacy of Alien Jerky, which started here before moving to Baker, California. Before that, this was the location of the "CIA Bar," a watering hole that operated in the 1980s, allegedly used by intelligence agencies to monitor the after work chatter of workers from nearby Area 51, to make sure secrets were not spilling out of lubricated mouths. CLUI photo

North of Ash Springs the two-lane highways of southeastern Nevada converge/diverge at Crystal Springs, where 93 heads east through Caliente before heading north again to Pioche, and 375 heads west, past the back door to Area 51, near the fabled black mailbox, and through the town of Rachel, where the Little A'Le'Inn bar and restaurant has been serving UFO tales and tourists for more than 25 years.

Going to Wendover, though, we'll take Highway 318 north from Crystal Springs, continuing up the Pahranagat Valley, past alfalfa farms, whose central pivot irrigation make partial circles like pie charts, through Hiko, a town marked just with a post office. The next retail opportunity on this route is north of Lund, 100 miles up the road.

Ten miles north of Hiko is a turn-off onto Seaman Wash Road, a dirt road that leads to Garden Valley, 30 miles further, where the artist Michael Heizer has been building his *City* complex since 1972. The mile and a half long artwork is now part of the Basin and Range National Monument, a 704,000 acre wilderness area established by President Obama in 2015. Eventually *City* will be open to the public, but for now it remains off limits, behind a locked gate—the Area 51 of Land Art.

The new sign for Basin and Range Monument on Seaman Wash Road. CLUI photo

The new sign has already been embraced by the community with a bullet hole on its graphic horizon. CLUI photo

Highway 318 then enters the White River Narrows, where the road winds along the bottom of a steep canyon, walled in on either side, and covered in Native American rock art, if you know where to look. No water is to be seen, either, it's a relic of river.

Coming out of the narrows, the landscape widens into the White River Valley, with just a few ranches and one roadside rest for 60 miles, until the speed limit drops precipitously to 25 miles per hour to pass through the small village of Lund, an old Mormon agricultural town of around 250 people, north of which is the first gas and retail since Ash Springs, more than 110 miles away.

Some of the creative graffiti at Halstead's that has been popping up at abandoned sites around Nevada and Southern California, created by Thrashbird, a street artist based in Los Angeles. CLUI photo

It's just a few miles further to the northern end of State Route 318, where the road ends at a T at Highway 6. Like many remote intersections in Nevada, this one has a few abandoned buildings that once served travelers on the road. This intersection had a small bar and restaurant, Halstead's Blackjack Inn, now covered in curious graffiti.

Highway 6 is a road even more lonely then Nevada's official Loneliest Road, Highway 50. West on Highway 6 is a 170 mile stretch between Tonopah and Ely without any retail opportunities at all, let alone a gas station, even though along the way you pass by Nevada's only oil refinery, in the Railroad Valley, where, in a pinch, they have been known to help the occasional desperate traveler running out of fuel.

We, however, are heading east on Highway 6, to Ely, 20 miles away. The road climbs up the Egan Range, into pinyon pine forests peppered with old mines. Along the way the two-mile-wide empoundment dam for the tailings from the five-mile-wide mining operation at Ruth becomes visible. Ruth has been mined since 1868, when an early prospector named Thomas Robinson found gold. The mine, which still bears his name, evolved into a massive underground operation run by Kennecott Copper, which became an open pit around 1950. Ore was hauled by rail 13 miles away to the smelter at McGill. Kennecott idled the mine and closed the smelter in the early 1980s.

The copper mine at Ruth, now nearly five miles wide. CLUI photo

The mine was bought and reopened by BHP in the 1990s, though by then the railway and the smelter at McGill were gone. Copper from this mine is now processed to around 70% ore in an in-pit refinery, then is trucked on the highways by a continuous convoy of oversized dumptrucks running 24/7/365, 130 miles to Wendover, where it is placed on to rail cars and taken to Vancouver, Washington, then across the Pacific by ship to China, where it is further refined into copper to help wire up that country.

Little of this is immediately apparent in the town of Ely, a county seat and ranching center, where Highways 50, 93, and 6 intersect. Most of the jobs are at the mine, or at the state prison north of town. Ely was once a major rail town, too, though the tracks are pulled up or abandoned, except for a stretch by the old depot, where a steam ghost train is run by history buffs for the tourists interested in such things.

Kennecott Copper's thoughts about worker utility, left on some of the remaining smelter buildings at McGill. CLUI photo

Back on Highway 93 now, it's 12 miles north to McGill, the Kennecott mining company town, where a massive smelter operated for dozens of years, extracting copper, gold and silver from the pit across the valley at Ruth. The smelter, with its 750-foot smokestack, was torn down in the 1980s. Rows of small houses for workers remain, as well as a hillside managers row of larger houses, closer to the mill site. Several large-scale municipal buildings, schools, warehouses, labs, and other structures remain, all of which seem too big now for such a small town.

Though most of the land in the area is still owned by Kennecott, today there is only one Kennecott employee on site. His job is to maintain the irrigation system for the grass on top of the tailings mound. The mound is close to four miles long, and extends for two and a half miles west of town, nearly filling the valley from end to end. It is invisible to most passers-by, though, looking like some kind of natural landform, partially because of the continuous irrigation which keeps dust down and makes it look like agricultural land.

North of McGill, Highway 93 rides along the east side of the Steptoe Valley for 50 miles, a linear basin in the network of basin and range striations covering northern Nevada. At Schellbourne the highway crosses the route of the former Pony Express trail, marked by a wayside interpretive station and an abandoned motel.

The Pony Express looms large in the myths of manifest destiny, despite being in existence for just a year and a half, between 1859 and 1861. At the time, it was state of the art for getting information across the country—a note could be passed from east coast to west coast in as little as ten days. In a few years it would be outperformed by telegraphs and railways. The Pony Express was a 1,900-mile-long route across the western half of the continent, with hundreds of horses, and 184 stations spaced from 5 to 25 miles apart. Most served as relay stations where tired horses and riders could be swapped out for fresh ones, on their collective sprint across the plains and mountains. In this way, the Pony Express carried a total of 35,000 letters between its termini at St. Joseph, Missouri and Sacramento, California, over the course of its existence.

Crossing loops: monument where the Pony Express route crosses the CLUI "mule path" on Highway 93 in northern Nevada. CLUI photo

20 miles north from Schellbourne, Highway 93, the Great Basin Highway, veers left, and heads up towards Wells. Going straight, from here to Wendover, 60 miles away, the road is known as Alt. 93, and is a remnant of the old Lincoln Highway. The first views of the flats can be had after White Horse Pass in the Goshute Mountains, extending eastward into the bombing ranges of Utah—the end of one type of Basin and Range, and the beginning of another.

By now, on our trip from Los Angeles to Wendover, it's usually dark, and suddenly, the lights of the casinos of Wendover appear, looking like an oil industry supply base in the Arctic has met the Playboy party scene in *Apocalypse Now*. Once again, we have arrived. Only to depart again, and go back, either by a different route, or the same, a kind of interpretive highway hyperloop through the middle of the nowhere near here now. ♦

More clever cryptic tagging, this time on tubular tanks at the abandoned motel at Schellbourne. CLUI photo

TRIC OF THE TRADES

A SILICON VALLEY SUBURB DEVELOPS IN NEVADA

Exit 32 on Interstate 80, 32 miles east of the California state line, is the Tahoe Reno Industrial Center, a privately owned industrial park outside Reno that covers 167 square miles of land, probably sufficient to support its claim to being "the world's largest industrial center." CLUI photo

CALIFORNIA, TOO EXPENSIVE TO CONTAIN itself, is expanding its economy and its geography, over the Sierras into Nevada. The Reno region is becoming a major supply base for the San Francisco Bay Area, less than four hours away—one round trip in a day for a trucker providing fulfillment.

Reno has been flanked by commercial supply hubs for a while, from its warehouse-ridden doppelgänger, Sparks to the east, to a giant Starbucks Roasting Plant that serves California, extending southwards next to the Minden-Tahoe airport. In 1999, internet logistics pioneer Amazon established one of its first six nationwide fulfillment centers in Fernley, some distance east of the city. But with the massive and sudden growth of the Tahoe Reno Industrial Center (TRIC), Reno's logistics hinterlands have become state of the art.

Located on Interstate 80 between Reno and Fernley, TRIC started as an industrial park development in the late 1990s. By the mid 2000s, large logistics warehouses for PetSmart, Walmart, and others were developed, later followed by Prologis, Zulily, Jet.com, and eBay. TRIC was mostly about logistics, and after the economic downturn of 2008, saw no additional land sales for five years. It was the announcement of TRIC as the site for Tesla's Gigafactory in 2014 when things at TRIC really turned.

The Gigafactory is primarily a lithium-ion battery plant, being built with Tesla's partner Panasonic, to make batteries for Tesla cars and its Powerwall domestic battery storage units, as well as motors and other parts for its cars. If built out as planned, as it seems it might be, it will have a footprint that covers 5,800,000 square feet, around 133 acres, more than any single building on earth, possibly.

