
The northern, natural section of Arroyo Seco. Source: Leor Pantilat

Regulation and Restoration in the Arroyo Seco

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The Arroyo Seco sits at the center of a growing challenge facing Los Angeles and cities across the American West: how to modernize aging flood-control infrastructure while restoring ecological function, improving water resilience, and reconnecting communities to urban waterways. This report explores how decades of channelization and engineered water management transformed the Arroyo from a dynamic riparian ecosystem into a highly regulated drainage corridor, and how today's efforts to address water quality and climate resilience continue to be shaped by those legacy systems. Focusing on the proposed Arroyo Seco Water Reuse Project, the paper examines the opportunities and limitations of current "nature-based" infrastructure approaches, highlighting tensions between regulatory compliance, ecological restoration, and long-term watershed resilience. It concludes by outlining an alternative restoration vision centered on floodplain reconnection, habitat recovery, and community stewardship as a model for more adaptive and ecologically integrated urban water management.

The southern, channelized section of Arroyo Seco beneath San Rafael Bridge.
Source: Craftwater Engineering

From Ecosystem to Infrastructure

Within the Los Angeles River watershed, natural waterways have been systematically converted into concrete channels engineered to move stormwater to the ocean as quickly as possible during peak rainfall events. This infrastructure reduced flood risk and enabled dense urban development, but it also severed the ecological processes that once defined the landscape. Los Angeles is built on an alluvial fan that historically sustained interconnected hydrologic systems. Sediment and debris from the San Gabriel Mountains moved downstream to create landforms that supported riparian forests, wetlands, and estuarine habitats, while seasonal flows infiltrated permeable soils to recharge aquifers that supplied a relatively stable local water source (Gumprecht, 1999)

Today, sediment is intercepted and removed at dams and debris basins, impervious surfaces prevent infiltration, and urban pollutants contaminate runoff. The paradox of Los Angeles, as with much of California and the American West, is that infrastructure designed to control water now contributes to water scarcity, degraded water quality, and escalating maintenance costs. For planners and designers, the critical question is how urban water management can be reimagined to provide both flood control and restored ecological functions.

The Channelization of the Arroyo Seco

The Arroyo Seco, one of the Los Angeles River's primary tributaries, is an ideal setting to examine this question in the context of present-day environmental planning. Draining approximately forty-seven square miles from the San Gabriel Mountains to the Los Angeles River near downtown, the Arroyo is divided by Devil's Gate Dam into two distinct identities. Above the dam, it is a wild, boulder-strewn stream cut deep into the canyon and surrounded by dense stands of alder, sycamore, and willow. Below the dam, it flows into an open concrete channel surrounded by dense urban development with little resemblance to its historical condition (North East Trees, 2006).

This transformation followed catastrophic floods in the early twentieth century, culminating in the construction of Devil's Gate Dam in 1920 and subsequent channelization of downstream reaches. The need for flood control and public safety replaced a dynamic self-regulating system with one dependent on mechanical controls. Within a generation, a once-rich landscape of riparian woodlands, chaparral scrub, spring-fed lagunas, and an abundant salmon-bearing river was largely destroyed (Gumprecht, 1999).

Long before these changes, the Arroyo Seco formed part of the ancestral landscape of the indigenous Kizh Nation. Seasonal water flows, wetlands, and riparian corridors supported settlement sites, travel routes, and subsistence practices centered on fishing, plant gathering, and trade along the San Gabriel Valley watershed. Beginning in the late eighteenth century with Spanish missionization and continuing through Mexican and American land regimes, Indigenous inhabitants were progressively displaced from these landscapes. By the time flood-control infrastructure hydrologically reconfigured the Arroyo in the early twentieth century, the river had likewise been separated from the communities that had historically coexisted within its seasonal dynamics (McCawley, 1996).

The ecological consequences of that transformation are ongoing. As with most water bodies in the watershed, the Lower Arroyo is listed on California's Clean Water Act 303(d) list of impaired waterways for coliform bacteria, nutrients and algae, and trash, all products of urban runoff discharged through storm drains. The biological community is rated Very Poor by county monitoring assessments, and species that once defined the watershed, such as the southern steelhead, the arroyo toad, and the California gnatcatcher, have been locally extirpated. Native riparian habitat now comprises only fifteen percent of the total land area within the watershed, and far less in the urbanized stretches south of Devil's Gate. And although significant open space still exists adjacent to the channel, these areas are dominated by noxious species, cut off from wildlife corridors, and deprived of the runoff and groundwater that once sustained them (North East Trees, 2006).

Future risks, natural resilience

The current flood-control system is far less resilient than its concrete infrastructure might imply. As it approaches the end of its service-life, this infrastructure has become increasingly expensive to maintain and more vulnerable to extreme weather.

Flood-control functions are predicated on the annual excavation and disposal of millions of cubic yards of sediment that wash down from the steep, fractured San Gabriel Mountains during storms. Recurring sediment excavation and hauling alone can run into the hundreds of millions of dollars each year (LACFCD, 2012). As structures age, repair and rehabilitation costs compound. Concrete dams and channels can suffer abrasion and cracking from high-velocity flows and debris impacts, and foundations can be undermined by erosion (Stewart et al., 2011). These vulnerabilities are heightened in a changing climate. Facilities designed for past conditions become brittle and more prone to failure when faced with heavier rainfall events, more frequent storms, and larger debris flows (Milly et al., 2008; Thomas et al., 2024).

