ICING ON THE CAKE
WHERE INFRASTRUCTURE MEETS SUSTAINABLE LANDSCAPES
LANDSCAPE ARCHITECTURE

WHAT MY FRIENDS THINK I DO
WHAT MY MOM THINKS I DO
WHAT SOCIETY THINKS I DO
WHAT ARCHITECTS THINKS I DO
WHAT I THINK I DO
WHAT I REALLY DO

LANDSCAPE ARCHITECTURE
VALUE ADDS

+ **WATER MANAGEMENT**
  maximize irrigation efficiency | water capture + quality + reuse | turf to drought tolerant

+ **PERFORMANCE METRICS**
  water use calculations + water use projections vs. CA state requirements (ab1881)

+ **COMPREHENSIVE SUSTAINABILITY**
  analysis of site issues | strategic master planning | implementation | education
- Origin - founded in 1927
- Geography - Located in Long Beach, California 22 miles southeast of LAX Airport
- Campus - 2 locations in Long Beach - a Liberal Arts campus (LAC - 112 acres) and a Pacific Coast campus (PCC - 30 acres).
- Population - 24,739 students
  - 58% Hispanic
  - 14% White
  - 13% African American
  - 12% Asian / Pacific Islander
  - 4% Multi-ethnicity
  - 1% Native American / Unreported
- Education - 820 courses
  - 46% Bachelor's Degree
  - 7% Associate Degree
  - 19% Vocational
  - 2% Personal
  - 4% Basic Skills
  - 16% Undecided
  - 7% Unreported
- Athletics - 18 programs with more national and state titles than any other CA Community College.
SUMMARY OF IRRIGATION MASTER PLAN

LBCC’s campus irrigation system was inventoried and analyzed and a campus wide irrigation master plan was developed. The master plan allows LBCC to optimize and more efficiently manage system-wide irrigation and reduce water-use. Additionally, it allows for incorporation of new equipment with the existing to create a seamless transition into future project phasing. Key goals were to design a master distribution within limited watering windows and consolidate smaller individual controllers into the new master system; complete with flow sensors, moisture sensors, and remote programming to more efficiently manage irrigation campus wide. LCI designed a drought tolerant plant palette, including ornamental grasses and succulents. Turf was reduced, but retained as a campus feature.
LBCC
1 CAMPUS + 3 SITES + 3 SOLUTIONS

1 CAMPUS

3 DRAINAGE COLLABORATIVE SOLUTIONS

- Foster Water Quality
- Drought Tolerant Planting
- Reduce Water Use

NPDES/LID Compliance
Reduce Maintenance
SUMMARY OF INFRASTRUCTURE UPGRADES

Development of LBCC’s landscape implementation plans followed a series of campus master plan updates, and a campus-wide utility upgrade project. LCI was contracted as a prime consultant to address critical problems identified in the infrastructure master plan. The project scope was wide ranging and focused on water management solutions - drainage, irrigation, flooding, water quality, watershed compliance, implementing an irrigation master control system, and sustainable planting solutions. Besides water issues, LCI provided site design aesthetic improvements to enhance the pedestrian spaces for students and faculty. Following approval of the master landscape and irrigation improvement plans, LCI developed final plans for three key project areas: the Lew Davis parking lot / the front quad / the central quad. The project’s success was a collaborative and comprehensive effort working with LBCC + KPFF Engineers + P2S Engineering.

GOAL - to enhance the campus experience by developing functional, aesthetic, and sustainable solutions and guidelines for the ongoing bond construction program.
SUMMARY OF FRONT QUAD
The front quad was flat and had no drainage - any rain equaled flooding. There were extensive utility conflicts, plus no documentation for some of the underground infrastructure. Space for drainage retention was limited to a few spots. The school did not want runoff from the quad going into an already overloaded city stormwater system. The solution was a series of concrete dry wells (red dots) to retain water until it could infiltrate into the ground or overflow into city system. The wells have a 4' interior diameter with 4"-thick precast concrete liners.
The central quad had a flat terrain with an undersized drainage system. The existing large turf areas (balanced by new drought-tolerant plantings) allow for underground water capture and retention of runoff. A horizontal system of 8' diameter galvanized storage tubes were implemented as the best solution for water capture and retention option. This stored runoff is released slowly to a pump station via concrete drainage tubes three feet in diameter, augured to a depth of 13 feet. The pump station regulates the release of this runoff to the street, where it flows into the city's stormwater system.
SUMMARY OF LEW DAVIS PARKING LOT
The existing parking lot site was flat, had poor drainage and received runoff from adjacent buildings and street which inevitably caused flooding. Additionally, the site had a high water table and potential archaeological impacts if excavation exceeded 13 feet. The proposed design employed concrete drainage tubes three feet in diameter, augured to a depth of 13 feet. The tubes collect the runoff from the street and adjacent buildings during storms and retain it in the managed drainage swale until the water can infiltrate first into the tubes and then through the clay soil and into the water table.
ALVORD USD
CAMPUS OVERVIEW