Construction started in 2014, and is expected to be done in 2020. The factory is being built in stages, with fully functional production areas operating autonomously during construction. The first batteries were produced in the summer of 2016, when the factory was officially declared open, despite being only 14% complete. Currently around 30% complete, every day more than 3,000 people work at the building, mostly on construction. Tesla claims that when it is done, the factory could employ as many as 10,000 people, in production, and could have more than 20 million square feet of space inside, on a few levels. The final cost is estimated to be $5 billion.

With Tesla's commitment to TRIC, other tech companies began developing there at a large scale as well. Data center company Switch announced it would build its Citadel Campus at TRIC, an eight-building complex that would cover up to 2,000 acres, and enclose a total of 7.2 million square feet, making it by far the largest data center in the world. In 2016 Switch opened the first of its buildings, Tahoe Reno 1, with almost 1.5 million square feet. The site connects to its Core Campus in Las Vegas, where more than 2 million square feet of data center space is up and running, connected to the Citadel by a fiber system making them less than 7milliseconds apart, despite being on opposite ends of the state. The company describes how this loop extends through other fiber links to cover southern and northern California, making a big superloop with less than 10 millisecond latency, and only 4 milliseconds between TRIC and the Bay Area.

Mountains of data: Switch's Citadel data center at TRIC. The company says it will spend as much as $22 billion there, making it not only the biggest data center in the nation, but possibly the biggest single commercial development in the nation. CLUI photo

Across the interstate from TRIC, in a separate development known as the Reno Technology Park, Apple is nearly finished expanding the $1 billion data center it proposed for this location in 2010. In August 2017, Google acquired 1,200 acres just over the pass from Switch, to build a data center. Ground is yet to be broken.

The Google site in Martin Canyon would be the first development in the part of TRIC beyond the crest of the hill. This undeveloped area is accessed by the newest divided highway in the state, called USA Parkway. The parkway is a connective bridge, 18 miles long, linking Interstate 80, running through the Truckee River Valley, with Highway 50, the old Lincoln Highway, running through the Carson River Valley, east of Carson.

Google Valley and the USA Parkway, just over the hill from Switch. CLUI photo

USA Parkway was approved and paid for by the state of Nevada soon after the Tesla deal, and built with more than $75 million of state money. The northern half of the roadway was already mostly built by TRIC, and served as the main corridor through the industrial park, stopping abruptly at a stub just south of the pass. The state began construction in 2014 on the rest of the road, and the completed highway opened in the fall of 2017 as State Route 439. The brand new southern 12 miles of highway is notable for being a four-lane-wide limited access freeway with almost no exits, little traffic, and no legal turn around opportunities. If you end up on it, you are shunted out of TRIC like a gutterball into the dusty Carson Valley.

During rush hours, the highway does see some activity, as it's the most direct route to cities to the south like Phoenix, Las Vegas, and Los Angeles, and helps alleviate traffic along Interstate 80, where at times vehicles can back up dramatically. With more than 14,000 workers coming and going from TRIC's warehouses and construction sites, as well as all the truck traffic from the 11 million square feet of fulfillment centers currently operating at TRIC, shift changes are staggered to reduce congestion. Peak times for movement are in the early hours, from midnight to 6am, when trucks head out with wares to California, and when cement trucks flow in to pour slabs in the cool of night.

While the southern part of the USA Parkway is a lonely back door through the undeveloped part of TRIC, the northern part, heavily developed and bustling, is connected to the world through two consecutive exits of Interstate 80, six miles apart—Exit 28 to the west, and 32 to the east. With the interstate, river, and rail passing by, there was already some development here, including a diatomaceous earth plant, power plants, and a gravel pit, before TRIC was conceived, 20 years ago.

Back then the land was otherwise mostly empty, rolling hills, owned by Gulf Oil of Canada, which considered operating it as a hunting retreat for its executives, but otherwise had no plans for it. In 1998, Gulf's 104,000 acres were purchased by developers Lance Gilman and his partner Roger Norman for $20 million. The land covered 162 square miles, more than half of Storey County, a county which includes Virginia City, the fabled silver boomtown from the Comstock days, which at its peak in the 1860s was the largest city in the state. Now it is one of the least populated counties in the state.

Their idea at the outset was to promote and develop the site as an industrial park. In the early 1980s Gilman worked as a commercial real estate broker and boat show promoter in Southern California, and developed a business park and housing tracts south of Reno in 1988, with his partner Roger Norman, a fellow Southern Californian. Based on that success, they had high hopes for growth in the region. Purchasing the Gulf Ranch and turning it into TRIC would become their crowning achievement, but it took a few years to get started.

In 2002, to generate revenue and jump-start the moribund county economy, Gilman opened a brothel at the western end of what would become the Tahoe Reno Industrial Center. At the time taxes from brothels were a major source of revenue for the county, and the county was nearly broke.

He also purchased the Mustang Ranch, located a few miles away. The Mustang Ranch was famous as the first legal brothel to operate in the country, in 1971, then owned by the notorious Joe Conforte. Pursued by the IRS, Conforte eventually fled the country, the Ranch went into receivership, and was eventually taken over by the federal government. Gilman bought it when it was being auctioned off on eBay by the Bureau of Land Management, which by then owned the land it was on, and wanted the buildings removed.

In 2004, Gilman had the buildings flown to his land by helicopter, and installed them next to his existing brothel. He then renamed the whole complex the World Famous Mustang Ranch. Other businesses followed, mostly logistics and warehousing, before slowing during the recession times of 2008-2011.

In 2012 Gilman, whose holdings now covered 65% of the county, was elected as a county commissioner. A story he loves to tell is how when the guys from Tesla were making the rounds around the country looking for a site for the Gigafactory in 2013, they met with him in his office trailer at TRIC. When asked how long it would take them to receive a grading permit, one was slid across the table to them, with the suggestion that all they needed to do was to fill it out. Tesla soon agreed that this would be the place for what was being touted then, and now, as the largest and most important commercial development project in the country. ♦

Turning TRICs: The Mustang Ranch brothel anchors the west end of the Tahoe-Reno Industrial Center. One of the slogans of the Ranch is "Exit 28, where the sex is great." CLUI photo

BUILDING BIG
THE OUTER LIMITS OF ENCLOSURE

Rendering of the Tesla Gigafactory 1, under construction at the Tahoe Reno Industrial Center. Tesla image

IT HAS BEEN SAID THAT Tesla's Gigafactory 1, currently under construction in Nevada, will be the biggest building in the world, if completed as planned, in 2020. Though superlatives like this are usually more a comparison of ways of measuring than empirical fact, it does provoke a consideration of the outer limits of enclosed space. If the Gigafactory, and the overall economy of scale, suggests that big boxes are getting bigger and bigger (Tesla even has other gigafactories in the works too), then perhaps it is interesting to consider the current state of the art of megaspace.

The Gigafactory is projected to have a footprint of 5,800,000 square feet, inside of which will be two main floors, one at grade and one 41 feet above it. In addition there will be some mezzanines between the two main floors, bringing the square footage inside to somewhere between 12,000,000 and 24,000,000 square feet. The internal square footage projections are dynamic, as the building is being made in more than a dozen discrete blocks, one at a time, adjusting to production methods and demands as they go, and they are currently less than half done.

But the overall size and shape of the structure, its outer length, width, and height, are likely to remain as projected: 3,600 feet long by 1,600 feet wide, by 71 feet high, or thereabouts. Multiply those three and you get the volume of space that the building encloses, which perhaps is as good a reflection of the total "size" of a building as any: 408,960,000 cubic feet.

This is still smaller than the current "largest building in the world,"* Boeing's aircraft assembly building in Everett, Washington, where commercial airliners including the 747 are built, and which encloses 472,370,000 cubic feet. That building, though, is mostly open space, on one level, with a roof that is 19 feet higher then the Gigafactory (90 feet vs. 71 feet). If you took out that extra "headroom," the Gigafactory would be larger, as its footprint is nearly a million square feet more than Everett's 4,280,000 square feet. But who's counting? (Lots of people, actually.)

** The CLUI usually tries to stay out of global comparisons, since we focus on the landscape and culture of the USA, leaving the rest of the world to everyone else. That said, it's nice to think that the building with "the largest footprint in the world" might be the Aalsmeer Flower Auction building in the Netherlands: Somewhere between five and ten million square feet of flowers from all over the world, depending on who is measuring.*

Boeing's Everett assembly plant, slightly larger than the Gigafactory by some ways of measuring. CLUI photo

Just Plane Big

It makes sense that the production center for the biggest airplanes is the biggest building, since airplanes are likely the biggest mass-produced objects humans make indoors.

The Boeing plant, located at the north end of Paine Field in Everett, is much larger than most aircraft manufacturing sheds. It is also exceptional in that it was not built by the US military, like most of the other large aircraft plants in the country. Though Boeing had a presence at Paine Field during the war, the current Everett Plant was built in 1966, to produce the first 747s for the commercial market. The other two primary Boeing production areas in Washington, at Boeing Field, and at Renton, both have sheds containing around a million square feet, not even close to Everett's 4,280,000 square foot building, which, incidentally, sits next to another building with 1,200,000 square feet and 131,000,000 cubic feet, built to make wings for the 777 aircraft, which is on some lists as one of the ten largest buildings in the world, by volume.