From a policy and planning perspective, the prevailing engineering-first mindset tends to ignore this compounding systemic weakness and address symptoms with piecemeal technical fixes: incremental concrete reinforcement, additional treatment plants, larger detention basins, and more end-of-pipe controls. Those responses can reduce immediate hazards or meet pollutant compliance targets, but they perpetuate a logic that favors rigid, single-purpose facilities over dynamic, watershed-scale approaches (NRC, 2009).

When the calculus is reframed towards total lifecycle costs and resilience planning, nature-based solutions emerge as a viable alternative. These systems, mimicking natural processes that occur in wetlands, floodplain corridors, and riparian buffers do not reject engineering altogether. Rather, they reactivate functions of sedimentation, filtration, plant uptake, microbial processes, detention, and infiltration to address water quality, flooding, habitat, and public space at the same time. While the exact definition of "nature-based" is debated and variable, solutions that rely on natural biological, geomorphological, or chemical processes are increasingly seen as better positioned to meet the demands of the future. Such approaches harness the self-regulating adaptability and longevity of ecological systems, helping to recharge aquifers, slow runoff, filter pollutants, and increase biodiversity (CNRA, 2022).

The challenge remains that these systems often require multiple, distributed interventions, longer-term project timelines, novel engineering approaches with variables that can be harder to immediately quantify, and more complex policy frameworks. Compared to long-established "hard" engineering disciplines and policy frameworks, the real-world application of nature-based solutions is very much an emerging practice, and is often at odds with current land-use practices, regulatory requirements, and jurisdictional boundaries (Thorslund et al., 2017).

Measure W and the challenges of institutional change

In Los Angeles, the most significant recent attempt to redirect investment toward nature-based water management is the 2018 passage of the Safe Clean Water Initiative, known as Measure W – an annual parcel tax of 2.5 cents per square foot of impervious surface that generates over $230 million per year. Those funds are allocated across a range of regional projects aimed at improving water quality, increasing

Promotional graphic for the Safe Clean Water Program in Los Angeles County.
Source: Safe Clean Water Program, "Safe, Clean Water for LA County," Safe Clean Water Program.

local supply, and creating ecological amenities for the public (LACFCD, 2018). By any account, Measure W is a meaningful step forward from the water management practices of the previous century. It provides a dedicated funding stream for projects that could test new approaches, catalyze broader investment, and build public engagement with watershed issues.

However, several years after passage, environmental groups have raised concerns about the program's trajectory. Critics point to a lack of measurable outcomes or metrics for project success, and note that applicants are not required to track negative impacts such as tree removal. Furthermore, some projects appear to be overdesigned to maximize water quality scoring rather than deliver multi-benfit results. Hardscape removal, one of the initiative's core intentions, is occurring less than expected, with projects frequently sited in existing green space rather than replacing impervious surfaces: after 3 years and $660M of funding, Measure W projects had removed only 2.8 acres of hardscape. Overall, projects appear to prioritize a backlog of "shovel-ready" municipal projects, using new money to fulfill existing infrastructure obligations rather than expanding overall investment into novel and transformative water management projects. (Los Angeles Waterkeeper, 2023)

These concerns point to a key challenge of moving towards nature-based approaches within a system in which old ways of thinking are still deeply entrenched. Measure W creates the financial conditions for a different approach to water infrastructure, but the metrics and incentive structures that govern how projects are designed and evaluated can still privilege a strongly engineered approach. Scoring criteria are heavily weighted towards short-term, easily quantifiable metrics such as pollutant load reduction and acre-feet of groundwater recharge. Metrics that are less easily quantifiable, such as nature-based features and community benefits, are imprecisely defined and given much less weight in project consideration. Watershed-scale ecological impacts, such as floodplain reconnection, riparian succession, and sediment redistribution, are not explicitly factored into project scoring.

The Arroyo Seco Water Reuse Project: Policy in Practice

The Arroyo Seco Water Reuse Project illustrates how these structural preferences shape infrastructure decisions at a project scale. Located across two sites in the lower Arroyo Seco corridor, the project proposes two stormwater capture and treatment facilities designed to address a water quality compliance obligation while delivering water supply and habitat co-benefits. While the project responds to a legitimate regulatory mandate and improves baseline water quality, its design reflects an institutional logic of compliance and quantification rather than restoring natural processes that can meet the ecological and societal needs of the sites.

San Rafael Creek and the Arroyo Seco Confluence

The first site is located at the confluence of San Rafael Creek and the Arroyo Seco Channel in the City of Pasadena. San Rafael Creek is one of the last remaining relatively natural tributaries of the Arroyo Seco, draining approximately 697 acres of heavily developed residential and recreational land through a soft-bottomed earthen canyon before entering a short concrete-lined reach in its final approach to the mainstem

Source: City of Pasadena and City of South Pasadena Draft Initial Study/Mitigated Negative Declaration

channel (City of Pasadena, 2023). The creek is perennial, fed by natural springs supplying Johnston Lake upstream, and baseflow at the outfall is generally present year-round. The drainage area includes Annandale Golf Course, surrounding residential neighborhoods, and a network of storm drains whose combined discharge has historically produced elevated bacteria concentrations at the outfall (Craftwater Engineering, Inc., 2023). In the Arroyo Seco Load Reduction Strategy (LRS), this location, designated Outfall AS-41, was identified as a priority compliance point under the Los Angeles River Bacteria Total Maximum Daily Load (TMDL) (ULAREG, 2016).

