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## Donald C. Tillman Wastewater Reclamation Plant Blower Foul Air Project– Los Angeles, California ENVISION ANALYSIS CASE STUDY



Figure 1: Donald C. Tillman Wastewater Reclamation Plant, with Japanese garden in the foreground/Photo from Civiltec Engineering Inc.

### The Zofnass Program at Harvard University John Daley, Judith Rodríguez, Prof. Spiro N. Pollalis August 9, 2019

John Daley, ENV-SP, prepared this Envision analysis case study under the supervision of Judith Rodríguez, ENV-SP, as part of the Harvard-Zofnass Program for Sustainable Infrastructure directed by Prof. Spiro N. Pollalis for the purposes of research and education. The analysis serves as a basis for research and class discussion for the development of case studies focused on the business case for sustainable infrastructure. The cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective project design or implementation.

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## 1. PROJECT DESCRIPTION & LOCATION

The Donald C. Tillman Water Reclamation Plant (DCTWRP) Blower Air Clean Up System (Project 6171) was built in 2017 to support wastewater treatment operations at DCTWRP, a wastewater treatment and recycling facility for the city of Los Angeles. The \$6.8 million renovation installed a bio-trickling filter to remove pollutants from facility-derived air before distributing the air to downstream equipment involved in aeration, a key water treatment step.

The primary stakeholders for this project were the Bureau of Engineering Environmental Engineering Division (the designer of the foul air cleaner), the Los Angeles Bureau of Sanitation (the operator of the plant), and the US Army Corps of Engineers (the owner of DCTWRP's lease).

The project is 22.5' by 22.5' by 12' and has four main components. First, there are circulation pumps to collect foul air. Next is a series of degreasers, which remove large impurities in the air. After that is the bio-trickling step, which continuously cycles an acidic aqueous solution containing helpful bacteria through the air. This cycling allows bacteria to consume hydrogen sulfide gas in the foul air. Lastly, there are several ducts and pipes connecting the project with upstream and downstream wastewater infrastructure. By removing pollutants from foul air, the clean up system prevents corrosion and extends the life of blowers, piping, diffusers, and other important equipment.

Today, there are four main wastewater treatment facilities in Los Angeles, which collectively process about around 450 million gallons of wastewater per day for four million residents. These treatment facilities include Terminal Island, Los Angeles-Glendale, Donald C. Tillman, and Hyperion, which process on average 15, 20, 80, and 300 million gallons of wastewater per day, respectively. Terminal Island, Los Angeles-Glendale, and Donald C. Tillman recycle all of the water they process, while Hyperion recycles 25% of its water.

## 2. EXECUTIVE SUMMARY OF ENVISION ASSESSMENT

The DCTWRP Blower Air Clean Up System achieved Envision Silver, earning 37% of all applicable points. While the project was very narrow in scope, it managed to achieve significant scoring in all categories, while also demonstrating innovative leadership through its programmatic approach to Envision.

In the Quality of Life category, the project earned points for protecting valuable community wastewater infrastructure and enhancing public health through reduced chemical usage. The project also earned points for adhering to Los Angeles' progressive hiring guidelines, which mandate the hiring of local, minority, and disadvantaged workers.

In the Leadership category, the project earned points for Los Angeles' strong commitment to sustainability and its thorough monitoring, maintenance, and worker training programs. One important component of this project that was missing was an analysis of possible future

expansion of the Donald C. Tillman plant; it is unclear how well the blower air clean up system would be able to support an increase in wastewater treatment volume if such a change occurred.

In the Resource Allocation category, points were awarded for recycling over half of construction waste, planning for end of life recycling, sourcing 29% of energy from renewables, and using recycled water from DCTWRP during operations. The biotrickling filters have extremely low resource demands because they continuously recycle water and use self-propagating bacteria instead of chemicals. One key way the project could have improved in this category was by using recycled or regional materials and supporting sustainable procurement.

The project's highest scoring category by percentage was Natural World (many of the categories were not applicable, however). The project earned points primarily for being located on a greyfield and for a catch basin that allows the site to capture and treat all on-site stormwater and spillage, thus preserving land and water quality.

The City of Los Angeles has declared climate change and risk management as top priorities, and this project was no exception. By eliminating the use of potable water and chemicals, enhancing water recycling infrastructure, using corrosion resistant materials, and mitigating the urban heat island effect, project 6171 is poised to thrive in an increasingly resource constrained and climate-altered world.

One of the most notable aspects of this project was that it earned leadership innovation points for piloting a programmatic approach to Envision. Rather than assess the project for Envision after the design or construction process, the project team integrated internal policies and protocols into the Envision credit system, thereby using Envision as a planning tool and encouraging sustainable achievement beyond Bureau of Engineering norms. This programmatic approach to Envision provides an example not only for other municipal projects in Los Angeles, but also for companies and cities worldwide.

### **3. APPLICATION OF THE ENVISION RATING SYSTEM**

The Envision V2 system is a set of guidelines that aid in optimizing the sustainability of an infrastructure project during the planning and preliminary design phases, as well as a means to quantify the relative sustainability of the project. In this case study, the infrastructure to be assessed is the Donald C. Tillman Wastewater Reclamation Plant Blower Foul Air Project.

Envision consists of 60 credits grouped into five categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. Each credit pertains to a specific indicator of sustainability such as reducing energy use, preserving natural habitat, or reducing greenhouse gas emissions. Those credits are rated on a five-point scale referred to as a 'level of achievement': 'improved', 'enhanced', 'superior', 'conserving', and 'restorative'. Evaluation criteria are provided to determine if the qualifications for each level of achievement have been met for a

particular credit. In each of the five categories there is a specific credit called “Innovate or exceed credit requirements”. This is an opportunity to reward exceptional performance that applies innovative methods within the subjects that Envision evaluates.

The criteria for the levels of achievement vary from credit to credit, but generally an ‘improved’ level of achievement is awarded for performance that slightly exceeds regulatory requirements. ‘Enhanced’ and ‘superior’ levels indicate additional gradual improvement, while ‘conserving’ often indicates performance that achieves a net-zero or neutral impact. ‘Restorative’ is the highest level and is typically reserved for projects that produce an overall net positive impact. The Envision system weighs the relative value of each credit and level of achievement by assigning points. Credit criteria are documented in the Envision Guidance Manual, which is available to the public on the ISI<sup>1</sup> and Zofnass Program<sup>2</sup> websites.

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<sup>1</sup> [www.sustainableinfrastructure.org](http://www.sustainableinfrastructure.org)

<sup>2</sup> [www.zofnass.org](http://www.zofnass.org)

### 34. ANALYSIS BY ENVISION CREDIT

QUALITY OF LIFE	
Donald C. Tillman Water Reclamation Plant Los Angeles, California	
<b>QL1.1 Improve Community Quality of Life</b>	<p><b>10</b></p> <p><b>Superior</b></p> <p>The Blower Foul Air Clean up project, officially known as Project 6171, earned a superior level of achievement for its support of city goals, engagement with stakeholders, and improvement of wastewater infrastructure.</p> <p>Broadly speaking, project 6171 was designed to support two major community plans--the Sustainable City pLAN and the One Water LA 2040 Plan Guiding Principles Report. These plans include goals of sourcing water locally and improving water infrastructure. In particular, project 6171 supports the operations of the Donald C. Tillman Wastewater Reclamation Plant, which provides a clean, renewable source of recycled water to the community, by mitigating the harmful effects of polluted air on piping and equipment. In addition, the project uses no chemicals or potable water in its operation.</p> <p>During the design process, the project team made sure to frequently engage the Bureau of Sanitation (the operator of the treatment plant) and the US Army Corps of Engineers (the owner of the plant’s lease) to ensure the project had their approval. However, project 6171 was inherently limited in its ability to achieve higher levels of achievement for this credit because it was an internal renovation with little direct effect on the surrounding community.</p> <p><i>Mayor Eric Garcetti. City Sustainable pLAN. P. 16-20.</i>  <i>City of Los Angeles. One Water LA. 2015. p. 1.1-1.2, 3.1-3.2.</i>  <i>LA Bureau of Engineering Environmental Engineering Division. Project 6171 Meeting Notes. 2013-2015.</i>  <i>Department of the Army. Formal Army Corp Approval Letter. 2016.</i></p>
	<p><b>2</b></p> <p><b>Enhanced</b></p> <p>The project earned an enhanced level of achievement for local job creation and improving DCTWRP infrastructure.</p> <p>During the design and planning of the project, City Engineers logged 4,821 hours, and over \$750,000 was spent on outside engineering services. Construction required 22,000 labor hours from crane operators, electricians, and construction workers on top of an additional 7,500 hours of supervision.</p> <p>In addition, the project improves the performance of the DCTWRP’s water treatment processes by providing a clean source of process air.</p> <p>To achieve higher scores for this credit, the project would have needed to significantly improve conditions for businesses and the public.</p>