Like many things in the USA, the largest airplane manufacturing buildings have their origins in World War II and the decade following it, when the Air Force designated dozens of weapons production facilities as strategically essential Air Force Plants. These were generally government-owned, contractor-operated manufacturing centers for planes, rockets, and other strategic materiel, commissioned by the federal government but made by corporations.

At least a dozen of the 85 official Air Force Plants are aircraft assembly sites, with building footprints in excess of one million square feet. The rest of them are things like aircraft engine plants, and missile plants, which tend to have smaller buildings. Though some have been demolished, many of them remain, in some form. Together they are probably the largest collection of the largest buildings in the country.

Air Force Plant Number 4, for example, is a former bomber plant west of Fort Worth, Texas. It has a building that is nearly a mile long and 650 feet wide, a footprint of more than 3 million square feet. In the 1940s and '50s, B-36 bombers were made here by Consolidated Aircraft, later Convair. Now it is operated by Lockheed, and continues to be one of the largest military aircraft

Blimp hangar at Tustin, California, one of a dozen or so remaining from the 1930s and 1940s. CLUI photo

Airline terminals in China and Dubai are listed among some of the largest buildings in the world, but in the USA, few airport buildings exceed two million square feet. The new Tom Bradley International Terminal at LAX, for example, which cost more than $1 billion, is nearly a half mile long, but less than 150 feet wide. CLUI photo

plants in the US, making F-16s, F-22s, and F-35 fighter planes. The plant's various buildings cover more than 6.5 million square feet, and employ around 17,000 people.

At Air Force Plant Number 6, in Marietta, Georgia, Lockheed made the C-5, the largest transport aircraft currently in use by the US military. The plant was originally a Bell bomber plant in WWII, but has been one of Lockheed's primary large aircraft assembly plants since 1951. During the Vietnam War, more than 32,000 people worked there, mostly making military transport planes like the C-130, C-141, and later, the C-5. The main assembly building has a footprint of 2 million square feet.

Air Force Plant Number 13 was a Boeing bomber assembly plant in Wichita, Kansas, built to be further inland and out of range of enemy fire, unlike most of Boeing's production near the coast in Washington State, and able to deliver its planes quickly to either the Atlantic or the Pacific theater. The Wichita plant made hundreds of B-52s and B-29s, in a building with 2.7 million square feet, next to others that total that amount again.

Boeing sold it to Spirit Aerosystems in 2005, and though whole bombers are not made there anymore, Spirit still makes aircraft subassemblies for military and civilian aircraft at the plant, for companies that include Boeing.

And Air Force Plant Number 1? That was the Martin plant near Omaha, where the B-29s that would become the famous nuclear bomb-dropping Enola Gay and Bockscar were made. Some of the plant was torn down after the war, but the main assembly building, known as Building D, remains. Though large by most standards, at 1,100 by 700 feet, its footprint is less than 800,000 square feet, smaller than many Walmart distribution centers now (though considerably taller). It is located on the grounds of Offutt Air Force Base, home to the Strategic Air Command (now known as Stratcom), which is building a new headquarters, and has said it will be tearing down Building D at some point soon.

Big planes do not always mean immense buildings. The Spruce Goose was the largest airplane in the world from 1947-1952, when it was surpassed by the B-52. Unlike those mass-production planes, where massive assembly plants were needed so that several planes could be assembled at once (like the B-52, of which 744 were made over the years, mostly in Wichita and Washington state), only one Spruce Goose was made, and the hangar it was made in was a mere 225,000 square feet. Though the plane has moved up to a museum in Oregon, the hangar is still there at Howard Hughes' old airport in Culver City, California. It was used for years as a movie production center, for big things like the *Titanic*, and is now owned by Google.

Once they are built and put into service, commercial airliners and large military planes spend most of their lives outside, even when they are not in use, going indoors only for maintenance. Some maintenance hangars can hold several planes, though even so, most are less than 500,000 square feet. The biggest aircraft hangars, in cubic feet, are those made for airships like dirigibles and blimps.

Airships were a big deal starting in the early 1900s, when they were used sometimes for transportation, and as aerial surveillance platforms, used especially to spot submarines, all the way through WWII. To keep them out of the wind, and to maintain them, more than 20 large hangars were built at different locations around the United States, mostly by the Navy.

Fewer than a dozen remain, though they are easy to spot at places like Moffett Field, in Sunnyvale, California; Tillamook, Oregon; Akron, Ohio; and Lakehurst, New Jersey. Most are around a thousand feet long and 300 feet wide, making a footprint of 300,000 square feet, but with a roof more than 200 feet above the ground, they can enclose as much as 50,000,000 cubic feet of uninterrupted space, enough to generate internal weather patterns, some say. Google, always pushing the numerical boundaries, has a 60 year lease on three of them, near their headquarters in Mountain View.

Big Government Makes Big Buildings

It can take a village to build these megaprojects, and there is no bigger village in the US than all of us—in the form of the federal government.

During WWII, in addition to aircraft buildings, the federal government was busy making massive and innovative structures for the Manhattan Project, including the gaseous diffusion plant at Oak Ridge, Tennessee, built in 1944 to enrich uranium, which

NASA's Vehicle Assembly Building at Cape Canaveral, the "tallest single-story building in the nation." CLUI photo

for many years was the largest building in the world. The K-25 building, as it became known, had a footprint of 1,640,000 square feet, and a volume of 97,500,000 cubic feet. It was in use until 1985, and torn down in 2013.

Two other gaseous diffusion plants were constructed in the 1950s, at Paducah, Kentucky and Piketon, Ohio. While the enclosed space at both of these plants totaled more than 5 million square feet—as much as 10 million square feet at the Ohio plant—it was in separate, though adjacent buildings. Both of these plants are now closed, and undergoing decontamination before eventually being demolished, possibly. Like the big dirigible hangar in Akron, the Ohio plant was operated by Goodyear until it was taken over by Lockheed in 1986.

Rockets can be big things too, though our ICBMs are less than 60 feet tall, making them relatively easy to build and move around. Really big rockets, like the Saturn V, which took men to the moon, were developed at places like NASA's Marshall Space Center in Alabama, where their engines were tested on outdoor stands. Launching was mostly done at Cape Canaveral, where rockets would arrive in separate pieces from manufacturers, then be assembled at the launch site.

This was done in a large vertical building, the Vehicle Assembly Building, which is still there. Since it was vertical, it has a relatively small footprint, 348,000 square feet, but is 526 feet tall, and encloses 130,000,000 cubic feet, making it among the largest buildings in the nation. It is the tallest single-story building in the nation, and the tallest building outside of a metropolitan center.

The big pieces of these rockets were too large to fit in a plane, train, or truck, so they would come by boat, which meant that they had to be made at facilities with water access. The largest pieces for the Saturn rockets, as well as the external fuel tanks for the Space Shuttle, were made at NASA's Michoud Assembly Building, east of New Orleans. The building covers 1,870,000 square feet. The site was first developed as an aircraft plant in WWII, then was taken over and expanded by NASA in 1961, as an auxiliary site for the Marshall Space Center in Alabama, to build rockets for the Apollo Program. It is still used to manufacture the stages of large satellite-launching rockets, built by Boeing and others.

The other company currently building the biggest rockets is SpaceX, Elon Musk's company. The rockets are manufactured at the SpaceX headquarters, on the original site for the Northop Aircraft company at Hawthorne Airport, in Los Angeles. The main manufacturing building for SpaceX is a three-story building with a 300,000 square foot footprint. The rocket stages are shipped by long oversized truck loads to launch sites, where final assembly takes place. CLUI photo

The biggest satellite launching rockets used today, the Atlas V and Delta IV, though nearly as tall as a Saturn V, more than 200 feet, are narrower, and built in stages, and are assembled at the 1.6 million square foot United Launch Alliance plant in Decatur, Alabama. They are too large to travel over highways or fit in planes, like some smaller rocket components can, so a special ship, the 300 foot long Delta Mariner, built for this purpose with a cavernous loading bay, brings them down the Tennessee River from Decatur, ultimately into the Gulf, then to either the west or east coast launch sites at Cape Canaveral or Vandenberg. At these launch sites are large sheds known as horizontal integration facilities. They are located next to launch pads, where the rocket stages are attached before being lifted vertically for launch. These building are generally less than 500,000 square feet in size.

Complex Office Complexes

The Pentagon made some of the largest buildings in the country, including itself, the Pentagon. The five-sided structure with a five-acre pentagon-shaped courtyard in the middle was built in WWII. At the time it was made, it was the largest office building in the nation, with somewhere around 6,500,000 square feet on five above-ground floors, and two underground levels. Its outer diameter is 1,414 feet, wider than the Empire State Building is tall. Around 26,000 people work inside. It has six zip codes, and 20 fast food restaurants. Construction was overseen by Colonel Leslie Groves, who, based on his success with building the Pentagon, was selected to run the Manhattan Project, building even bigger buildings for that.