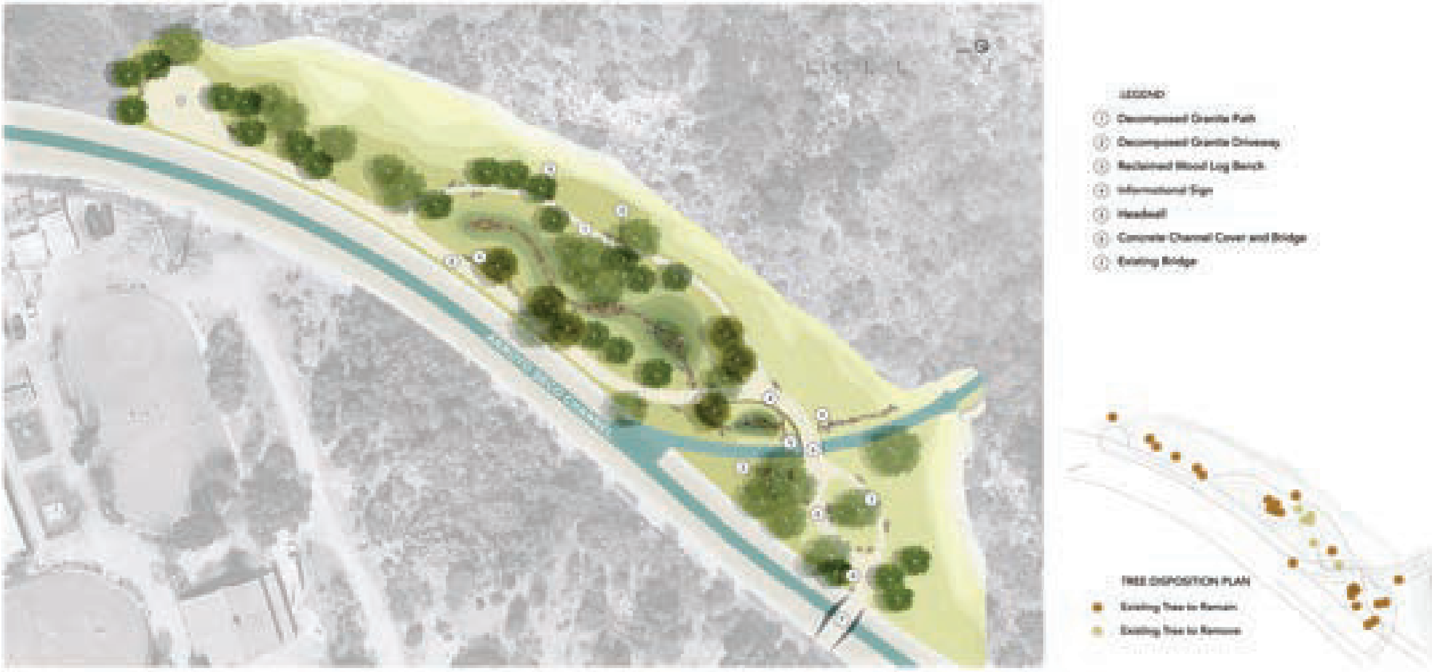
The priority designation was based on monitoring conducted between 2012 and

Satellite view of the San Rafael site along the Arroyo Seco channel. Source: Google Earth.

2013 that documented exceedances of the recreational water quality standard for E. coli during several sampling events under modest dry-weather flow conditions typical of the creek's perennial character. Subsequent dry-weather sampling conducted upstream in 2018 recorded bacteria concentrations within the San Rafael Creek and Johnston Lake system that were below the applicable single-sample exceedance threshold, suggesting that dry-weather conditions within the watershed may already be trending toward compliance (ULAREG, 2016; Kinnetic Laboratories, 2018).

The regulatory timeline is central to understanding the scale of the proposed intervention. Under the Los Angeles River Bacteria TMDL, dry-weather exceedances in tributaries such as the Arroyo Seco were required to be addressed by September 2023, while wet-weather compliance requirements extend to 2037. In response to the dry-weather mandate, the 2016 LRS proposed diversion of low-flow discharges from Outfall AS-41 to a dry well located upslope of the site near Laguna Road and San Rafael Avenue. The implementation table in the LRS identifies this measure as capable of eliminating 100 percent of dry-weather bacteria loading from the outfall. (ULAREG, 2016)

The currently proposed San Rafael facility is substantially larger in scope. The design would divert flows through a 6.3 cfs drop inlet at the upstream end of the concrete reach, route them along a rock-lined channel, and treat them in a 0.437 acre-foot infiltration basin. When infiltration capacity is exceeded, flow would pass through an underground jellyfish filter (a proprietary



San Rafael concept plan for the Arroyo Seco Water Reuse Project.
Source: Draft Initial Study/Mitigated Negative Declaration: Arroyo Seco Water Reuse Project.

mechanical cartridge system) before discharge. Infrastructure components would be located underground or screened from view, and the surrounding area would be revegetated with native riparian species. Project documentation describes a system sized to capture runoff associated with the 85th-percentile 24-hour design storm, an engineering performance standard typically associated with wet-weather stormwater management under Enhanced Watershed Management Program planning (City of Pasadena, 2023).