		<p><i>Bureau of Engineering. UPRS Hours in Planning and Design. 2014-2016.</i>  <i>Bureau of Engineering. Project 6171 Cost Estimate Summary. 2016.</i>  <i>City of LA Bureau of Engineering. DC Tillman Water Reclamation Facility Blower Foul Air Clean Up System. Pre-Design Report. 2014.</i></p>
<p><b>QL1.3 Develop Local Skills and Capabilities</b></p>	<p><b>5</b></p>	<p><b>Superior</b></p> <p>The project earned superior for its creation of local jobs and outreach to women, minorities, and other disadvantaged workers.</p> <p>The Los Angeles Bureau of Engineering has strong internal policies to promote progressive hiring practices. These policies include an 8% bid preference to local businesses, requirements to obtain bids from businesses owned by minorities, women, disabled veterans, and other disadvantaged groups, and a requirement that 30% of the total labor hours come from local workers.</p> <p>In addition, the project team drafted specific training requirements for plant personnel, which included in person training, maintenance procedures, and operating instructions. The training was provided by the contractor and equipment vendor and approved by city engineers.</p> <p><i>City of Los Angeles. Business Inclusion Program Outreach Documentation and Process.</i>  <i>City of Los Angeles. Project Labor Agreement. 2015-2020. P.24-25.</i>  <i>City of Los Angeles Bureau of Engineering. Specifications for DC Tillman Water Reclamation Plant Blower Air Clean up System. Section 01820 Operations and Maintenance Training.</i></p>
<p><b>QL2.1 Enhance Public Health And Safety</b></p>	<p><b>2</b></p>	<p><b>Improved</b></p> <p>The project earned an improved level of achievement for assessing risks, meeting health and safety regulations, and instituting strict safety protocols.</p> <p>As per Bureau of Engineering specifications, numerous safety measures were taken by the project team. First, the project team reviewed several alternative solutions for the air cleaner system. They decided on a biotrickling filter because it had the lowest overall cost, no chemical requirement, and the safest work environment. In designing the air cleaner system, the project team held a pre-construction safety conference that included engineers, contractor and subcontractor representatives, and city safety inspectors to discuss general safety practices. In addition, the project team drafted project specific safety protocols that were provided to the contractor as construction requirements.</p> <p>Given that the biotrickling filter is a relatively new technology in industrial wastewater treatment settings, the project team also drafted novel safety and maintenance protocols for long term operation.</p> <p>To achieve a conserving level, the project would have had to substantially exceed standard practices and regulations.</p>

		<p><i>City of Los Angeles Bureau of Engineering. DCT Blower Foul Air Clean Up System Pre-Design Report. Table 4: Evaluation of Alternatives. 2014.</i></p> <p><i>City of Los Angeles Bureau of Engineering. DC Tillman Water Reclamation Plant Blower Air Clean Up System General Conditions, General Requirements, Technical Provisions. Section 01311 Preconstruction Safety Conference, Section 01411 Confined Space Entry, Section 17400 Process Instrumentation and Control.</i></p>
<p><b>QL2.2 Minimize Noise And Vibration</b></p>	<p><b>8</b></p>	<p><b>Conserving</b></p> <p>The project completed appropriate noise and vibration assessments, developed project specific specifications for the contractor, and included noise monitoring and mitigation plans, thereby earning a score of conserving.</p> <p>All Bureau of Engineering projects are designed to comply with the City of Los Angeles Noise Control Ordinance. Prior to construction, the project team used ambient noise data and equipment specifications to model noise levels at the property line of the wastewater plant. These calculations modeled an ambient operational noise level of 44.3 dB at the perimeter, well under the standard of 60.2 dB for commercial properties. To ensure the calculations were accurate, the project team required the contractor to test noise levels in the field.</p> <p>During construction, the contractor was only permitted to work between 7am and 7pm Monday to Saturday, and was required to adhere to strict noise levels for different equipment types.</p> <p>No significant vibrational impacts resulted from the project.</p> <p><i>Los Angeles County. Noise Control Ordinance of the County of Los Angeles. 1978.</i></p> <p><i>City of Los Angeles Bureau of Engineering. DC Tillman Water Reclamation Plant Blower Air Clean Up System General Conditions, General Requirements, Technical Provisions. Section 15020 Noise, Vibration, and Seismic Control.</i></p>
		<p><b>Conserving</b></p> <p>The project earned conserving for this credit for conducting a thorough lighting needs assessment, selecting non-hazardous, energy efficient LED lighting components, and mitigating light pollution.</p> <p>The LED's selected do not contain mercury or other hazardous substances, and they achieve an 85% reduction in energy usage from traditional lighting. The project team also met Illuminating Energy Society of North America standards for automatic light control (i.e. dimming lights when there is sufficient daylight or when people are not in the vicinity), interior and exterior lighting allowances, and light pollution.</p> <p>*Note: No Coversheet was provided, just documentation.</p> <p><i>City of Los Angeles Bureau of Engineering. DC Tillman Water Reclamation Plant Blower Air Clean Up System General Conditions, General Requirements, Technical Provisions. Section 16370 Wastewater Facilities Lighting.</i></p>
		<p><b>No Level</b></p>
		<p><b>0</b></p>

<b>QL2.4 Improve Community Mobility And Access</b>		To achieve a score for this credit, the project team would need to show a consideration of the impact of construction and operations on traffic and mobility.
<b>QL2.5 Encourage Alternative Modes of Transportation</b>	<b>1</b>	<b>Improved</b> The project earned an Improved level of achievement for being located within walking distance of public transportation.
		To earn higher levels of achievement, the project team would have needed to actively encourage the use of non-automobile transport by adding bike lanes or subsidizing public transportation for employees. Given the highly technical and internal nature of the project, such measures are probably superfluous.
		Google Maps. Donald C. Tillman Transit Accessibility Map. 2017.
<b>QL2.6 Improve Site Accessibility, Safety &amp; Wayfinding</b>	<b>0</b>	<b>Not Pursued</b>
<b>QL3.1 Preserve Historic And Cultural Resources</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>QL3.2 Preserve Views And Local Character</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>QL3.3 Enhance Public Space</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>QL0.0 Innovate Or Exceed Credit Requirements</b>	<b>N/A</b>	<b>Not Pursued</b>
	<b>36</b>	

<b>LEADERSHIP</b>		
	<b>Donald C. Tillman Water Reclamation Plant Los Angeles, California</b>	
	<b>Enhanced</b>	