- Origin - founded in 1896, became USD in 1960
- Geography - encompasses the western portion of the city of Riverside, eastern portion of the city of Corona, and segments of Riverside County.
- Campus - 23 schools
- Population - nearly 20,000 students
- Fun Fact - named after William Alvord, former mayor of San Francisco and early university of California Trustee

STATISTICS
- Origin - founded in 1896, became USD in 1960
- Geography - encompasses the western portion of the city of Riverside, eastern portion of the city of Corona, and segments of Riverside County.
- Campus - 23 schools
- Population - nearly 20,000 students
- Fun Fact - named after William Alvord, former mayor of San Francisco and early university of California Trustee
Lake Greenema - Client (and facility staff) expressed that major flooding issues occur during rainy periods in central courtyard area adjacent to outdoor patio. Because of inadequate drainage capabilities the rain creates ponding over existing sidewalk connection.

Redesign Courtyard from large turf area to Rain Garden with diverse plant materials which could potentially improve stormwater infiltration and drainage

and provide a discovery education feature for students/teachers - team discussed potential solution of developing rain garden within north planting area (low point) to capture stormwater runoff and allow for water to be slowly released into storm drain system, infiltrated, and celebrated. There is Opportunity for providing landscaped edge to fill in bare areas.

Reinigurate Courtyard from large water intensive turf areas to water-wise aesthetic landscape feature - redesign by strategic replacement of some turf areas with drought tolerant plants and/or inert materials (see image palettes). Redesign of courtyards could be done into design of proposed rain garden. Irrigation system retrofit would be required for any redesigned landscape areas.

Regrade turf area and clean drain out - regards area would direct water to the drain.

North Courtyard Drainage – drainage from this area is not reaching the underground drain.

Provide soft green edge and screen unsnappealing views to trash enclosure - install medium height shrubs around 3 sides of transformer to provide barrier between student use and screen primary views. Access shall be provided. Irrigation system retrofit would be required for any redesigned landscape areas.

Exposed Soil at Pavement Edges – there are conditions of 2-3’ wide border of exposed soil (no turf / planting) at edge of pavement within interior courtyards. Potential for slipping hazard from dirt / gravel build-up and unsnappealing

Provide plant load transition at perimeter of concrete - install low growing drought tolerant plant material and retrofit irrigation system. Renovation could be into development of courtyards and proposed rain garden

Regrade turf and clean drain out - regards area would direct water to the drain.

School Entry – landscape of the main entry / parking area (Falmouth / Indiana) consists predominantly of turf. Turf is extremely water intensive and state regulations are mandating reduction of water use. Additionally there are no shade trees in parking areas.

Provide soft green edge and screen unsnappealing views to parking area - install medium height shrubs around 3 sides of transformer to provide barrier between student use and screen primary views. Access shall be provided. Irrigation system retrofit would be required for any redesigned landscape areas.

Existing Tree in South Courtyard – tree is in poor condition and visually unsnappealing

Provide soft green edge and screen unsnappealing views to transformer - install medium height shrubs around 3 sides of transformer to provide barrier between student use and screen primary views. Access shall be provided. Irrigation system retrofit would be required for any redesigned landscape areas.

Existing Pump Station – existing irrigation pump is adjacent to playground. In discussion with maintenance staff, the pump is antiquated and has not been in use for a long time. The pump is in a fenced enclosure but could create potential liability for kids playing adjacent to it. Additionally the pump and fenced enclosure is visually unsnappealing.

Option 1 - Provide soft green barrier between playground and screen unsnappealing views to pump - install medium height shrubs around enclosure on playground side to provide barrier between student use and screen primary views. Access can be provided from parking area. Irrigation system retrofit would be required for any redesigned landscape areas.

Option 2 - Remove pump (and associated equipment) - remove pump and reconnect pipes underground with the mainline. This option requires further investigation by civil engineer and LCI.

Existing Irrigation System – existing irrigation system has 2 points of connection and neither connection has a master valve or flow sensor installed. This may create a situation where irrigation management is constantly under pressure and will cause stress.

Install flow sensors and master valves - it is LCI’s opinion that this can be accomplished with minimal disturbance to the existing landscape with current controller technology. This would help protect marine and monitoring.