After WWII, the main business of America went back to business, and the private sector started making really big buildings again. Many of these were office buildings in downtowns, going up instead of outwards, like the Pentagon. Skyscrapers clustered especially in Manhattan and Chicago, both of which claim the tallest, if not the largest, downtown buildings in the country.

One World Trade Center, by some ways of measuring, is the tallest building in the nation—1,776 feet if measured to the tip of its spire, they say (in fact, though, it is even taller than that, 1,792 feet

Shopping malls are another megastructural form, and there are more than a dozen of them that exceed 2 million square feet. With 2,779,000 square feet, the Mall of America, outside of Minneapolis, is often considered the largest shopping mall in the land, though the largest may actually be the King of Prussia Mall, outside of Philadelphia, bigger by 14,000 square feet, or so. CLUI photo

to the top of its spire). But the height of a building should really be measured to its roof, not its spires, in which case the World Trade Center is 1,368 feet tall (exactly the same height as the original 1970 World Trade Center), and is surpassed in height by two other buildings in the USA.

With a roof at 1,451 feet, the Willis Tower in Chicago, built in 1974 as the Sears Tower, is still the tallest building in the country, followed by the slender residential tower at 432 Park Avenue in New York City (1,396 feet), built a few years ago. The next tallest building in the country is the Empire State Building, still hanging in there, at 1,250 feet. The Trump Tower in Chicago, which often appears as the fourth tallest tower in the USA, listed as 1,389 feet to the top of it's spire, is actually only 1,171 feet when measured to its roof.

Closed in by city blocks, skyscrapers are relatively narrow, limiting their overall volume. The base of the World Trade Center is only 200 feet on a side, and the nation's second tallest building, 432 Park Avenue, is only 100 feet on a side. Unlike 432 Park Avenue, most skyscrapers taper as they go up, further shrinking their volume. The Willis Tower, which starts with a base more than 250 feet on its long side, is staggered as it goes up, like cigarettes sticking out of a package, which some say was its design inspiration. Still, the Willis Tower is among the widest of the tallest skyscrapers, with 4,500,000 square feet of usable floorspace, making it among the most voluminous buildings out there (60 million cubic feet or so). Still, it is not that far off from its squat Art Deco neighbor, the 4,000,000 square foot Merchandise Mart, built way back in 1930, when it was the largest building in the world.

Though long and low, suburban office parks also have big corporate centers under one roof too. The largest of this type of building could be the 3,000 foot long six-story office building for the United Services Automobile Association (USAA) company in San Antonio, Texas. The company, a direct-marketing insurance and financial services company, serving mostly military personnel and their families, claims that its 4,463,000 square foot headquarters is possibly the largest single-occupancy office building in the country.

The Merchandise Mart in Chicago was the largest building in the world when it was built in 1930, and it still is awfully big. CLUI photo

All Play and No Work

Some of the largest non-industrial buildings are Las Vegas casino resorts like the Palazzo, Las Vegas, with 6,948,980 square feet, in a single structure with a footprint of over 2 million square feet. Elsewhere on the Strip are at least six of the ten largest hotels in the World, topping the list with the Venetian (7,117 rooms), MGM Grand (6,852 rooms), and City Center (6,790 rooms).

Though massive in scale, these casino resorts may enclose many millions of square feet, but push the definition of what a building is by having multiple structures built at once or at different times. City Center, for example, though conceived as a single development (one of the largest single private developments in US history—built at a cost of more than $9 billion) has 16,797,000 square feet of floorspace, but it is divided into several structures, designed by different architects, even. Is this a single structure with a multiple-building theme? Maybe so.

Las Vegas is known to house some of the largest trade shows and conventions in the nation, and the Las Vegas Convention Center is indeed one of the largest venues of this type, with more than 2 million square feet of exhibition space. Only a few other convention centers seem to have exhibition floorspace as large or larger than that, including McCormick Place in Chicago, and the Orange County Convention Center in Orlando, Florida.

Though they can have much smaller footprints, enclosed stadiums are much taller than convention centers, and are among the largest buildings out there. Likely the largest of these is the AT&T Stadium in Arlington, Texas, where the Dallas Cowboys play football. It cost more than a billion dollars to build, and can hold more than 100,000 people. Though it has a footprint of less than a million square feet, it contains more than 100 million cubic feet under its retractable roof. This may or may not be the largest enclosed space in a stadium (and thus the largest column-free space in the nation), as other stadiums claim to have a similar volume. The Superdome in New Orleans, with its fixed roof, is said to contain a volume of 125 million cubic feet. Either way, these epic enclosures are still considerably less than the 472 million cubic feet inside Boeing's aircraft assembly building in Everett, Washington.

Subaru, Lafayette, IN. Subaru's only vehicle assembly plant in the USA covers around 3.4 million square feet. CLUI photo

Honda, Marysville, OH. One of four Honda assembly plants in the USA covers around 4 million square feet. CLUI photo

Spanning Space

Steel manufacturing sheds, which can be as much as a mile long, like at Burns Harbor, Indiana, are also among the largest buildings out there, though usually very narrow. Some aluminum plants, too, can be a mile long, like Alcoa's at Riverdale, Iowa. Hard to say if these are single buildings, though, as they are often made up of a series of long sheds built in stages over the years. There are a few metal shipyard sheds that are large and built all at once, but none larger than one at the Austral Shipyard in Mobile, Alabama, which has a footprint of 734,637 square feet, and a ceiling height of more than 65 feet, making for a volume of 48,204,000 cubic feet.

Buckydomes and Biospheres may seem like big structures, but they actually aren't, in the big picture. Biosphere 2, in Oracle, Arizona, encloses around 7,200,000 cubic feet under glass, on a footprint of 3.14 acres, which is less than 137,000 square feet. The largest geodesic enclosure in the USA is likely the Spaceship Earth sphere at Epcot, in Florida, which opened in 1982. It has a diameter of 165 feet, enclosing a volume of 2,352,000 cubic feet. A larger geodesic sphere was built for Expo 67, in Montreal, with a diameter of 250 feet. Now called the Biosphere, it is not quite a complete sphere, and contains around 7 million cubic feet, similar to the Biosphere 2.

Other monolithic dome structures, geodesic or not, span large-ish spaces, like the Climatron at the Botanical Gardens in St. Louis, or the aviary at the Queens Zoo, a low dome with a 175-foot diameter that was originally built for the 1964 World's Fair. Bigger domes have been used to enclose spaces for things like university sports arenas, but even the largest of these, like the Superior Dome at Northern Michigan University, in Marquette, Michigan, is only 535 feet in diameter, enclosing a space of 222,150 square feet. An impressive-looking megastructure, even more so as it's made of wood and not steel, but still smaller than some Walmarts.

Speaking of Walmarts, the company is, unsurprisingly, likely the largest container of space in the nation. With around 3,500 supercenter stores in the US averaging 179,000 square feet each, that's 626,500,000 square feet, or more than 22 square miles. That doesn't include Sam's Clubs or other types of stores the company operates. In addition, there are more than 100 distribution centers for the company across the country, whose sizes range from 500,000 square feet to more than a million square feet.

Where House the Warehouse

Regional storage and distribution centers are one of the fastest growing types of buildings out there, and hundreds of them, possibly into the thousands by now, surpass a million square feet (the equivalent of 500 feet wide and 2,000 feet long). Company-dedicated warehouses at ports and production nodes are especially large. For example, an import warehouse for Target at the port of Savannah, Georgia opened in 2007, and has more than 2 million square feet. Another on the west coast, at Lacey, Washington, is 1,700,000 square feet. John Deere's Parts Distribution Center in Milan, Illinois, just a few miles from its company headquarters in Moline, is located next to the airport and is 2,800,000 square feet. Michelin Tires recently built a distribution warehouse near its factory in Spartanburg, South Carolina, which is said to be 4 million square feet.

In some cases internal logistics hubs have formed near UPS and FedEx nodes. Nike's 2,800,000 North America Logistics Campus, opened outside of Memphis, has a BNSF intermodal yard nearby, next to FedEx's national distribution hub at the airport southeast of town. These remote warehouse nodes can emerge in the middle of nowhere, where real estate is cheap, at the sweetspot between major cities and ports. Like at Grapevine, California, population zero, where Ikea built its largest distribution center in the US, a 1,725,000 square foot warehouse, because it was on the interstate halfway between the Bay Area's urban sprawl and Southern California's urban sprawl. Also, importantly, it was between the port of Los Angeles and the Port of Oakland, so the company could shift its deliveries between the two, as needed, as both were a few hours away either way, a day's round trip for a trucker.

This kind of mega-region logistics is what has created the Tahoe Reno Industrial Center, a rapidly growing logistics center outside of Reno, Nevada, four hours from the Bay Area, but beyond the expensive real estate and regulatory environment of California, and where the Gigafactory, possibly the second largest building in the country, is currently under construction.