<p><b>LD1.1 Provide Effective Leadership And Commitment</b></p>	<p><b>4</b></p>	<p>The project earned an Enhanced level of achievement because of the Bureau of Engineering and City of Los Angeles’ strong commitment to sustainability.</p> <p>The City of Los Angeles is working to position itself as a national leader in sustainability, and sustainability commitments have been made in every city department. Moreover, the Bureau of Engineering and the city council formally pledged to incorporate Envision into city projects where applicable via a 2016 motion. Currently, more than 50 Bureau of Engineering employees are Envision Certified Sustainability Professionals (ENV-SPs).</p> <p>At the project level, the team made several important commitments to sustainability, including diverting construction and demolition waste, using energy efficient lighting, and protecting community wastewater treatment infrastructure.</p> <p><i>Mayor Eric Garcetti. Sustainable City pLAN. p. 2.</i>  <i>Mayor Eric Garcetti. Executive Directive No. 7. April 8, 2015.</i>  <i>City of Los Angeles Bureau of Sanitation. Strategic Plan 2015/16-2020/21</i>  <i>City of Los Angeles. Public Works Bureau of Engineering. Strategic Plan.</i>  <i>Joe Buscaino, Councilmember. Los Angeles Envision Motion. October 18, 2016.</i>  <i>City of Los Angeles Bureau of Engineering. DC Tillman Water Reclamation Plant Blower Air Clean Up System General Conditions, General Requirements, Technical Provisions. Section 16370 Wastewater Facilities Lighting, Section 01562 Environmental Mitigation.</i></p>
<p><b>LD1.2 Establish A Sustainability Management System</b></p>	<p><b>0</b></p>	<p><b>Not Pursued</b></p>
<p><b>LD1.3 Foster Collaboration And Teamwork</b></p>	<p><b>1</b></p>	<p><b>Improved</b></p> <p>Collaboration and teamwork are an integral part of every City of Los Angeles project. Early on, Project 6171 held a Pre-Design Kick-Off Meeting between the Environmental Engineering Division (the designer of the air clean up system) and the Bureau of Sanitation (the future operator of the system), and these two city agencies worked closely throughout the design process to provide a safe, environmentally friendly, and low cost system. During pre construction, meetings were held between the design team, the contractor, subcontractors, and city inspectors to review construction plans, discuss regulations, and plan out a schedule. The project team also reached out to other stakeholders involved with the instrumentation, structural, mechanical, and electrical aspects of the wastewater plant to facilitate integration of the air clean up system with the existing facilities. During construction, regular meetings were held between the project team and contractor to review progress and address problems.</p> <p>Although there was no formal risk and reward sharing contract, the Bureau of Engineering and Bureau of Sanitation inherently share risk and reward because they are both city agencies.</p>

		<p><i>City of LA Bureau of Engineering. DC Tillman Water Reclamation Facility Blower Foul Air Clean Up System. Pre-Design Report. 2014.</i></p> <p><i>City of Los Angeles Bureau of Engineering. Specifications for DC Tillman Water Reclamation Plant Blower Air Clean up System. Section 01312 Project Meetings.</i></p>
<b>LD1.4 Provide For Stakeholder Involvement</b>	<b>0</b>	<b>No Level</b>
		The project identified three main stakeholders for this project: the Bureau of Sanitation (the operator of the treatment plant), the US Army Corps (the owner of the land on which the DCTWRP is located), and the Environmental Management Group (a subgroup of the Bureau of Engineering that ensures compliance with the California Environmental Quality Act). The project was determined to have no significant impact on the public, and thus the public was not involved as a stakeholder.
		The Bureau of Sanitation, the primary stakeholder, made several significant contributions to the project, including deciding a location for the air bio-trickling filter, reviewing the design, and recommending small design changes. The US Army Corps and Environmental Management Group formally approved the project and chose not to be involved in the design or construction.
		<p><i>City of LA Bureau of Engineering. DC Tillman Water Reclamation Facility Blower Foul Air Clean Up System. Pre-Design Report. 2014.</i></p> <p><i>Maria Martin, Environmental Management Group. DCT Blower Foul Air Clean-Up System CIP 6171 CEQA Notice of Exemption. February 9, 2015.</i></p> <p><i>Environmental Engineering Division. 90% Design Review Workshop. July 6, 2015.</i></p>
<b>LD2.1 Pursue By-Product Synergy Opportunities</b>	<b>0</b>	<b>Not Pursued</b>
<b>LD2.2 Improve Infrastructure Integration</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>LD3.1 Plan For Long-Term Monitoring &amp; Maintenance</b>	<b>10</b>	<b>Conserving</b>
		The air treatment filter is supported by a maintenance and monitoring plan that protects its mechanical, biological, and chemical processes, thus earning the project a score of Conserving.
		The overall goal of the biotrickling filter is to clean foul air from sewage treatment using degreasing filters and aquatic bacteria that oxidize H <sub>2</sub> S gas. To achieve maximum functionality, the filters must be periodically replaced, the pH of the water must be around 1.5-2, and adequate air and water pressure must be maintained. To that end, the contractor provided a final operations and maintenance manual to the Bureau of Sanitation detailing the procedures and responsibilities of plant personnel. Additionally, many automated systems are in place to monitor pH and water flow and detect jammed valved and clogged filters.
		The Bureau of Sanitation has assigned staff to maintain the bio-trickling filter,

		<p>and these staff are required to undergo classroom and field training. Increased funding for the biotrickling filter’s ongoing operations and maintenance is outlined in the Bureau of Sanitation 2016-17 budget. The increase represents a negligible fraction of the agencies \$477 million budget and is not expected to pose a financial burden.</p> <p><i>City of Los Angeles Bureau of Engineering. Specifications for DC Tillman Water Reclamation Plant Blower Air Clean up System. Section 17400 Process Instrumentation and Control, Section 13445 Biotrickling Filter Odor Control System, Section 01820 Operations and Maintenance Training.</i>  <i>Los Angeles Bureau of Sanitation. Fiscal year 2016-17 Executive Summary. 2016.</i></p>
<p><b>LD3.2 Address Conflicting Regulations &amp; Policies</b></p>	<p><b>0</b></p>	<p><b>Not Pursued</b></p>
<p><b>LD3.3 Extend Useful Life</b></p>	<p><b>1</b></p>	<p><b>Improved</b></p> <p>Project 6171 is designed with numerous strategies to extend the useful life of the project, thus earning it an Improved level of achievement.</p> <p>Given the high concentrations of hydrogen sulfide (H2S) gas in the foul air, the fans, ducting, holding tanks, and maintenance platforms are designed with corrosion resistant materials. The biotrickling filters have operational lives around ten years, much longer than industry standard chemical treatments, which have to be replenished every month. Moreover, the project itself extends the useful life of downstream facilities.</p> <p>The project could have earned higher levels of achievement by considering future expansion of the wastewater treatment plant.</p> <p><i>City of Los Angeles Bureau of Engineering. Specifications for DC Tillman Water Reclamation Plant Blower Air Clean up System. Section 09800 Protective Coating. FiberGlass Systems. Chemical Resistance Chart. p.10.</i>  <i>City of Los Angeles Bureau of Engineering. Specifications for DC Tillman Water Reclamation Plant Blower Air Clean up System. Section 13446 Protective Coating.</i></p>

<p><b>LD0.0 Innovate Or Exceed Credit Requirements</b></p>	<p>3</p>	<p>The project earned three innovation points for piloting the Environmental Engineering Division’s programmatic approach to Envision. This approach represents an alternative approach to the Envision certification process that is efficient and scalable.</p> <p>In contrast to traditional Envision projects, which evaluate Envision criteria following project design or completion, project 6171 incorporated Envision into every phase of project planning. First, the project team filled out each Envision cover sheet* with applicable “program” information ranging from state of California environmental regulations to City of Los Angeles goals to Bureau of Engineering standard operating procedures. During the design process, the project was assessed against program and envision standards. For example, for QL1.3 “Develop Local Skills and Capabilities”, the project exceeded Bureau of Engineering hiring standards for local and minority workers while also earning a Superior level of achievement.</p> <p>By integrating program information within an envision framework, the Environmental Engineering Division can better communicate envision standards to city personnel, spend less time and money on verification, and identify potential program areas of improvement. Envision is now included in training manuals for Environmental Engineering employees.</p> <p>Besides greatly benefiting the Environmental Engineering Division, this programmatic approach to envision is highly scalable to other city agencies. To that end, the Environmental Engineering Division has collaborated with CH2M Hill Engineers, Inc. to share their approach through papers, conferences, and talks with other municipalities.</p> <p>*Note: Each envision credit has its own cover sheet, which explains the criteria and scoring for that credit. When projects apply for envision certification, they fill out these cover sheets with explanations of how they met the credit, as well as attached documentation</p> <p><i>Michael Sarullo, Environmental Engineering Division. Project Delivery Manual Training. Planning and Pre-Design: Envision. 2018.</i>  <i>CH2M HILL Engineers, Inc. and City of Los Angeles Bureau of Engineering, Environmental Engineering Division. Integrating Envision Principles in Program Management for Decision Support. Published in ASCE ICSI 2017 Proceedings.</i></p>
<p>19</p>		