Existing Irrigation Controller – the existing Hunter ACC and Kc Controller are not currently connected to a centralised system or a web server receiving local weather data for auto-adjusting. These controllers are not considered smart controllers.

Replace existing controllers - install new controllers that are capable of communicating with each other to share flow data from the same mainline and monitor usage based on mainline capacity. It is LCI’s opinion that replacing existing controllers can be done without major construction work to the existing infrastructure. This would help protect marine and monitoring.

Existing Backflow Preventer – there are 2 (two) existing backflow preventers. One backflow services only the athletic fields while the landscape outside of the athletic fields (classrooms, parking, etc) is serviced by an outlaid (not per code) backflow. Current code requires a backflow preventer for irrigation systems to be code compliant as there is potential for cross contamination for system back into water connection

Remove existing irrigation system – connect system that has outdated backflow preventer to existing backflow preventer. This is a serious condition and should be undertaken immediately.

Existing Backflow Preventer – there are 2 (two) existing backflow preventers. One backflow services only the athletic fields while the landscape outside of the athletic fields (classrooms, parking, etc) is serviced by an outlaid (not per code) backflow. Current code requires a backflow preventer for irrigation systems to be code compliant as there is potential for cross contamination for system back into water connection

Existing Backflow Preventer – there are 2 (two) existing backflow preventers. One backflow services only the athletic fields while the landscape outside of the athletic fields (classrooms, parking, etc) is serviced by an outlaid (not per code) backflow. Current code requires a backflow preventer for irrigation systems to be code compliant as there is potential for cross contamination for system back into water connection

Existing Garden Areas – there are existing wood planters which contain dying plant material and the (2) garden areas in fenced enclosures (west perimeter) are need of refresh. It is not known whether the gardens are actively being used by the students

Provide engaging new garden areas for student / teacher hands on educational experience - work with school to redesign and replant garden areas as opportunity to engage students and teachers with the outdoors and provide educational experience. Additionally new materials, colors, site furniture, and outdoor "work stations" could be implemented to further enhance the experience for students and faculty. Experience could be collaborative with LCI working with and receiving input from students and teachers on the garden use and design.

Black Top Shade Trees – there are large shade trees on east side of school at black top with some existing seating areas. Client expressed interest in providing more seating and taking advantage of shaded areas.

Provide engaging new garden areas for student / teacher hands on educational experience - work with school to redesign and replant garden areas as opportunity to engage students and teachers with the outdoors and provide educational experience. Additionally new materials, colors, site furniture, and outdoor "work stations" could be implemented to further enhance the experience for students and faculty. Experience could be collaborative with LCI working with and receiving input from students and teachers on the garden use and design.

Black Top Shade Trees – there are large shade trees on east side of school at black top with some existing seating areas. Client expressed interest in providing more seating and taking advantage of shaded areas.

Install shade trees at playground blacktop low point

Create an educational element for students as well.

Mulch, artificial turf, or transition from blacktop to athletic field because of dirt / gravel build up. There is opportunity for providing landscaped edge to fill in bare areas.

Provide plant load transition at perimeter of black top area - install low growing drought tolerant plant material and retrofit irrigation system. Mulch, artificial turf, or landscape elements could be provided within proposed planting area to allow access points between adjacent sports fields and black top area. Irrigation system retrofit would be required for any redesigned landscape areas.
*note - photos not provided for observations 11, 12, 13 because they are not visible or not installed

*callout - the number references comments from sheet 1a / the letter references photograph from sheet 1c
*note - photos not provided for observations 11, 12, 13 because they are not visible or not installed
DRAFT REVIEW - ALVORD USD LANDSCAPE & IRRIGATION ASSESSMENT  /  APRIL 22, 2016

IRRIGATION ASSESSMENT - COST ANALYSIS OPTIONS

**Orrenmaa Elementary 1d**

**TIER 1 - $**

**TIER 2 - $$**

**TIER 3 - $$$**

**PRIMARY AREA**
- Transition at blacktop and central courtyards, including “Lake Orrenmaa” (see observations 1, 2, 3)

**SECONDARY AREA**
- All non-primary turf/planting areas (parking, streetscape, entry, playground) - excludes athletic fields

**SPECIAL LANDSCAPE AREA**
- All athletic fields - to remain turf areas
- Turf areas adjacent to 2-story buildings - out of scope

**ATHLETIC FIELD PERIMETER**
- 15-20' turf area perimeter of athletic fields. This area is required to be converted from turf to drought tolerant shrubs to meet Tier 3 calculations

*Note - legend colors represent planting areas (predominantly turf) to be replanted with drought tolerant materials (include irrigation retrofit). Legend applies only to key map (not bar graph tiers).