Carscape

The Gigafactory is a battery plant, but is also a car factory, manufacturing parts for electric cars. Given the scale of the car industry, 265 million registered cars on the road, and up to 20 million new ones being sold every year, it is not surprising that

BMW, Spartanburg, NC. BMW's only vehicle assembly plant in the USA covers around 4 million square feet. CLUI photo

Tesla, Fremont, CA. Tesla's only vehicle assembly plant covers around 5 million square feet. CLUI photo

the structures for the automobile industry in the USA cover more ground than nearly any other.

Some of the largest corporate buildings are car company headquarters, like GM's Renaissance Center in Detroit, which has 5,540,000 square feet, and Chrysler Headquarters and Technology Center, in Auburn Hills, Michigan, which has 5,300,000 square feet and a contiguous office complex with a central building that is half a mile long. Ford's headquarters in Dearborn is more modest, but is close to the company's famous River Rouge Plant, one of the biggest industrial sites in the country today, as it was in the 1920s, when it was cranking out Model T's, the first car for the masses.

"The Rouge" had more than a square mile of vertically integrated production, going from piles of raw material coming in by boat for making steel, to finished cars, spread over 93 buildings, and nearly 16 million square feet of factory floor. Though the parts for Model T's were produced at Rouge, the final assembly actually took place at the Highland Park assembly plant. Over the 19-year span of production, more than 16 million Model T's were produced. In 1927 the Model T was finally replaced by the Model A, which were produced at the Rouge plant from 1927 to 1931. Almost 5 million Model A's were made, but by then it was just one among many cars being produced by American manufacturers. Though the connected steel sheds at the center of the Rouge site cover more than 3.3 million square feet, there is no single megastructure at Rouge. It continues to be an active industrial site, with a steel plant owned by another company now, a manufacturing plant for Ford cars, and a modern plant with around 2 million square feet, which assembles the F-150 pickup. Made since 1948, the F-150 has been the best-selling car in the USA for more than 35 years.

The Highland Park plant, north of downtown Detroit, was where Ford's assembly line method changed the world of mass production. When it opened in 1910 to assemble the Model T, it had 90 acres under one roof, nearly 4 million square feet, the largest manufacturing plant in the country. When the moving assembly line was implemented there in 1913, manufacturing time for the Model T went from 728 minutes per car to 93 minutes, making the car affordable and available to many more people. The plant could produce a million cars a year. After production for the Model A went to the River Rouge plant, the Highland Park plant made parts, Sherman tanks in WWII, then eventually became storage, with buildings leased to other companies. Today, just a few pieces of the original complex remain, vacant or used for warehousing, and the rest are open lots, parkland, and a shopping center.

The moving assembly line vehicle manufacturing developed at Highland Park has been recreated all over, starting at Ford Model T plants at other cities too, like Chicago, then spreading out all over the world. Today there are around 40 active consumer vehicle assembly plants in the USA. General Motors, for many years the largest company in the nation, has a dozen large vehicle assembly plants in the USA, in Texas, Kentucky, Kansas, Tennessee, Missouri, Ohio, Indiana, and five in Michigan. In addition, the company has numerous parts plants, making engines, transmissions, and other components. GM still sells more cars in the US than anyone, around three million per year. Most of its assembly plants are between two and four million square feet.

Ford, which sells around 2.6 million cars a year in the USA, has eight assembly plants at the moment, which generally range from three to 4.7 million square feet. Chrysler, (now Fiat/Chrysler), sells around 2.2 million cars per year and has five assembly plants in the USA, ranging from two to five million square feet. Toyota, which sells around 2.4 million cars in the USA, has five plants in the USA too, including a plant in Georgetown, Kentucky, which makes more than 500,000 vehicles a year, and has 7.5 million square feet, likely the largest car plant in the country. Nissan's plant in Smyrna, Tennessee, one of two the company has in the USA, has 5.9 million square feet, and is likely the second largest car plant in the country.

Not too far down the list of "largest automotive assembly plants in the USA" is Tesla's current vehicle assembly plant in Fremont, California. It was built in 1962 by General Motors, and grew over time. Starting in 1984 it was operated as the New United Motor Manufacturing Plant, a partnership between Toyota and General Motors, making things like Toyota Corollas, until 2009, when it was the last car assembly plant in California to close. In 2010, Tesla bought it, reversing the trend, though it took a while for it to grow into the space, which is usually listed as somewhere between 4,300,000 and 5,500,000 square feet. Like many megastructures, the interconnected factory complex is not all enclosed in one building, but at a half mile long by a third of a mile wide, it's pretty damn big, no matter how it measures up. ♦

INTERPRETING THE AMERICAN BOTTOM

CLUI FIELD UNIT OPENS IN GRANITE CITY

The CLUI Field Unit open in Granite City, Illinois. CLUI photo

THE REMARKABLE LANDSCAPE OF THE Mississippi River across from St. Louis, known as the American Bottom, was the subject of an exhibit that opened to the public in December 2017, inside an on-site CLUI interpretive trailer. The exhibit was produced by a group led by Matthew Fluharty and Jesse Vogler of the Sam Fox School at Washington University, and was developed from a long-term and ongoing research and documentation program about the region, aided by the CLUI.

If St. Louis, with its soaring Saarenin arch, is the gateway to the west, then East St. Louis, across the river from the arch, must be, in some obverse way, the gateway to the east. These bottom lands are a remarkable mix of older versions of America—more about its origins than its westward aspirations.

With a name that refers to its fundaments, and location in the heart of the nation, the American Bottom is the landscape of oxbows, horseshoe lakes and lowlands of the Mississippi River, extending from Alton, Illinois in the north (just upstream of the confluence of the Missouri River) to the Kaskaskia River to the south (across from St. Genevieve).

The long southern reach of the Bottom is monolithic, a three-mile-wide strip of agricultural land on the Illinois bank of the river, between the levee and the bluff, extending for 50 miles south of St. Louis. The northern part of the Bottom is more diversely developed, a flat space of overlooked industry and history, as if in an urban shadow spreading eastward, cast by the great gateway American city of St. Louis, as the sun sinks into the beckoning west.

This American Bottom is a mixture of open lands, islands of small, half-emptied old towns, elevated highways, chemical plants, drainage ditches, treatment plants, and residential grids of industrial suburbs, built by the likes of Standard Oil, Alcoa, US Steel, and Monsanto.

One of the few remaining houses from a development that was slowly bought out to create a park around the center of the Cahokia Mound complex, part of which had been turned into a pornographic drive-in theater. CLUI photo

Many of these towns are deflated versions of themselves, like East St. Louis itself, as industries change, and close, tumbling from their peaks in the 1950s. Among them is Brooklyn, Illinois, whose sign declares it to be the oldest town in the United States incorporated by African Americans, and National City, a company town built by the St. Louis National Stockyards Company, which thrived through the 1950s, then declined, finally evicting its last residents in 1996, before disincorporating the following year.

The greatest gone city in the Bottoms, though, is Cahokia, where a thousand years ago, as many as 30,000 people lived in a six-square mile city. More than a hundred mounds, some several stories tall, rose above the flat plains here, arranged around a central plaza and Monks Mound, the largest pre-Columbian earthwork in the Americas. Though its residents were gone by 1400, the mounds remained.

When the Europeans arrived, some mounds were flattened to fill marshes, build levees, and make for easier agricultural use, but most of the mounds were simply ignored, and merged with suburban and industrial development. New mounds began to rise among them, slag heaps, ash piles, municipal landfills, capped industrial sites, and heaps of coal brought in to fuel power plants and factories. Mound building is a continuous human process, especially on the American Bottom. ♦

The CLUI exhibit trailer is currently at the corner of 19th and State Street. It's open to visitors, who can get access information to it, as well as other CLUI exhibit facilities, by calling the CLUI Information Line at 310 839-5722. The trailer may move around a bit, and will eventually be deployed elsewhere, so check in before you go. CLUI photo

A HOLE IN THE HEART OF SCREENLAND

FINAL STEPS TAKE CULVER CITY TO THE NEXT LEVEL

The big hole in the middle of Culver City's downtown redevelopment just got bigger: over the next year, the empty lot will become a new pile of architecture called the Culver Steps (just a few steps away from the Center's headquarters). But first they are digging a hole (for burying cars in an underground parking structure). CLUI photo

THE FINAL HOLE IN THE downtown development plan for Culver City, an empty lot known as Parcel B, is finally being filled. The development rights were sold to a new company that just closed the deal, and now construction has begun.

The site, a block from the Los Angeles headquarters of the CLUI, has long been an empty lot caught in the complications of the city's extensive public/private downtown redevelopment project. As the pivotal empty lot in the city's plan, Parcel B was the site of the Center's 2013 exhibit about office trailers in an office trailer.

Construction fence in downtown Culver City. CLUI photo

Established a hundred years ago by Harry Culver as a crossroads community, where "all roads lead to Culver City," the key to the city's downtown redevelopment over the past 20 years was based on closing these major thoroughfares that once converged in downtown. The reclaimed space has created public plazas that link formerly isolated properties. New parking garages house an inflow of visitors, and former parking lots became multiplexes. Restaurants moved in, followed by more restaurants, and downtown became a destination again.