<p><b>RESOURCE ALLOCATION</b></p>		
<p><b>Donald C. Tillman Water Reclamation Plant Los Angeles, California</b></p>		
<p><b>RA1.1 Reduce Net Embodied Energy</b></p>	<p>0</p>	<p><b>Not Pursued</b></p>

<b>RA1.2 Support Sustainable Procurement Practices</b>	<b>0</b>	<b>Not Pursued</b>
<b>RA1.3 Used Recycled Materials</b>	<b>0</b>	<b>Not Pursued</b>
<b>RA1.4 Use Regional Materials</b>	<b>0</b>	<b>Not Pursued</b>
<b>RA1.5 Divert Waste From Landfills</b>	<b>N/A</b>	<b>Not Applicable</b>
		The project received not applicable for this credit because no operational waste is generated. The only waste related to this project is a media that is disposed of every 5-10 years as hazardous waste.
<b>RA1.6 Reduce Excavated Materials Taken Off Site</b>	<b>2</b>	<b>Improved</b>
		The project used 34% of excavated materials on site, thereby earning an Improved Level of achievement.
		745.9 cubic yards of material were excavated during construction for the purposes of leveling the ground for the biotrickling filter. 34% of this fill was used on site for backfill, reducing the environmental and financial costs of excavated materials transport. <i>City of LA Bureau of Engineering Environmental Engineering Division. Project 6171 Cut and Fill Reuse Calculations. 2016.</i>
<b>RA1.7 Provide for Deconstruction &amp; Recycling</b>	<b>8</b>	<b>Superior</b>
		Project 6171 achieves a total end of life recyclability rate of 65.3%, thereby earning a Superior level of achievement. In addition, the City of Los Angeles has thorough protocols in place to facilitate end of life recycling. Some of the project's main recyclable or reusable materials include concrete, steel, and fiber-reinforced plastic. <i>City of Los Angeles Bureau of Engineering. Specifications for DC Tillman Water Reclamation Plant Blower Air Clean up System. Section 01572 Construction and Demolition Waste Management.</i>
<b>RA2.1 Reduce Energy Consumption</b>	<b>0</b>	<b>Not Pursued</b>
		<b>Enhanced</b>

<p><b>RA2.2 Use Renewable Energy</b></p>	<p>6</p>	<p>The project met an Enhanced level of achievement by sourcing 29% of its energy needs from renewables.</p> <p>The Los Angeles Department of Water and Power, which provides power to the DCTWRP, sourced 24% of its electricity from renewables (11% wind, 4% hydro, 4% biomass, 3% solar, 2% geothermal) in 2015, the most recent reporting year at the time of envision certification. In addition, DCTWRP has 1,444 rooftop solar panels producing nearly 900 megawatt hours annually. Thus, the total confirmed contribution from renewables was 29%. However, the Department of Water and Power has plans to expand to 33% renewables by 2020, and thus the renewable energy portfolio of DCTWRP will continue to improve.</p> <p><i>LA Department of Water and Power. Power Content Label. <a href="https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-power/a-p-renewableenergy/">https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-power/a-p-renewableenergy/</a></i></p> <p><i>City of Los Angeles Bureau of Sanitation. Donald C. Tillman PV Addition Plans. July 2009.</i></p>
<p><b>RA 2.3 Commission &amp; Monitor Energy Systems</b></p>	<p>0</p>	<p><b>Not Pursued</b></p>
<p><b>RA3.1 Protect Fresh Water Availability</b></p>	<p>17</p>	<p><b>Conserving</b></p> <p>Project 6171 is a closed loop water recycling system within DCTWRP, and it therefore meets the level of Conserving.</p> <p>The biotrickling filter recirculates 700 gallons of water per minute, discharging low pH water onto the filter media to facilitate the bacterial reaction that consumes hydrogen sulfide gas. Although this water is continually reused, some of it is lost to evaporation, so 50 gallons of water from the treatment plant are added to the system per minute. The biotrickling filters have no impact on fresh water availability.</p> <p><i>City of Los Angeles Bureau of Engineering Environmental Engineering Division. DC Tillman Water Reclamation Facility Blower Foul Air Clean-up System Pre-Design Report. April 2014. p. 23.</i></p>
<p><b>RA3.2 Reduce Potable Water Consumption</b></p>	<p>17</p>	<p><b>Conserving</b></p> <p>All operational water needs for project 6171 will be drawn from DCTWRP wastewater treatment process water. This qualifies the project for a Conserving level of achievement.</p> <p>As mentioned in RA3.1, the biotrickling filter recirculates its water, adding small amounts of recycled process water from the plant to compensate for evaporation. No potable water is used during operations. In contrast, traditional chemical methods of removing hydrogen sulfide gas from process air require potable water.</p>

		<i>City of Los Angeles Bureau of Engineering Environmental Engineering Division. DC Tillman Water Reclamation Facility Blower Foul Air Clean-up System Pre-Design Report. April 2014. p. 22-23.</i>
<b>RA3.3 Monitor Water Systems</b>	<b>6</b>	<b>Superior</b>
		This project meets the Superior level of achievement because the water circulating in the biotrickling filter is continuously monitored for pH and water flow. Additionally, all process water within DCTWRP is reused within the plant or discharged under National Pollutant Discharge Elimination System (NPDES) standards.  Monitoring the water quality of the biotrickling filter is essential to the effectiveness of the foul air clean up system. Thus, DCTWRP staff continuously monitor pH and water flow.
		All discharges that leave DCTWRP are treated in accordance with NPDES standards, with monitoring reports submitted monthly, quarterly, and annually to the United States Environmental Protection Agency. These standards ensure discharges have safe levels of pollutants, salinity, and temperature.  <i>City of Los Angeles Bureau of Engineering. Specifications for DC Tillman Water Reclamation Plant Blower Air Clean up System. Section 17400 Process Instrumentation and Control.</i> <i>California Regional Water Quality Control Board Los Angeles Region. Waste Discharge Requirements for the City of Los Angeles Donald C. Tillman Water Reclamation Plant Discharge to the Los Angeles River via Discharge Outfalls and Ponds. March 2017.</i>
<b>RA0.0 Innovate Or Exceed Credit Requirements</b>	<b>2</b>	The project team earned two innovation points for recycling or reusing at least 50% of construction waste. Diversion of construction waste transcends the scope of Envision version 2, and is in line with the Enhanced level of Envision Version 3 RA1.5 Divert Construction Waste from Landfills. The project thus provides a methodology for future envision applicants to achieve this credit.  <i>City of Los Angeles Bureau of Engineering. Specifications for DC Tillman Water Reclamation Plant Blower Air Clean up System. Section 01572 Construction and Demolition Waste Management.</i>
	<b>58</b>	

<b>NATURAL WORLD</b>		
<b>Donald C. Tillman Water Reclamation Plant Los Angeles, California</b>		
<b>NW1.1 Preserve Prime Habitat</b>	<b>N/A</b>	<b>Not Applicable</b>
	<b>N/A</b>	<b>Not Applicable</b>