This distinction is important because the 2023 dry-weather deadline that initially created the compliance pressure targets only the relatively small perennial flows documented at the AS-41 outfall. The dry-well diversion described in the LRS was specifically sized to address that condition and was identified as sufficient to eliminate dry-weather bacteria loading from the outfall (ULAREG, 2016). By contrast, the infrastructure now proposed is oriented toward the longer-term wet-weather performance standard scheduled for 2037. While such infrastructure is intended to provide broader water supply benefits, the scale and design logic of the project extend beyond the narrow dry-weather compliance obligation that originally triggered the need for action at this site.

The LRS also acknowledged that proposed diversions could be replaced by alternative measures that infiltrate or eliminate dry-weather flows or address sources directly (ULAREG, 2016). Supporting this view, a 2019 reconnaissance conducted by Stillwater Sciences suggested that restoring the concrete-lined lower reach of San Rafael Creek and naturalizing its confluence with the Arroyo Seco could potentially provide an ecological pathway toward TMDL compliance (Stillwater Sciences, 2019). That assessment was preliminary, but its findings indicated that a formal feasibility study of restoration-based alternatives would have been warranted prior to committing to a more intensive structural solution.

Satellite view of the San Pascual site along the Arroyo Seco channel.
Source: Google Earth.

San Pascual and the Arroyo Seco Golf Course

The second site targeted in the Arroyo Seco Water Reuse Project is located roughly 850 feet from the San Rafael site, southeast of the San Pascual Avenue overpass in South Pasadena. The area carries significant cultural importance to the present-day Kizh Nation (Gabrieleño Band of Mission Indians – Kizh Nation, 2025). A water diversion at this location has historically supplied irrigation to the Arroyo Seco Golf Course, operated by the City of South Pasadena, although this system is currently non-operational due to poor water quality in the Arroyo Seco (City of Pasadena, 2023).

Unlike the San Rafael site, San Pascual has no independent TMDL compliance requirement, and its inclusion in the project appears to be driven by downstream treatment and water supply function. A major component of the San Pascual site plan is the removal of 136 trees, including 36 protected native species, to accommodate treatment infrastructure and construction access.

The proposed San Pascual facility would divert channel flow downstream of the San Rafael facility, pass it through a 6.5 acre-foot infiltration basin, and deliver a portion via pipeline to the Arroyo Seco Golf Course through a dedicated pump house constructed on golf course property. Project documents state that the facility is projected to deliver approximately 30 acre-feet of treated water annually for golf course irrigation and contribute approximately 258 acre-feet to groundwater recharge in the Raymond Basin (City of Pasadena, 2023).

San Pascual concept plan for the Arroyo Seco Water Reuse Project.
Source: Draft Initial Study/Mitigated Negative Declaration: Arroyo Seco Water Reuse Project.

Compliance Constraints and Community Concerns

While the Arroyo Seco Water Reuse Project represents a shift from the concrete-centric flood control infrastructure typical of the 20th century, much of the core logic addressing watershed problems through facility-scale engineering solutions persists. This logic is reinforced by regulatory, funding, and governance structures that provide limited incentives for incorporating long-term ecological, cultural, and societal considerations into water management.

The City of Pasadena frames the project primarily as an urgent compliance mandate. Within this framework, the most direct strategy is to intercept flows near the priority outfall and route them through engineered infrastructure designed to deliver predictable treatment outcomes. However, consistent with broader critiques of Measure W, the Arroyo Seco project demonstrates how regulatory and funding structures shape project design to meet existing operational and maintenance priorities that extend beyond the program’s stated goals.

Central to this critique is the golf course irrigation component. The San Pascual site, although not subject to TMDL compliance requirements, consumes a substantial portion of project resources and requires extensive mechanical infrastructure to pump, treat, store, and distribute water for irrigation. While this reduces reliance on potable municipal water, the use of reclaimed stormwater to maintain turf has generated controversy, particularly given the potential for the water to be re-contaminated through fertilizer and pesticide applications associated with golf course management. Some residents and environmental advocates view irrigated golf courses as an intrinsically unsustainable land use, raising questions about whether this allocation aligns with watershed restoration goals (City of Pasadena, 2024).

The project's water supply justification relies heavily on a projected contribution of approximately 258 acre-feet per year to the Raymond Basin aquifer via on-site infiltration. This figure drives the San Pascual facility's Measure W scoring and positions it as a regional water supply investment rather than an adjunct to the San Rafael site. However, geotechnical investigations at San Pascual encountered perched groundwater at the contact between younger alluvial deposits and underlying bedrock, and the report concluded that the dense, fine-grained bedrock would significantly impede vertical infiltration. Stormwater infiltrating the alluvial deposits is expected to migrate laterally along the bedrock contact rather than percolating downward to recharge the deeper aquifer (Craftwater Engineering, Inc., 2022a; 2022b). While the geotechnical evaluation identifies this lateral migration, the MND does not assess where this water ultimately travels or its potential effects on urban infrastructure beyond the immediate 15-foot setback recommended by the engineers. The potential for such impacts remains unstudied and uncertain.