Parcel B is the last piece of this urban puzzle to fall into place, and in many ways is the center of it all. The new structure will have 75,000 square feet of offices above 40,000 square feet of retail and restaurant space, plus a 35,000-square-foot public plaza. The development is called the Culver Steps, as it will have a set of wide steps from the ground to the first level, evoking Manhattan's elevated High Line, Rome's Spanish Steps, and Washington DC's Lincoln Memorial steps. Though the steps are part of the building, and not technically public space, they will be open to the public.

The building and plan, designed by Ehrlich Yanai Rhee Chaney Architects, was selected and approved by Culver City in 2011. It took all these years to execute it because the governor of California dissolved the state-supported Community Redevelopment Agency, which owned real estate at many formerly needy downtowns, including Culver City's, leading to a bit of a legal ownership mess.

As of a few months ago, the mess was sufficiently cleared up for the property's development rights to be sold by the previous developer, Hudson Pacific, to the new one, Hackman Capital Partners, for an undisclosed sum.

The new developer, Hackman Capital, is the same company that bought the Culver Studios, a 14-acre movie studio, adjacent to Parcel B, in 2014. The main studio building facing Parcel B was built to resemble a Southern mansion, kind of like George Washington's Mount Vernon, and is familiar to many because it was part of the trademark for David O. Selznick Pictures when that company owned the studio.

A few months ago, Hackman announced that Amazon Studios will be pulling up stakes in Santa Monica, and taking over 280,000 square feet at Culver Studios. Apple is looking at space nearby, and Google has taken over much of the former Howard Hughes airport at the other end of town. It seems the redevelopment of Culver City is now complete. The Heart of Screenland (the official city motto) has been retooled for the new digital screenscape. ♦

Construction fence showing how the new Culver Steps structure will look, filling the last hole in the Heart of Screenland. CLUI photo

WENDOVER REPORT

FROM THE CLUI OUTPOST IN THE BONNEVILLE BASIN

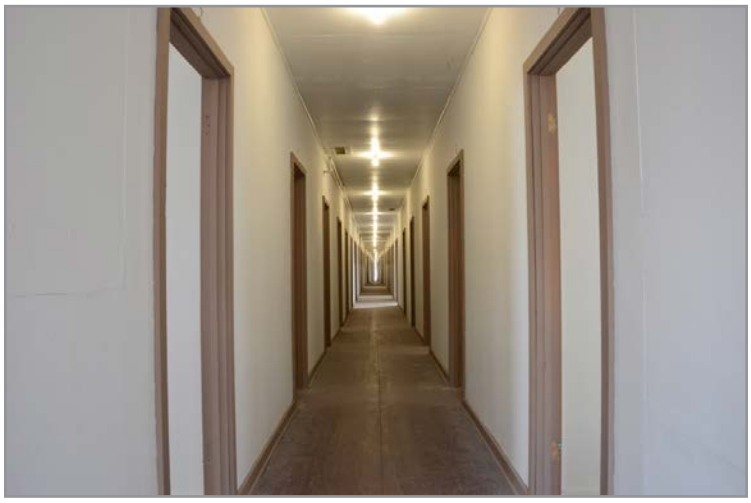
University group visiting the CLUI Orientation Building in Wendover. Photo by Hikmet Loe.

THE CLUI OUTPOST ON THE edge of the salt flats had another busy season in 2017, with former residents coming back to work on long-term local projects, including Kristin Posehn, who installed her *Metropolis* project in the exhibit hall, and Dan Torop, who flushed out his installation there as well. Alan Nakagawa visited to work on an audio project connecting his family's hometown of Hiroshima with the hangar at Wendover. Lucy Raven returned to work on a film project. William Lamson returned to build *Minerology*, an elaborate installation on display indefinitely in an old armaments building.

William Lamson's *Minerology* exhibit, a long-term dioramic salinification installation in the Partially-Missing Building on the old airbase at Wendover. CLUI photo

Other Wendover recidivists and regulars came to help out at the work party, including Wendy Wischer, John Mack, Eric Potter, Phil Weil, Jed Lackritz, Dan Torop, Jenny Lyon, Sara Velas, Oswaldo Gonzalez, John Hogan, Hikmet Loe, Aurora Tang and Matthew Coolidge. Thanks to all of you for your help!

Land Arts of the American West, based out of Texas Tech in Lubbock, came for a week during their season in the field, as they do every year. This year the class covered more than 5,500 miles during their semester-long classroom in the landscape, camping out 48 nights in expert expeditionary style, led by Chris Taylor.



Endless hallway: The CLUI Exhibit Hall, next to the Orientation Building, has many rooms of projects done by researchers and interpreters at Wendover over the years. CLUI photo

Other classes and groups visited this year, including from the University of Toronto, Brigham Young University, Westminster College, University of Utah, Otis College of Art and Design, the Museum of Contemporary Art San Diego, the Dia Art Foundation, and the University of Nevada, Las Vegas. Others came on their own and signed the guest book, or not.

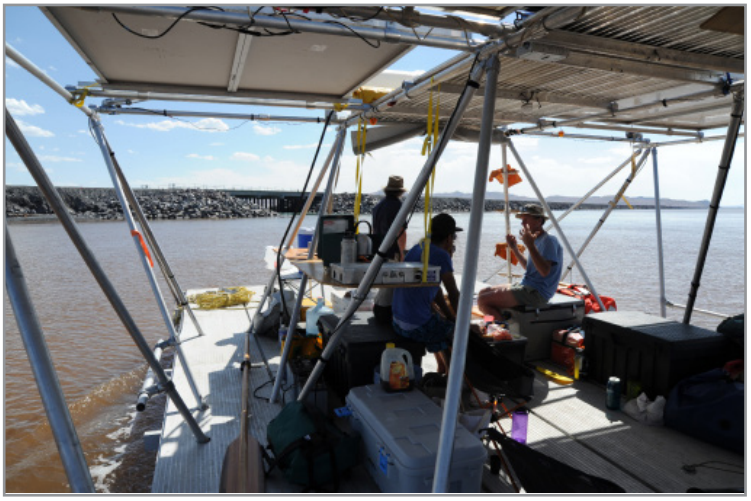
A young woman known only as Amanda, seen here heading west on the eastbound lane of Interstate 80 near the Aragonite Exit, stopped in to rest at CLUI Wendover for a day on her eight month solo walk across the country from coast to coast. CLUI photo

Expeditions on the Great Salt Lake Exploration Platform (GSLEP) continued in 2017. Visitors and travelers included Monty Paret from the University of Utah, Hajoe Moderegger and Franziska Lamprecht from eteam, Emily Rabinowitz and Jose Villanueva from Land Arts, and Alex Robinson from the University of Southern California, along with members of the CLUI, and GSLEP program managers Steve Badgett and Chris Taylor.

The craft was stationed at Lakeside, next to the Lucin Cutoff causeway, in a safe harbor of sorts, as the winds and waves on the lake can be dramatic, challenging anchorages and overwhelming the electric propulsion systems of the platform.

This position, on the north side of the cutoff, enabled travel on the north arm of the lake, known as Gunnison Bay. Over the course of the season, starting in May, the solar-powered floating habitat was able to visit all the points of interest around the north arm, including Little Valley Harbor and the new breach in the cutoff.

The GSLEP on the north arm of the lake. CLUI photo



Group on board the GSLEP heading towards the new breach in the causeway. CLUI photo

Excerpt from Field Report from GSLEP experientialist Alex Robinson, May 2017:

… After two days of heavy winds and deep swells kept us in our original harbor, at Lakeside, next to the friendly waves and toots of passing freight trains, we headed north. Scouting in the Zodiac and the day's glassy pink waters gave us confidence to travel past Behrens Trench spit, into perhaps the most remote portion of Gunnison Bay…We cruised steadily under solar power past the superlative Gunnison Island and north of *Spiral Jetty* and Rozel Point, both submerged deep under the eastern horizon. We navigated along the shallow western littoral zone, floating just above the difficult-to-anchor-in salt pan, in waters soupy with brine shrimp and pink cyanobacteria. Around the bird refuge of Gunnison, bobbing seagulls spread out evenly like desert sagebrush, sparsely carpeting the lake for miles. As we cruised along—propelled by the sun—islands, mountain ranges, trestles, and dredge materials would slowly appear and disappear above and below the horizon. Beyond the angled constructions of the ingenious aluminum craft, there were no corners, only the curvature of the earth, made tangible and intimate by open distances. Standing up from the pilot's low berth would reveal a new landmass—maybe an edge to a previously infinite distance. Around the time the sun would mercilessly stare us in the face, we would stop, clinging with anchors to some patch of soft mud and sand left by the lake's regular human industry. The sunsets over glassy waters were stunning. Ecstatic. The sun's shadow would subtly arc, reflected in waters that would later collect the night's stars. At night our hammocks would violently rock and flap in the winds, as we slept… ♦

DESERT RESEARCH STATION REPORT

STILL HERE, DESPITE THE ODDS AND ODDITIES

Hinkley: Not quite dead yet. CLUI photo

The Center's Desert Research Station, north of Hinkley, California, continues its role as an exploratory node in the Mojave and a base for examining issues related to remote sensing and the margins of detection. The main exhibit space and walking trail are open to the public, while additional buildings provide logistics support for research projects.