<b>NW1.2 Preserve Wetlands and Surface Water</b>		
<b>NW1.3 Preserve Prime Farmland</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>NW1.4 Avoid Adverse Geology</b>	<b>3</b>	<b>Superior</b>
		Geological hazards were thoroughly assessed and mitigated during the design process, leading to a score of Superior.
		As with all Bureau of Engineering projects, a geotechnical report was prepared for project 6171 prior to design to assess risks of faults, tsunamis, groundwater, adverse soil, landslides, and other relevant geologic formations. Because project 6171 was built in a secure existing wastewater treatment facility, no major geologic hazards were reported.  Routine measures were taken to reduce liquefaction, and DCTWRP systems already exist to redirect all on-site stormwater and spills to headworks for treatment. The nearest fault to the project is 6.3 miles away, so the facility is designed to withstand a ½ inch of seismic shaking.  <i>City of Los Angeles Bureau of Engineering. Project Delivery Manual. Section 8.4 Geotechnical Report.</i> <i>City of Los Angeles Bureau of Engineering Geotechnical Engineering Group. Geotechnical Report Donald C. Tillman Water Reclamation Plant Blower Foul Air Clean-up System Project. 2014.</i>
<b>NW1.5 Preserve Floodplain Functions</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>NW1.6 Avoid Unsuitable Development on Steep Slopes</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>NW1.7 Preserve Greenfields</b>	<b>15</b>	<b>Conserving</b>
		The phase 2 project was located entirely on the existing wastewater treatment facility, a greyfield site, and thus had no impact on undeveloped land. It achieved a score of Conserving.
		<i>City of Los Angeles Bureau of Engineering Geotechnical Engineering Group. Geotechnical Report Donald C. Tillman Water Reclamation Plant Blower Foul Air Clean-up System Project. 2014.</i>
<b>NW2.1 Manage Stormwater</b>	<b>21</b>	<b>Restorative</b>
		The project met Restorative because 100% of on-site stormwater is captured, treated, and beneficially reused.  The project was built with a new catchment basin, which captures all stormwater near the biotrickling filters. The stormwater is treated at facility headworks, after



		<p>which the water is recycled for use in the area, or safely discharged into the Los Angeles river.</p> <p><i>City of Los Angeles Bureau of Sanitation. Stormwater Pollution Prevention Plan DC Tillman Water Reclamation Plant. January 2017.</i></p>
<b>NW2.2 Reduce Pesticides and Fertilizer Impacts</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>NW2.3 Prevent Surface and Groundwater Contamination</b>	<b>14</b>	<p><b>Conserving</b></p> <p>Project 6171 prevents surface and groundwater contamination by capturing stormwater and by mitigating the use of chemicals in the air treatment process.</p> <p>As mentioned previously, the project’s operational water is continuously reused for filtration, and the project site was designed with a catch basin to capture and redirect all on site stormwater to DCTWRP headworks for treatment.</p> <p>The project also comes with a thorough spill and leak prevention plan. All extra materials used for the biotrickling filter are stored in covered and contained areas. In the case of a spill, all materials would be collected in the stormwater basin and sent to headworks for treatment.</p> <p>Furthermore, project 6171 provides an alternative to traditional chemical scrubbing of hydrogen sulfide gas, a process that requires high amounts of potentially hazardous chemicals that can threaten ground and surface water.</p> <p><i>City of Los Angeles Bureau of Sanitation. Stormwater Pollution Prevention Plan DC Tillman Water Reclamation Plant. January 2017.</i></p> <p><i>City of Los Angeles Bureau of Engineering. DCT Blower Foul Air Clean Up System Pre-Design Report. Table 4: Evaluation of Alternatives. 2014.</i></p>
<b>NW3.1 Preserve Species Biodiversity</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>NW 3.2 Control Invasive Species</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>NW3.3 Restore Disturbed Soils</b>	<b>N/A</b>	<b>Not Applicable</b>
<b>NW3.4 Maintain wetland and surface water functions.</b>	<b>N/A</b>	<b>Not Applicable</b>

<b>NW0.0 Innovate Or Exceed Credit Requirements</b>	<b>N/A</b>	<b>Not Pursued</b>
	<b>53</b>	

<b>CLIMATE AND RISK</b>		
	<b>Donald C. Tillman Water Reclamation Plant Los Angeles, California</b>	
<b>CR1.1 Reduce Greenhouse Gas Emissions</b>	<b>0</b>	<b>Not Pursued</b>
<b>CR1.2 Reduce Air Pollutant Emissions</b>	<b>6</b>	<b>Enhanced</b> Project 6171 was designed to comply with South Coast Air Quality Management District standards for DCTWRP, and it therefore meets the Enhanced level of achievement. Project 6171 adds negligible air quality emissions to DCTWRP. <i>South Coast Air Quality Management District. Permit to Operate. 2014.</i>
		<b>Conserving</b> Due to the City of Los Angeles’ strong internal climate assessment and adaptation plans, the project met a Conserving level of achievement.  The Sustainable City pLAn includes strong commitments to prepare for the effects of wildfires, droughts, heatwaves, and rising sea levels in a changing climate. This document led to a Greater LA Climate Action Framework with guidelines for climate change response, as well as a One Water LA 2040 Report, with guidelines for water management. At the Bureau of Sanitation level, the Los Angeles Sanitation Climate Risk Assessment and Adaptation Measure Recommendations offers more specific goals and guidelines.  These reports and plans were drafted with significant input from the community, state and federal regulators, the EPA, city officials, and other private and public stakeholders.  <i>Mayor Eric Garcetti. City Sustainability pLAn. p. 34-40, 66-73.</i> <i>Los Angeles Regional Collaborative for Climate Action and Sustainability. A Greater LA Climate Action Framework. 2016.</i> <i>City of Los Angeles. One Water LA 2040 Plan. 2015. P 3.1-3.4.</i> <i>United States Environmental Protection Agency. Los Angeles Sanitation Climate Change Risk Assessment and Adaptation Measure Recommendations for Wastewater Assets. 2016.</i>
<b>CR2.1 Assess Climate Threat</b>	<b>15</b>	<b>Conserving</b>

<p><b>CR2.2 Avoid Traps And Vulnerabilities</b></p>	<p><b>16</b></p>	<p>Project 6171 adequately assessed long term traps and vulnerabilities related to material availability, cost, and corrosion and mitigated risk, thereby earning a score of Conserving.</p> <p>Throughout the design process, the project team worked closely with the Bureau of Sanitation to ensure smooth integration of the biotrickling filter with existing facilities, and to discuss strategies to maximize longevity of the project. The four main engineering design variables that were discussed as a result were cost, maintenance time, fresh water usage, and chemical input.</p> <p>The project optimized these design variables in several ways. The biotrickling filters themselves were selected in part because of their durability and low maintenance. The bacteria themselves are a renewable resource....All hardware, ducting, and maintenance platforms are made with corrosion resistant materials. The pH in the filters is continuously monitored and linked to controller that can automatically dose a pH-lowering solution. Lastly, water is continually recycled, with small amounts of water from the treatment plant being added to account for evaporation. Based on these design elements, the project efficiently uses time, money, and materials.</p> <p><i>City of Los Angeles Bureau of Engineering. DCT Blower Foul Air Clean Up System Pre-Design Report. p. 8-14.</i>  <i>FiberGlass Systems. Chemical Resistance Chart. p.10.</i>  <i>Environmental Engineering Division. 90% Design Review Workshop. July 6, 2015.</i></p>
<p><b>CR2.3 Prepare For Long-Term Adaptability</b></p>	<p><b>16</b></p>	<p><b>Conserving</b></p> <p>Project 6171 was designed to be adaptable to climate change, resource scarcity, and funding, thereby earning a score of Conserving.</p> <p>The city of Los Angeles has made adapting to climate change a top priority, as evidenced by its landmark report A Greater LA Climate Action Framework. This report has led to critical thinking about energy, water use, and adaptability at every level of government.</p> <p>As mentioned previously, project 6171 uses no potable water, relying instead on treated recycled water from DCTWRP, a resource that is not expected to be affected by climate change. In addition, the project eliminates the need for industrial chemicals, which minimizes the risk of supply chain disruptions.</p> <p><i>Los Angeles Regional Collaborative for Climate Change and Sustainability. A Greater LA Climate Action Framework. 2016.</i>  <i>City of Los Angeles Bureau of Engineering. DCT Blower Foul Air Clean Up System Pre-Design Report. p. 8-14.</i></p>
<p><b>CR2.4 Prepare For Short-Term Hazards</b></p>	<p><b>0</b></p>	<p><b>Not Pursued</b></p>
		<p><b>Superior</b></p>