As a result, the 258 acre-feet figure that underpins the facility's scale, funding allocation, and characterization as a drought-resilience measure is not substantiated by the site's own subsurface data. This internal inconsistency has not been explicitly addressed in project documentation or public communications.

The project's physical footprint further intensifies opposition, particularly the issue of significant tree canopy removal. Although replacement planting is proposed, opponents argue that the loss of a mature riparian canopy constitutes a significant ecological impact that could take decades to recover (City of Pasadena, 2024). Within the vegetated corridor of the Arroyo Seco—one of the few remaining semi-forested urban landscapes—this removal reinforces concerns that regulatory compliance and engineered solutions are prioritized over existing habitat preservation.

Community opposition also highlights jurisdictional, legal, and cultural concerns. Portions of the San Pascual footprint lie within Los Angeles city parkland, prompting objections that the project repurposes public open space to benefit another municipality. Advocates have raised legal water rights objections, arguing that stormwater historically flowing through the Arroyo is a shared watershed resource; diverting it for golf course irrigation alters hydrologic flows and may affect downstream ecological and public uses (City of Pasadena, 2024). Tribal opposition from the Kizh Nation echoes these objections in a formal letter, additionally noting inadequate ecological and hydrological assessments of the site (Gabrieleño Band of Mission Indians - Kizh Nation, 2025).

The project's advancement suggests that several of these issues were not fully resolved during the early planning stages. The project initially proceeded under a Mitigated Negative Declaration (MND), which does not require a full alternatives analysis under the California Environmental Quality Act. Litigation filed by project opponents subsequently led the cities to prepare a full Environmental Impact Report (EIR), which is now underway, though by that stage significant design and engineering work had already been completed (Sharp, 2025). In responding to public concerns, city officials have framed the project as constrained by regulatory compliance timelines, despite the absence

Cost & Schedule

Phase	Description	Cost	Completion Date
Design	Assuming approval occurs in June 2023, the development of 30% design drawings will begin in July 2023. It is assumed that 100% design drawings will be finished by December 2025.	$2,305,000.00	12/2025
Planning	For contingency costs including construction management, permit allowance, escalation costs, environmental compliance monitoring and unallocated contingencies.	$8,205,710.00	07/2028
Construction	Assuming design finishes in December 2025, the project will be submitted to SCW for construction funding. Construction is expected to begin in July 2026.	$23,484,376.06	07/2028
TOTAL		$33,995,086.06	

Estimated cost and schedule for the Arroyo Seco Projects.
Source: Safe Clean Water Program

of a separate bacteria Total Maximum Daily Load compliance requirement at the San Pascual site. The city has also maintained that the project is consistent with applicable water rights, that adequate consultation with Tribal representatives has occurred, and that the overall project would produce a net environmental benefit (City of Pasadena, 2026).

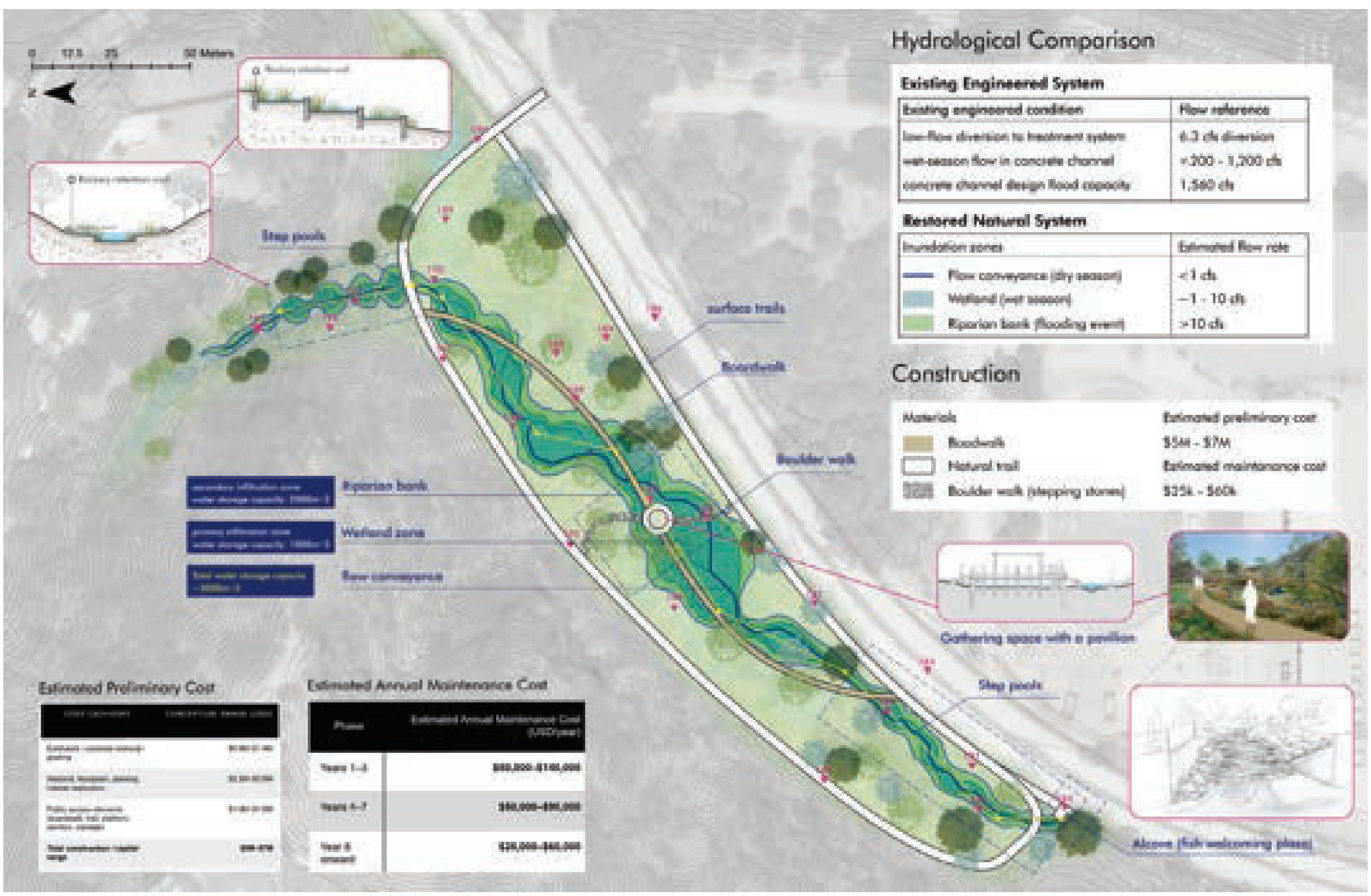
As a whole, this project reflects some of the broader critiques of Measure W implementation. While the program promotes watershed health, water quality, and community co-benefits, the Arroyo Seco Water Reuse Project exemplifies how regulatory imperatives, operational priorities, and jurisdictional boundaries can overshadow ecological and cultural objectives. In practice, even projects under programs intended to support nature-based solutions can translate watershed challenges into heavily engineered facilities that satisfy narrow compliance requirements while leaving broader hydrologic and culturally significant dimensions of the watershed largely outside the frame of evaluation.