THE SURROUNDING COMMUNITY OF HINKLEY continues its dissolution, as the effects of PG&E's plume of hexavalent chromium, some say the largest in the land, dissipates under ground and above it. Though the legal settlements seem to be complete (as of 2008), people are still leaving town for all kinds of reasons—like there is no school or post office or store there anymore. Modest homes, abandoned, can remain empty for years, getting picked apart by vandals until the bank, or county, or wind eventually tear them down. PG&E is still buying property and removing structures too.

PG&E (Pacific Gas & Electric), of course, is one of the three big private energy utilities operating in California, along with Southern California Edison and San Diego Gas and Electric. While these latter two primarily serve Southern California, PG&E is based in San Francisco, and mostly serves Northern California. PG&E provides electricity to the region, produced at its hydro-power plants in the Sierras, and its Diablo Canyon Power Plant on the coast, the only commercial nuclear plant still operating in the state.

But like its name says, the other part of the company is gas, which was the company's main resource starting in the 19th century, when it delivered manufactured gas for lighting San Francisco. In the 1930s, the company helped build one of the longest pipelines in the country to bring natural gas from West Texas to California. The line, expanded and still in use today, comes into the state at Topock, crossing the Colorado River next to Interstate 40, then arcs through the middle of the state all the way up to Oregon, and now into Canada. This metal pipe, three feet in diameter, supplies dozens of gas-fired power plants in the state, many of which were owned by PG&E. The company had to sell them off in the 1990s due to deregulation policies.

The new limited-access version of Highway 58, which opened in 2017, adds to Hinkley's demise by routing traffic around what's left of the town. CLUI photo

This gas line has eight compressor stations in California to keep gas liquefied and flowing through the state. The chemical chromium-6 was used as a rust inhibitor in the cooling plants at these facilities, and during the 1950s and 1960s the material, now a known carcinogen, was disposed of into unlined waste ponds, where it slowly percolated into the groundwater.

At the Hinkley plant, the second compressor station after Topock, around 370 million gallons of wastewater containing chromium was dumped in ponds from 1952 to 1966, enough to generate a plume that covered a few square miles and reached hundreds of drinking water wells. Complaints about illness and even deaths caused by this led to the largest civil settlement of its kind, with PG&E paying hundreds of millions of dollars to affected families to avoid being sued. This was all made more famous by the 2000 Hollywood movie *Erin Brockovich,* about the lawyers working on behalf of Hinkley residents.

The 13 households in the area that were drawing water from the most contaminated part of the plume were among the first to settle and move away, and their land was quickly taken over by PG&E, and the homes razed, around 1993. The plume extends from that site, near the plant, for a few miles north, following the hydraulic grade, which heads towards Harper Dry Lake, a few miles past the Center's Desert Research Station. How far north is a contested issue, since tiny amounts of hexavalent chromium occur naturally in the mineral-rich water of the desert.

Concentrations of chromium vary significantly, but for the most part are far below levels considered dangerous by the EPA: 100 parts per billion. California's EPA sets the maximum contaminant level for chromium at 50 parts per billion. 2017 sampling of the hundreds of monitoring wells around Hinkley shows a few dozen with amounts higher than 100 parts per billion, and three test higher than 1,000, with one as high as 2,100. The well at the DRS had 2.6 parts per billion, low even for background levels, and low enough to suggest a gap between the two disputed distant parts of the plume.

The USGS is working on a five-year baseline study to understand the background levels of the chemical, and 600 test wells are monitored throughout the area by the local water district and the state, and contractors for PG&E. Project Navigator Incorporated, the company that is, in their words, controlling the strategic direction of this demanding environmental project, is managing the fallout for PG&E. The company, based in Brea, California, has a community office in Hinkley, and operates at many other environmental remediation and superfund sites around the country, including the Asarco plant at El Paso, and at Newark Bay, New Jersey.

Remediation efforts in the most affected areas include pumping ethanol into the ground to convert the chromium-6 into less harmful chromium-3. This process, some say, is causing other dangerous chemicals to become more concentrated in the groundwater. It could be decades before the clean up is complete, if it ever is. Settlements, though, seem to have stopped in 2008, after a total of around $650 million was paid out to affected parties, including cases at other compressor stations along the pipeline, especially at Kettleman Hills, the next one down the line from Hinkley. For the moment, Hinkley remains on the verge of existence. ♦

In 2017, the artist Daniel Hawkins built a lighthouse on a hill above Hinkley, visible from all over the region. Lighthouses are both a comfort, as an aid to navigation marking a familiar point of reference, and ominous, a warning of hazards like the rocky shore or shoals nearby. The effect of a lighthouse on this desert hilltop suggests that either way we are at sea, both on the landscape and off. CLUI photo

CLUI VISITORS AND VISITATIONS

CLUI EXHIBITS AND PROGRAMS FIND their way out to the world through the network of CLUI exhibitions venues, and through the internet, but also through programs at other museums and cultural venues around the world.

In 2017 CLUI landscans were part of exhibitions shown at a number of places, including Princeton University School of Architecture. CLUI exhibits were featured at the Donna Beam Gallery at the University of Nevada, Las Vegas, and at the Barrick Museum of Art, also at UNLV (next to an exhibit called *Preservation*, independently curated by Aurora Tang, program manager at the CLUI). Members of the CLUI were invited to give talks and presentations at places including UC Santa Cruz and the Clark Institute in Massachusetts.

Class groups coming for talks at CLUI Los Angeles included Bartlett School of Architecture, Auburn University, University of Nebraska, Technical University of Berlin, UCSD Scripps Institute, MEF University Istanbul, Seattle University, UCLA, Strelka Institute Moscow, USC, Woodbury University, Pitzer College, and the University of Richmond. ♦

BOOK REVIEWS

BOOKS NEW TO THE SHELVES OF THE CLUI LIBRARY

The Spiral Jetty Encyclo: Exploring Robert Smithson's Earthwork though Time and Place, Hikmet Sidney Loe, 2017
We've long said and believed that the *Spiral Jetty* is a point of embarkation, not a terminus. It is a reason to go somewhere you would otherwise likely not, even putting the smelly, hot/cold, dry, remote northern arm of the Great Salt Lake on the top of many bucket lists. This book uses *Spiral Jetty* to spiral outwards to embrace its physical and cultural context, and is the published evidence that the *Spiral Jetty* is not just an artwork, but a fulcrum, between here and there, history and the future. It's the center point for a contemporary perspective that embraces the primacy of place in an anthropic world, and among the first anchors cast into the sea of space establishing a continental American antipodinal point. If *Spiral Jetty* is the center of the New World, then this is that world's first atlas.

Two Cabins, by James Benning, edited by Julie Ault, 2011
Several years ago, over several years, the filmmaker James Benning made two cabins on his mountain property in the southern Sierras, one modeled after Henry David Thoreau's cabin at Walden Pond, and the other after Theodore Kaczynski's cabin in Montana (now at the Newseum, in Washington DC). Both these characters were radical American individualists, whose methods and legacy differ dramatically, but who were also similar, in a way, like a circular spectrum that meets again at opposite ends. The two cabins contain artwork and writings Benning has collected over the years, including some original work by Kaczynski, making a kind of museum/shrine/grotto of independent American idealist cabin extremism. It's on private property, and hard to see, as a hermit's cabin should be, but just knowing it's there is enough, a kind of conceptual land art monument. The book about it is a work of art too.

Mapping America: Exploring the Continent, Tom Howells and Duncan McCorquodale, editors, 2010
Nice big book of 120 maps of the USA, produced over the past 500 years, including by early explorers, demographic thematic mappers, and contemporary artists. Jasper Johns may have his USA flag paintings, but these maps, with all their interesting details, show how the common ground of the nation can be understood in so many different ways, and all of them, to the same extent, true.

Cowed: The Hidden Impact of 93 Million Cows on America's Health, Economy, Politics, Culture, and Environment, Dennis Hayes and Gail Boyer Hays, 2015
The megafauna that has had the largest impact on the landscape of the USA is cows (following humans, of course). By no fault of their own, either, since we brought them here and manage their existence. Though they were useful for food and materials once, a long time ago, now, clearly, there are alternatives that are much more efficient. We all know that, and this book enumerates all the reasons convincingly yet again, but the industry of course is entrenched, in the economy and culture. If cows were to revolt, though they may not outnumber us, they do collectively outweigh us, hugely.

Borderwall as Architecture: A Manifesto for the U.S.-Mexico Boundary, Ronald Rael, 2017
A great anthology of incidents, forms and vectors, along this most hyperbolic of spaces. Finally the US/Mexico border wall is getting the attention it deserves. The only problem with this book is that it's not long enough—we need to cover the whole border with books about it. Maybe then we will finally understand that our borders are where our nation's character is stratigraphically exposed, revealing hidden layers, like a roadcut, sliced through the meat of continuously connected and inhabited terrain.