<b>CR2.5 Manage Heat Island Effects</b>	<b>4</b>	Currently, urban areas surrounding LA are on average 5 degrees Fahrenheit cooler than the city. Following Los Angeles' goal of reducing this temperature differential by 1.7 degrees Fahrenheit by 2025, The project designed 79% of its surface to be either shaded or have a solar reflectance index greater than 29. It therefore met the Superior level of achievement.
		<i>Mayor Eric Garcetti. City Sustainable pLAN. P. 66. SRI Calculator. Percentage of Area Minimizing Heat Accumulation. <a href="https://coolcolors.lbl.gov">https://coolcolors.lbl.gov</a>.</i>
<b>CR0.0 Innovate Or Exceed Credit Requirements</b>	<b>N/A</b>	<b>Not Pursued</b>
	<b>57</b>	

<b>Points Achieved Available</b>	<b>223</b>	<b>Donald C. Tillman Water Reclamation Plant Los Angeles, California</b>
	<b>603</b>	
	<b>37%</b>	<b>Envision Silver</b>

APPENDIX:

A: PROJECT PICTURES AND DRAWINGS

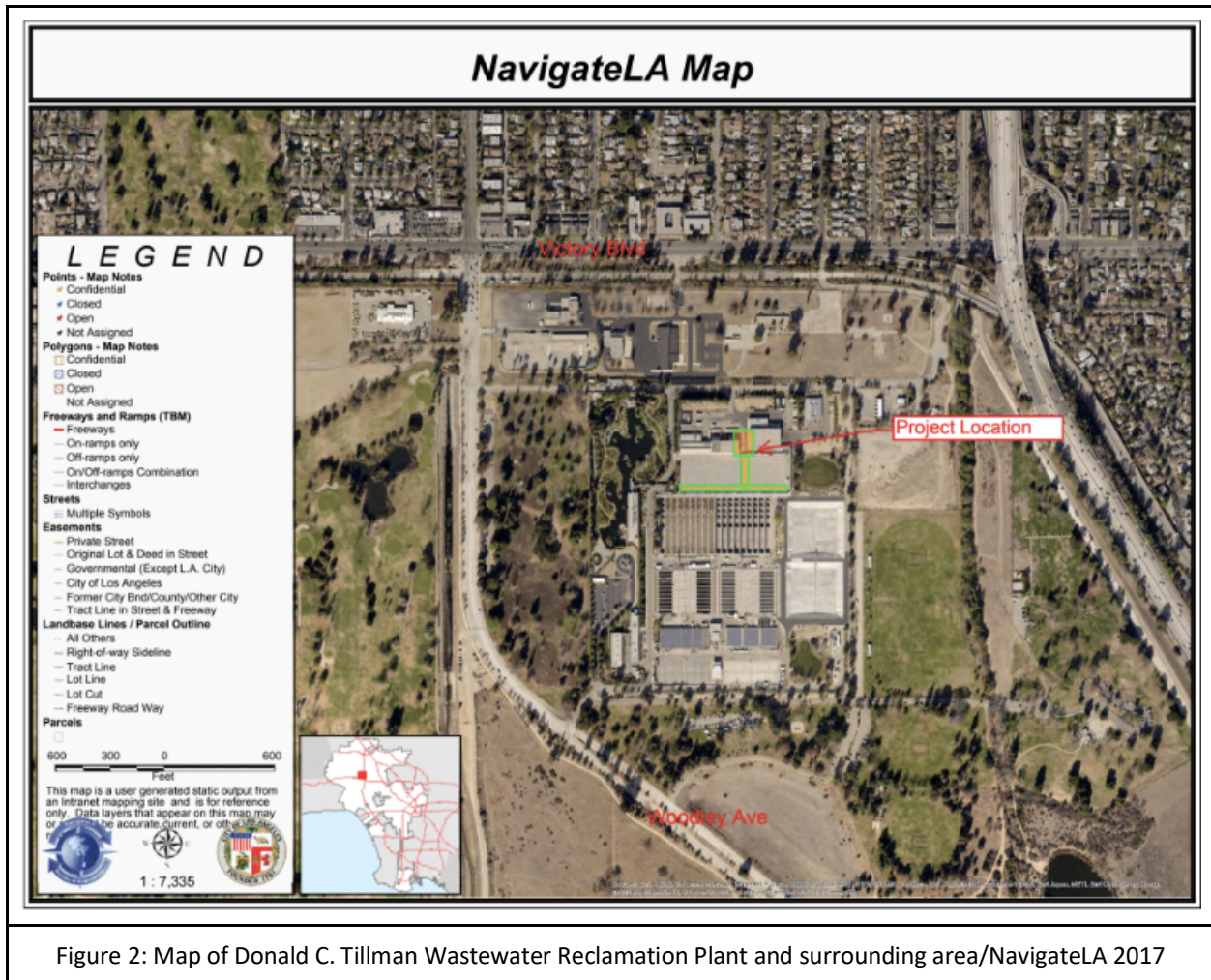


Figure 3:

Figure 4:	Figure 5:
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**B: ENVISION POINTS TABLE**

				Improved	Enhanced	Superior	Conserving	Restorative
1	QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life					
2			QL1.2 Stimulate Sustainable Growth & Development					
3			QL1.3 Develop Local Skills And Capabilities					
4		COMMUNITY	QL2.1 Enhance Public Health And Safety					
5			QL2.2 Minimize Noise And Vibration					
6			QL2.3 Minimize Light Pollution					
7			QL2.4 Improve Community Mobility And Access					
8			QL2.5 Encourage Alternative Modes of Transportation					
9			QL2.6 Improve Site Accessibility, Safety & Wayfinding					
10		WELLBEING	QL3.1 Preserve Historic And Cultural Resources					
11			QL3.2 Preserve Views And Local Character					
12			QL3.3 Enhance Public Space					
QL0.0 Innovate Or Exceed Credit Requirements								
13	LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment					
14			LD1.2 Establish A Sustainability Management System					
15			LD1.3 Foster Collaboration And Teamwork					
16			LD1.4 Provide For Stakeholder Involvement					
17		MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities					
18			LD2.2 Improve Infrastructure Integration					
19		PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance					
20			LD3.2 Address Conflicting Regulations & Policies					
21			LD3.3 Extend Useful Life					
LD0.0 Innovate Or Exceed Credit Requirements								
22	RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy					
23			RA1.2 Support Sustainable Procurement Practices					
24			RA1.3 Used Recycled Materials					
25			RA1.4 Use Regional Materials					
26			RA1.5 Divert Waste From Landfills					
27			RA1.6 Reduce Excavated Materials Taken Off Site					
28			RA1.7 Provide for Deconstruction & Recycling					
29		ENERGY	RA2.1 Reduce Energy Consumption					
30			RA2.2 Use Renewable Energy					
31			RA2.3 Commission & Monitor Energy Systems					
32		WATER	RA3.1 Protect Fresh Water Availability					
33			RA3.2 Reduce Potable Water Consumption					
34			RA3.3 Monitor Water Systems					
RA0.0 Innovate Or Exceed Credit Requirements								
35	NATURAL WORLD	SITING	NW1.1 Preserve Prime Habitat					
36			NW1.2 Preserve Wetlands and Surface Water					
37			NW1.3 Preserve Prime Farmland					
38			NW1.4 Avoid Adverse Geology					
39			NW1.5 Preserve Floodplain Functions					
40			NW1.6 Avoid Unsuitable Development on Steep Slopes					
41			NW1.7 Preserve Greenfields					
42		L & W	NW2.1 Manage Stormwater					
43			NW2.2 Reduce Pesticides and Fertilizer Impacts					
44			NW2.3 Prevent Surface and Groundwater Contamination					
45		BIODIVERSITY	NW3.1 Preserve Species Biodiversity					
46			NW3.2 Control Invasive Species					
47			NW3.3 Restore Disturbed Soils					
48			NW3.4 Maintain Wetland and Surface Water Functions					
NW0.0 Innovate or Exceed Credit Requirements								
49	CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions					
50			CR1.2 Reduce Air Pollutant Emissions					
51		RESILIENCE	CR2.1 Assess Climate Threat					
52			CR2.2 Avoid Traps And Vulnerabilities					
53			CR2.3 Prepare For Long-Term Adaptability					
54			CR2.4 Prepare For Short-Term Hazards					
55			CR2.5 Manage Heat Island Effects					
CR0.0 Innovate Or Exceed Credit Requirements								