Restoring the Confluence, Connecting the Community: An Alternative Proposal

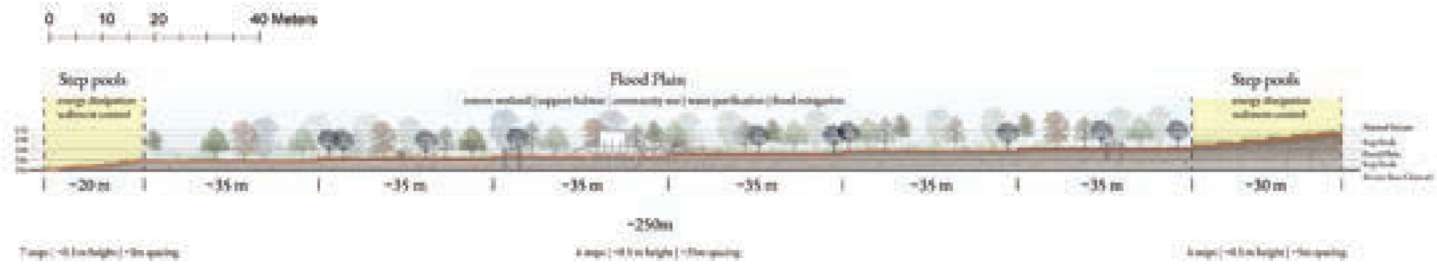
What would interventions at these two sites look like if ecological restoration, cultural stewardship, and long-term watershed resilience became the primary design objectives? While full watershed restoration requires significant upstream intervention, site-scale design can still serve as a meaningful step, delivering immediate ecological benefits while supporting the goal of broader future restoration. The following section outlines a conceptual alternative for the San Rafael confluence and San Pascual Park, exploring how these sites could shift from facility-based treatment toward landscape-based hydrologic and ecological processes. This alternative proposes restoring and naturalizing the San Rafael confluence while maintaining San Pascual Park as open space for ecological stewardship and community engagement rather than stormwater treatment infrastructure.

A Naturalized San Rafael

At San Rafael, an ecologically-centered alternative design would remove the concrete-lined lower reach, reconnecting flows to a meandering channel and expanded floodplain. Step pools, riffle sequences, and strategically placed boulders, including repurposed concrete and locally sourced stone, would help



Conceptual plan of an alternative proposal for the San Rafael site.