**IRRIGATION ANALYSIS - COST IMPLEMENTATION OPTIONS**

**ORRENMAA ELEMENTARY SCHOOL**
IRRIGATION ANALYSIS - MAIN LINE SYSTEM (EXISTING)
ORRENMAA ELEMENTARY SCHOOL

*note - analysis is for stress on existing mainline system
*note - analysis is for stress on existing mainline system

IRRIGATION ANALYSIS - MAIN LINE SYSTEM (PROPOSED)
ORRENMAA ELEMENTARY SCHOOL
### Entry

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Form</th>
<th>Shade Tolerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agave attenuata</td>
<td>Foxtail Agave</td>
<td>succulent</td>
<td>x</td>
</tr>
<tr>
<td>Ceratostigma plumbaginoides</td>
<td>Dwarf Plumbago</td>
<td>groundcover</td>
<td>x</td>
</tr>
<tr>
<td>Dianella revoluta</td>
<td>Little Rev Flax Lily</td>
<td>grass</td>
<td>x</td>
</tr>
<tr>
<td>Dietes irioidei</td>
<td>African Iris</td>
<td>grass / shrub</td>
<td></td>
</tr>
<tr>
<td>Gaura Lindheimer 'So White'</td>
<td>Geyser White Gaura</td>
<td>shrub</td>
<td></td>
</tr>
<tr>
<td>Hesperaloe parviflora</td>
<td>Red Yucca</td>
<td>shrub</td>
<td></td>
</tr>
<tr>
<td>Lantana x 'New Gold'</td>
<td>New Gold Lantana</td>
<td>groundcover</td>
<td></td>
</tr>
<tr>
<td>Lomandra longifolia 'Breeze'</td>
<td>Dwarf Mat Rush</td>
<td>grass</td>
<td></td>
</tr>
<tr>
<td>Muhlenbergia capillaris</td>
<td>Pink Muhly Grass</td>
<td>grass</td>
<td></td>
</tr>
<tr>
<td>Phormium 'Black Adder'</td>
<td>Black Adder Flax</td>
<td>grass</td>
<td></td>
</tr>
<tr>
<td>Rhaphiolepis indica 'Ballerina'</td>
<td>Ballerina Indian Hawthorn</td>
<td>shrub</td>
<td></td>
</tr>
<tr>
<td>Senecio mandralisciae</td>
<td>Blue Chalksticks</td>
<td>groundcover</td>
<td></td>
</tr>
<tr>
<td>Tradescantia pallida</td>
<td>Purple Heart</td>
<td>groundcover</td>
<td>x</td>
</tr>
<tr>
<td>Zauschneria californica 'Route 66'</td>
<td>Route 66 California Fuchsia</td>
<td>shrub</td>
<td></td>
</tr>
<tr>
<td>Cercidium x 'Desert Museum'</td>
<td>Desert Museum Palo Verde</td>
<td>ornamental tree</td>
<td></td>
</tr>
<tr>
<td>Cercis occidentalis</td>
<td>Western Redbud</td>
<td>ornamental tree</td>
<td></td>
</tr>
</tbody>
</table>

### Courtyards

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Form</th>
<th>Shade Tolerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agave attenuata</td>
<td>Foxtail Agave</td>
<td>succulent</td>
<td>x</td>
</tr>
<tr>
<td>Ceratostigma plumbaginoides</td>
<td>Dwarf Plumbago</td>
<td>groundcover</td>
<td>x</td>
</tr>
<tr>
<td>Dianella revoluta</td>
<td>Little Rev Flax Lily</td>
<td>grass</td>
<td>x</td>
</tr>
<tr>
<td>Dietes irioidei</td>
<td>African Iris</td>
<td>grass / shrub</td>
<td></td>
</tr>
<tr>
<td>Lomandra longifolia 'Breeze'</td>
<td>Dwarf Mat Rush</td>
<td>grass</td>
<td></td>
</tr>
<tr>
<td>Phormium 'Black Adder'</td>
<td>Black Adder Flax</td>
<td>grass</td>
<td></td>
</tr>
<tr>
<td>Rhaphiolepis indica 'Ballerina'</td>
<td>Ballerina Indian Hawthorn</td>
<td>shrub</td>
<td></td>
</tr>
<tr>
<td>Senecio mandralisciae</td>
<td>Blue Chalksticks</td>
<td>groundcover</td>
<td></td>
</tr>
<tr>
<td>Tradescantia pallida</td>
<td>Purple Heart</td>
<td>groundcover</td>
<td>x</td>
</tr>
</tbody>
</table>