POINTS ACHIEVED	223	37.0%
POINTS AVAILABLE	603	

C: GRAPHS

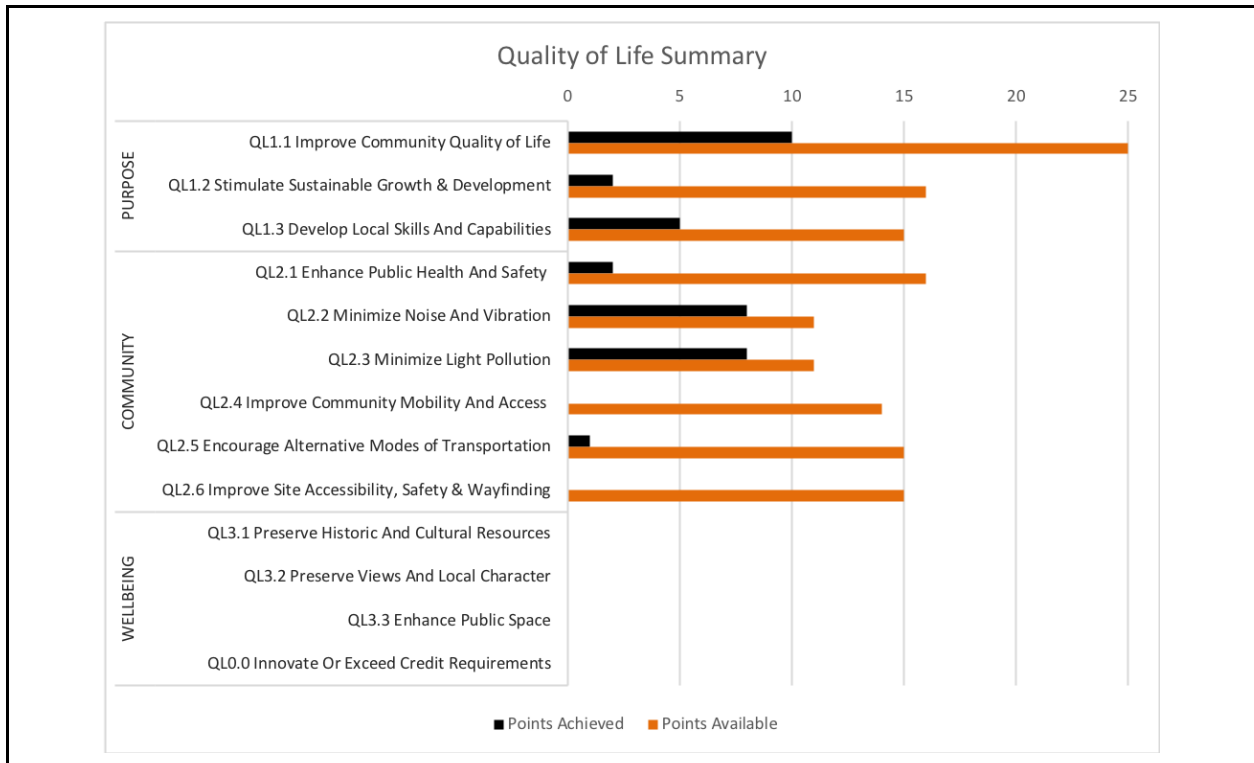


Figure #: Quality of Life category summary of results

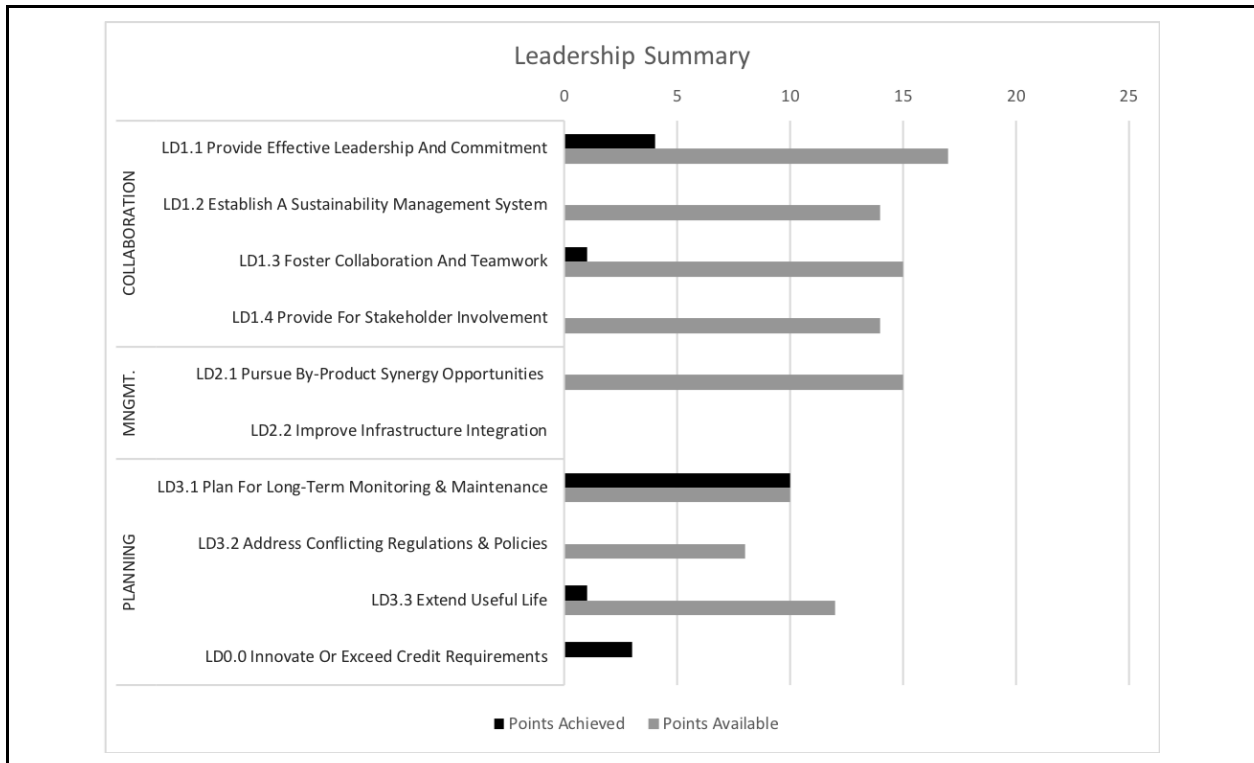


Figure #: Leadership category summary of results



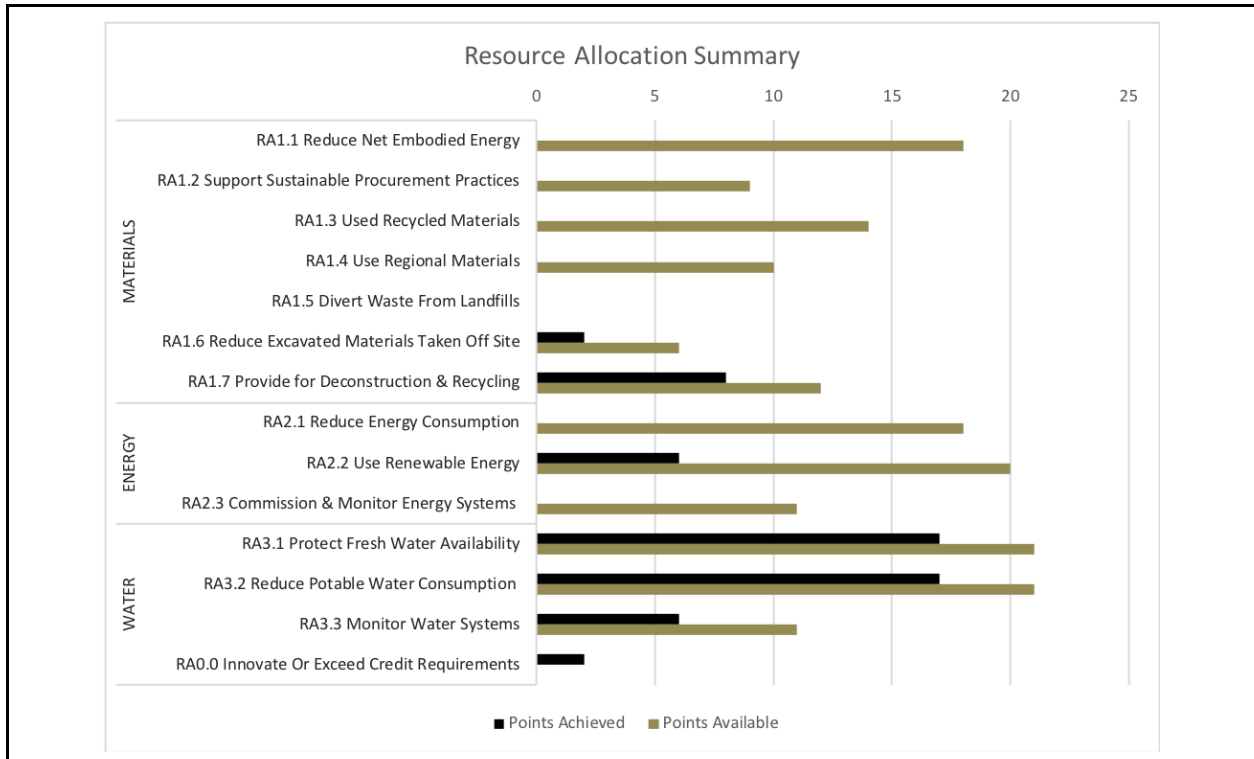