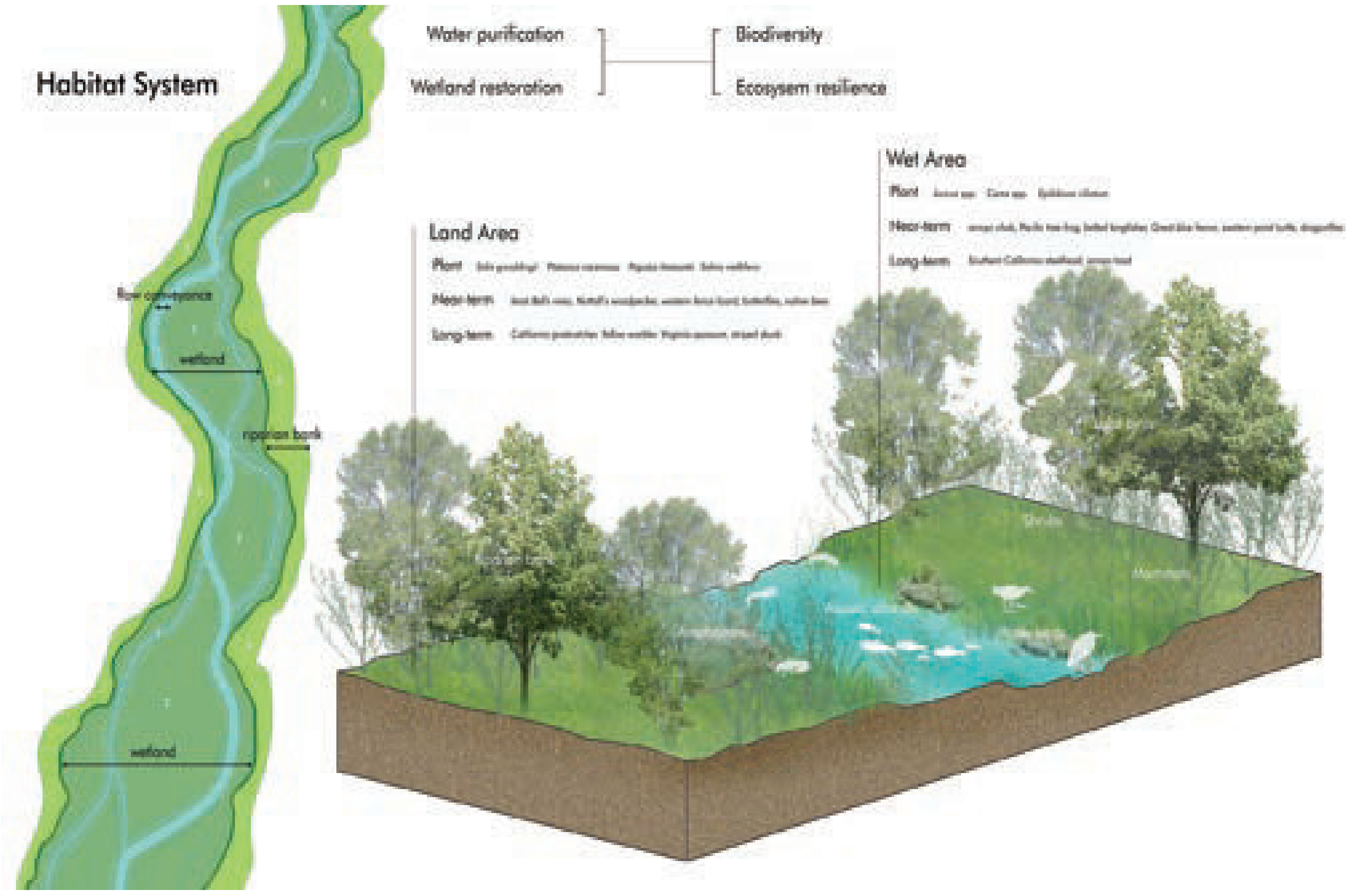
Longitudinal section of the proposed alternative, showing elevation change across the full corridor.

dissipate energy during storm events while supporting habitat complexity and channel stability. Unlike mechanical treatment systems, which approximate ecological processes but remain maintenance-intensive and single-purpose, natural wetlands regulate flood peaks, filter pollutants, support sediment redistribution, and provide multifunctional habitat and recreation using geomorphic and biological processes.

The AS-41 outfall drains a substantial urban watershed, and the Load Reduction Strategy identifies elimination of dry-weather flows from this outfall as the primary regulatory objective. The modest dry-weather discharges at the site, as recorded by LRS monitoring, suggest that the compliance objective at this location is not a large-volume stormwater conveyance challenge. With several acres of available space at the San Rafael confluence, a restoration approach warrants serious consideration as a potential means of achieving both regulatory compliance and broader ecological objectives. Yet project documentation provides little evidence that such alternatives were evaluated with the same level of rigor as the engineered treatment facility ultimately selected.

The City has noted that the lower reach of San Rafael Creek was originally lined with concrete to prevent channel scour during heavy winter flows, and the 2006 Arroyo Seco Watershed Management and Restoration Plan similarly acknowledged that removal of the lining would depend on reductions in upstream runoff. These concerns reflect legitimate flood control considerations. However, contemporary stream restoration practice routinely addresses high-energy urban flows through grade control structures, step-pool sequences, and strategically placed boulders that dissipate hydraulic energy while stabilizing sediment transport. The same hydraulic principles used to engineer concrete channels can be applied to size step-pool sequences and boulder placement for geomorphic stability under equivalent flow conditions (Chin et al., 2009).

Precedent shows that urban creek naturalization can reliably achieve meaningful restoration outcomes. In particular, the City of Milwaukee has used concrete removal as a key part of watershed management efforts. The restoration of the Menomonee River removed nearly a mile of mid-century concrete channel lining and replaced it with a natural riffle-pool system designed for high-gradient urban hydrology in partnership with the U.S. Army Corps of Engineers (MMSD, n.d.-b). Similarly, the Kinnickinnic River Flood Management Project removed extensive concrete channelization and reestablished a broader floodplain corridor capable of safely conveying storm flows while supporting



Habitat system and proposed ecological conditions for the Arroyo Seco alternative.

ecological recovery and public access (MMSD, n.d.-a). These projects demonstrate that restoration-based water management is an established and repeatable practice within highly engineered urban watersheds.