The Profiteers: Bechtel and the Men Who Built the World, Sally Denton, 2016
It's been 20 years since the previous tell-all book on Bechtel came out, *Friends in High Places, The Bechtel Story: The Most Secret Corporation and How It Engineered the World*, a book which led to a restructuring of Bechtel's internal thinking about its outward appearance, if nothing else. So it's high time for another. Privately-held Bechtel may be the reigning member of the club of companies that hold the smoking guns of post WWII American imperialism, and remind us that business itself can be a consensual conspiracy.

Overview, Benjamin Grant, 2016
This is a large format photo book of images that were not taken by a human, but rather cropped and assembled from internet satellite-mapping views—provided by DigitalGlobe, the satellite imaging company that supplies imagery to Google and others. The author/cropper, Benjamin Grant, has been posting daily satellite images on Instagram since 2013, as his Daily Overview project. The sites he depicts seem to be chosen for their visual drama, and some might slough this off as more mere global "Google Earth porn," but he backs each image up with just enough of a caption to extend them beyond simple formal qualities, to some kind of ground truth, and divides the book into nine "land-use-y" categories. The contextual shift of making a printed coffee table "photo" book of non-human internet images, selected by an "author," and credited to a company's machines (DigitalGlobe), is kind of interesting, and shows how the human role in photography is dissolving further into curation.

In the Aura of a Hole: Exploring Sites of Material Extraction, A. Laurie Palmer, 2014
Laurie Palmer, artist/reporter/interpreter/creative researcher, trudges and tours through the American land of extraction, narrowing in by focusing on 18 elements from the periodic table (in order from lightest to heaviest: Helium, Carbon, Sodium, Aluminum, Silicon, Phosphorous, Sulfur, Chlorine, Potassium, Calcium, Iron, Copper, Silver, Iodine, Gold, Mercury, Lead, Uranium), which happen to be mined, in one way or another, from the ground. She visits places where these materials are extracted or processed, and tells the tale of what she encounters, in a very first-personal kind of way, drawing in cultural, political, and phenomenological notions from all over the place. Really looking forward to her coverage of the remaining 100 elements!

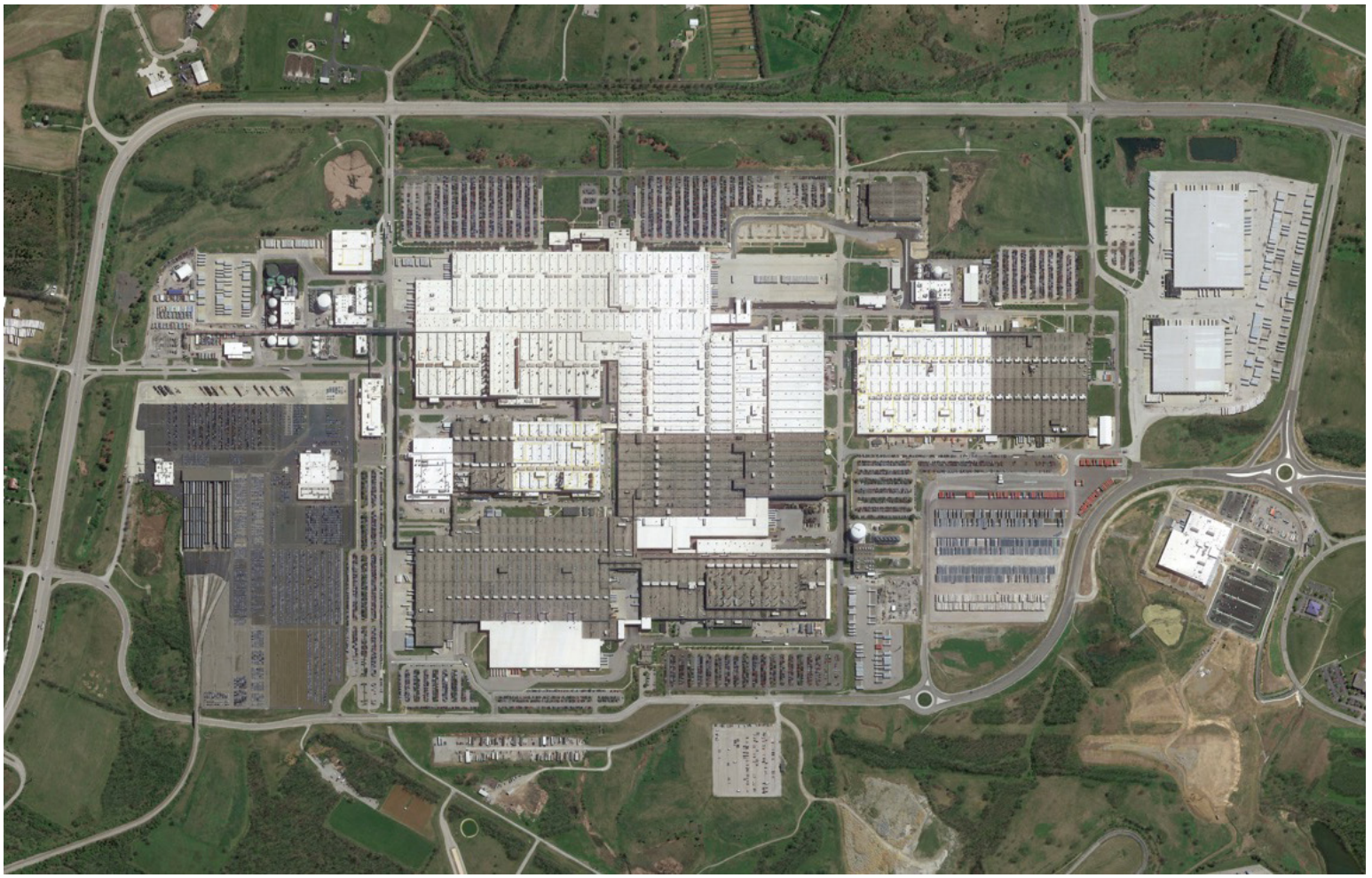
The Death and Life of the Great Lakes, by Dan Egan, 2017
A detailed and engaging story about the poor old Great Lakes, the largest collection of liquid fresh water on the planet, under siege from so many foreign organisms. Before canals and locks and seaways were constructed, the lakes were isolated from the rest of the world. Water flowed out, but not in. Currents, rapids, waterfalls—especially Niagara Falls—stopped waterborne biological mixing with the outside world. Starting with the Erie Canal and ending with the St. Lawrence Seaway, the falls were bypassed, and ocean-going vessels now come in to the interior, step by step, rising from sea level to 600 feet above it. They have brought in an onslaught of organisms, including eels and mussels that have taken over and caused surreal and extreme forms of population control. And that's not the half of it. A great book, and an even better story, still raging.

Raven Rock: The Story of the U.S. Government's Secret Plan to Save Itself-While the Rest of Us Die, by Garrett M. Graff, 2017
Detailed overview of the federal government's disaster preparedness and continuity plans, naming people, programs, and places all over the place, left over over the course of the Cold War. Technologies for things like post-nuclear war communication systems for the president's doomsday plane have gone through considerable evolutions, leading to some scientific advancements and interesting infrastructural relics, as well as things like the secret bunker for Congress at the Greenbrier resort, exposed in the early 1990s. Much of this system though, including the two primary government underground government evacuation and command centers, Mount Weather and Raven Rock, have been significantly upgraded and enlarged after 9-11. While the federal government prepares for the worst, we are still free, at least, to hope for the best.

Many Norths: Spatial Practice in a Polar Territory, Lola Sheppard and Mason White, 2017
A kind of atlas to constructed forms and infrastructures in the modern Canadian arctic, covering mining, communications, travel, housing, and much more. Written by architects who went through Harvard's Graduate School of Design (a source of many interesting things) with support from the Graham Foundation, design help from Bruce Mau, published by Actar, it avoids the excessive use of brilliantly creative graphics that sometimes overwhelms rather than elucidates in tomes of this sort. What's not to love?

5th Avenue: A Cultural Biography, edited by Constance Hockaday, 2016
A freeform book of photos of a freeform place that's still there, in some form, if not free—the 5th Avenue peninsula, in Oakland, California. This little neighborhood cul-de-sac of sheds and boats tucked into the port of Oakland's estuary, south of Jack London Square, is one of the oldest continuously operating scrappy industrial creative self-selecting unintentional communities in the Bay Area. It's out of this asphalt swamp, this fertile crack in the urban fabric, that the CLUI first opened for business in 1994.

CLUI Corps: Matthew Coolidge, Sarah Simons, Aurora Tang, Ben Loescher, George Budd, Steve Badgett, Tellef Tellefson, Igor Vamos.
Newsletter Editors: Matthew Coolidge, Sarah Simons, Aurora Tang.



Biggest building in the USA? Toyota's assembly plant in Georgetown, Kentucky. Image from Google Earth.

THE CENTER FOR LAND USE INTERPRETATION
9331 Venice Blvd.
Culver City, CA 90232
www.clui.org clui@clui.org