Figure #:Resource Allocation category\_ Summary of results

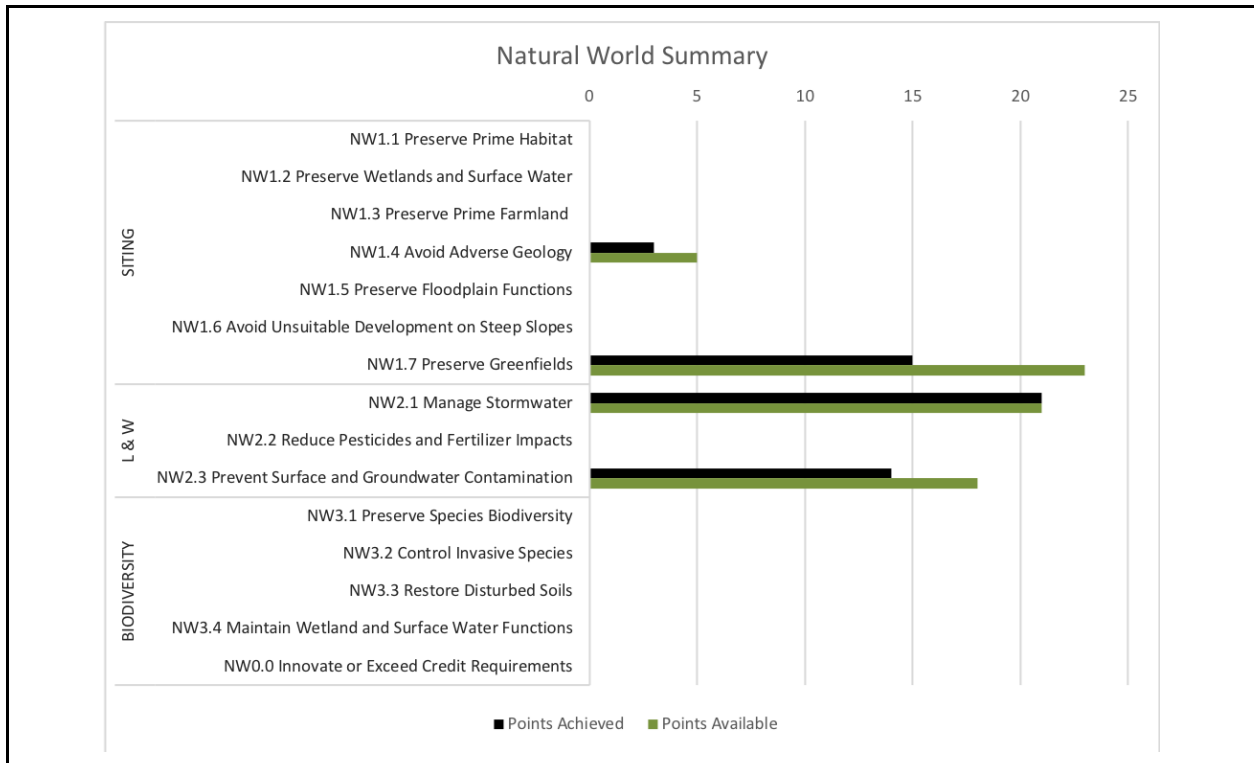
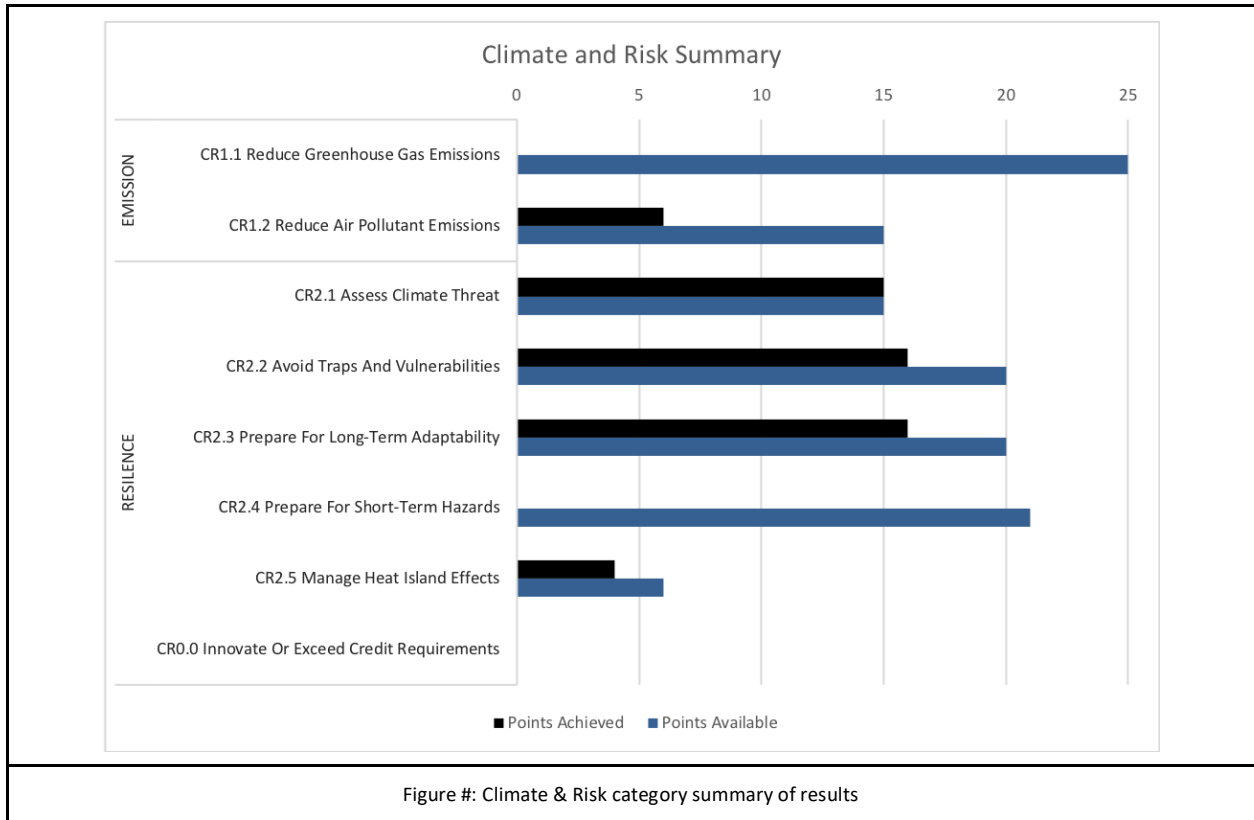


Figure #: Natural World category summary of results



## D: SOURCES

DOCUMENTATION PROVIDED
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