Equally important, the San Rafael confluence is located within the open green space of Lower Arroyo Park, where surrounding land uses are primarily recreational rather than residential or commercial development. Because adjacent development does not directly constrain the channel, this reach provides a relatively low-risk setting in which channel adjustments, floodplain reconnection, and adaptive management strategies could be implemented without exposing nearby structures to flood hazards.

While the geotechnical report identifies that this site is not suitable for infiltration infrastructure due to shallow bedrock and a high water table, these same conditions represent subsurface hydrology that naturally supports prolonged surface saturation, shallow water table conditions, and slow lateral moisture movement through alluvial soils – conditions that define functional seasonal wetland systems. The geology that renders the site unsuitable for aquifer recharge is precisely the geology that makes it well-suited for the kind of low-tech wetland restoration and ecological stewardship the alternative proposal envisions.

These conditons are ideal for designing habitat suitable for resident rainbow trout and – should future watershed restoration efforts reestablish migratory access to the Arroyo Seco – Southern California steelhead trout. The proposed design connects the mainstem channel to the restored wetland corridor through a step-pool sequence sized to accommodate fish passage while also providing maintenance access for sediment management within the adjacent concrete channel. Within the restored reach, riffle-pool sequences, coarse gravel recruitment zones, and strategically placed boulders or large wood structures would introduce hydraulic complexity and localized flow refugia while providing spawning and rearing substrates suitable for juvenile salmonids. Although downstream migration barriers in the Los Angeles River system currently limit steelhead access to the watershed, designing restoration projects with future habitat potential helps

Detail of hydrological zones and corresponding planting scheme.

Concept image illustrating ecological functions of a restored confluence.

Perspective view showing the wetland boardwalk in the proposed restoration area.

ensure that opportunities for ecological recovery align with broader long-term regional river restoration efforts.

San Pascual: Community-led Restoration

At the San Pascual site, where no compliance mandate exists, the currently proposed stormwater facility design could instead be replaced with a long-term stewardship and ecological enhancement strategy that builds on the community's existing care for the site, as well as the ecological functions that already exist there.

Rather than beginning with a fixed plan, this process should be dynamic, iterative, and driven by community input. Features might include low-tech, process-based restoration techniques, such as native plantings, small wood or stone weirs, and vegetated swales, which could help reestablish hydrologic and ecological dynamics while supporting public engagement. Trails, interpretive signage, and demonstration areas could support education and collaboration with the Kizh Nation, integrating cultural values and Indigenous stewardship practices into site management. While the current project proposes diverting treated stormwater to irrigate the nearby golf course, alternative water sources such as recycled or greywater irrigation are widely used by golf courses and could meet turf irrigation needs without relying on diversion of Arroyo Seco flows.

This approach could reduce long-term maintenance costs compared with mechanically intensive systems while embedding stewardship of the site within the surrounding community. It also aligns with the long-term vision of the Arroyo Seco Stream Restoration Plan: reconnecting the river and its tributaries from the San Gabriel Mountains to the Los Angeles River in ways that prioritize both ecological and societal benefits. While full corridor restoration will require decades of sustained investment and coordination, incremental projects like this can generate knowledge, pilot innovative approaches, and build momentum. By concentrating restoration at the San Rafael confluence while emphasizing stewardship and ecological enhancement at San Pascual, this alternative demonstrates a practical, nature-based pathway toward broader watershed resilience.

Conclusion: Towards a Nature-Based Future

The Arroyo Seco Water Reuse Project reflects a broader transition underway across Los Angeles and much of the American West. Aging flood-control infrastructure is increasingly strained by climate change, water scarcity, ecological degradation, and rising maintenance costs, prompting agencies to reconsider the assumptions that shaped twentieth-century water management. Programs such as Measure W promote multi-benefit and nature-based approaches. Yet the Arroyo Seco case illustrates how older engineering and regulatory frameworks remain deeply embedded within contemporary water management projects.

Project proposals are shaped as much by institutional structures as by site conditions. Ecological restoration often falls outside the mandates, performance targets, and professional responsibilities of the agencies responsible for urban water management. As a result, watershed challenges are frequently translated into projects that fit existing funding, regulatory, and operational frameworks, even when broader ecological opportunities exist. The Arroyo Seco Water Reuse Project demonstrates how regulatory compliance requirements, municipal priorities, and jurisdictional boundaries often exert greater influence on project outcomes than the ecological potential of a site.

Restoring urban watersheds will not occur by tacking isolated ecological features onto conventional infrastructure projects. It requires institutions capable of working across watershed scales, longer time horizons, and forms of stewardship that extend beyond compliance-driven project delivery. Projects such as those in the Arroyo Seco are therefore more than local debates over design or permitting. They are indicators of how future investments will shape the relationship between cities and their waterways. Whether those investments reinforce existing patterns of management or contribute to a more ecologically integrated future will depend not only on engineering and design decisions, but also on how success itself is defined.

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