### Slopes

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Form</th>
<th>Shade Tolerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arctostaphylos 'Emerald Carpet'</td>
<td>Carpet Manzanita</td>
<td>groundcover</td>
<td></td>
</tr>
<tr>
<td>Dietes irioidei</td>
<td>African Iris</td>
<td>grass / shrub</td>
<td></td>
</tr>
<tr>
<td>Lantana sellowiana 'Monswee'</td>
<td>Trailing Lantana</td>
<td>groundcover</td>
<td></td>
</tr>
<tr>
<td>Muhlenbergia capillaris</td>
<td>Pink Muhly Grass</td>
<td>grass</td>
<td></td>
</tr>
<tr>
<td>Myoporum parvifolium 'Putah Creek'</td>
<td>Creeping Myoporum</td>
<td>groundcover</td>
<td></td>
</tr>
<tr>
<td>Zauschneria californica 'Route 66'</td>
<td>Route 66 California Fuchsia</td>
<td>shrub</td>
<td></td>
</tr>
<tr>
<td>Cercidium x 'Desert Museum'</td>
<td>Desert Museum Palo Verde</td>
<td>ornamental tree</td>
<td></td>
</tr>
</tbody>
</table>

### Reen

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Form</th>
<th>Shade Tolerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligustrum japonicum 'Texanum'</td>
<td>Waxleaf Privet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Westringia 'Wynvabbe Gem'</td>
<td>Coast Rosemary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Equipment

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Equipment Description</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backflow Preventer</td>
<td>Febco 825YD Series</td>
<td></td>
</tr>
<tr>
<td>Wye Strainer</td>
<td>Febco 758A Series</td>
<td></td>
</tr>
<tr>
<td>Master Valve</td>
<td>Griswold 2000 Series</td>
<td></td>
</tr>
<tr>
<td>Flow Sensor</td>
<td>Calsense FM Series</td>
<td></td>
</tr>
<tr>
<td>Gate Valve</td>
<td>Febco F-619-RW-SON Series</td>
<td></td>
</tr>
<tr>
<td>Controller</td>
<td>Calsense CS-3000 Series</td>
<td></td>
</tr>
</tbody>
</table>

*note*
1. list is broad in scope for implementation across campuses - LCI recommends further design study for specific locations
2. some planting areas within courtyard areas are in shade, refer to plants marked as “shade tolerant” for these areas

---

**WATER REDUCTION MATERIALS - IRRIGATION / PLANT / INERT**

**ORRENMAA ELEMENTARY SCHOOL**
*note - refer to section 5a for specific plant locations and other notes

PROPOSED CALIFORNIA FRIENDLY PLANTS
ORRENMAA ELEMENTARY SCHOOL
Promoting energy and water reduction, while simultaneously improving the built environment for quality education, in the design of school buildings. Bring the past (existing buildings) into the present because the future is already there.

+ 50% site water reduction
  exceed CA State water mandate of 25% reduction within budget requirements

+ campus bio-swale system
  water animated through site, cleaning, and infiltrating back into aquifer

+ drought resistant turf
NATURAL VS. SYNTHETIC TURF

SUMMARY
1 - Natural has higher annual costs (on-going) while Synthetic has higher initial and end of life cycle replacement cost (15 year)
2 - Synthetic costs are higher than Natural over 15-year span because of initial construction and end of life-cycle replacement
3 - Synthetic is associated with more potential injuries
4 - The potential for high surface temperature and bacteria with Synthetic are significant concerns

ATTRIBUTES / INJURIES
NATURAL
Pros: low initial investment, low surface temperature, natural feel, low slip coefficient
Cons: low use tolerance, high water use, weather sensitive, high maintenance cost
Injuries: hamstring, knee, shin splints, ankle

SYNTHETIC
Pros: low water use, low maintenance cost, high use tolerance, weather resistant
Cons: high initial investment, possible carcinogenic, high surface temperature, high replacement cost, potential infection from bacteria
Injuries: hamstring, knee, shin splints, ankle, turf burn, staph infection from bacteria

COST COMPARISON
15 yr cost for 90k sq. ft. field

SOURCE: DIGERONIMO-MIKULA ASSOCIATIES INC.
VALUE ADDS

+ WATER MANAGEMENT
  maximize irrigation efficiency | water capture + quality + reuse | turf to drought tolerant

+ PERFORMANCE METRICS
  water use calculations + projections vs. CA state requirements (ab1881)

+ COMPREHENSIVE SUSTAINABILITY
  analysis of site issues | strategic master planning | implementation | education
Got Questions - Say Howdy!
bret hanson
bret@lcapouya.com
949-756-0150