Cannon

# Oceano Low Impact Development Plan
# Final Feasibility Study

*Prepared for*
Oceano Community Services District
1655 Front Street
Oceano, CA 93445

*Prepared by*
Cannon
1050 Southwood Drive
San Luis Obispo, CA 93401

2/13/2019

## Table of Contents

**Common Acronyms and Abbreviations**

| | |
|---|---|
| CCR | California Code of Regulations (see also Title 22) |
| CFM | Cubic Feet per Minute |
| CIP | Capital Improvement Program |
| County | County of San Luis Obispo |
| cuft or CF | cubic feet |
| CWA | Clean Water Act |
| DAC | Disadvantaged Community |
| DMA | Drainage Management Area |
| DWR | (California) Department of Water Resources |
| EIR | Environmental Impact Report |
| FMP | Facilities Master Plan |
| fps | Feet Per Second |
| gpd | Gallons Per Day |
| gpm | Gallons Per Minute |
| HDPE | High-Density Polyethylene |
| hr | Hour |
| I&I | Inflow and Infiltration |
| In | Inches |
| IRWM | Integrated Regional Water Management |
| IRWMP | Integrated Regional Water Management Plan |
| LF or lf | Linear Feet |
| LID | Low Impact Development |
| LiDAR | Light Detection and Ranging |
| MG | Million Gallons |
| mgd | Million Gallons Per Day |
| NIC | Not Included or Not in Contract |
| NPDES | National Pollution Discharge Elimination System (Regulatory Framework for Permitting Discharges to Surface Water) |
| OCSD | Oceano Community Services District |
| OPC | Opinion of Probable Cost |
| PCRs | Post-Construction Stormwater Management Requirements |
| PDWF | Peak Dry Weather Flow |
| PROP 1 | Proposition 1 |
| PVC | Polyvinyl Chloride |
| RW | Recycled (or Reclaimed) Water |
| RWQCB | Regional Water Quality Control Board |
| sqft or SF | Square Feet |
| SWRCB | (California) State Water Resources Control Board |
| SWRP | Stormwater Resource Plan |
| TDS | Total Dissolved Solids (aka Salinity) |
| TSS | Total Suspended Solids |
| UWMP | Urban Water Management Plan |
| WDR | Waste Discharge Requirements (RWQCB Permits for Discharges to Land or Groundwater) |

INTRODUCTION

## 1.1 Purpose and Scope

This draft study provides an overview of the low impact development (LID) assessment for the community of Oceano. The purpose of the study is twofold. The first objective is to provide recommendations to the County of San Luis Obispo to update the existing 2004 Drainage and Flood Control Study by incorporating LID standards and identifying programs to enhance stormwater capture, groundwater recharge, and reduce non-point source pollution. The second objective is to carry out an inventory of existing conditions (street and sidewalk infrastructure, drainage infrastructure, drainage management areas, known flooding, future projects, community places, multi-modal routes, and publicly-owned sites) to identify opportunities where multi-beneficial LID projects may be implemented in Oceano. Alternative LID Concepts have been developed (conceptual plans, high-level stormwater calculations, preliminary cost estimates) so that they can be compared and prioritized. The ultimate goal of this effort is to develop an LID conceptual project that can be used by the Oceano Community Services District (OCSD) to successfully obtain Proposition 1 and/or Urban Greening Grant funding.

## 1.2 2004 Drainage and Flood Control Study and LID Update

The County of San Luis Obispo's 2004 Drainage and Flood Control Study identified the following three primary drainage issues needing to be addressed in Oceano:

- Shallow flooding in residential areas
- Significant and frequent flooding on Highway 1
- Management of local stormwater runoff when the Arroyo Grande Creek Channel is flowing high

To address these issues the 2004 Drainage and Flood Control Study outlined three projects. The first two projects listed below were identified as "near term" projects and the third as a "long term" project.

- Build a downstream detention facility to manage additional runoff coming from other proposed curb and gutter improvements
- Construct improvements to Highway 1 and existing drainage channels to divert flows to the proposed detention facility
- Mitigate flooding in residential neighborhoods through construction of curbs, gutters, storm drains, and detention basins to convey stormwater runoff from the residential areas to the proposed detention facility west of Highway 1

Since the development of the 2004 study, the use of low impact development strategies and facilities, also called "green infrastructure," to manage stormwater has become better understood and more commonly incorporated into drainage and flood control efforts. In 2013 the Central Coast Regional Water Quality Control Board adopted new Post-Construction Stormwater Management Requirements (Post-Construction Requirements) that emphasize the use of LID systems to reduce pollutant discharges and restore watershed processes to protect water quality and beneficial uses. To increase LID technical capacity in the region, the Regional Water Board established the Central Coast Low Impact Development Initiative (LIDI), an organization funded by the Water Board to develop open source technical resources and support municipalities. In response to the Post-Construction Requirements and with support from LIDI, the County of San Luis Obispo developed a Post-Construction Requirements

Handbook to provide guidance and direction on how to comply with the Post-Construction Requirements. Included in the County's handbook is a chapter with guidance for LID site design measures.

**Proposed Updates**

As part of this study, proposed updates were developed to amend the existing 2004 Drainage and Flood Control Study. Below are recommendations for updates to the LID standards and programs to enhance stormwater capture, groundwater recharge, and reduce non-point source pollution.

Whereas the Study outlines three projects, we recommend adding a fourth project with the bullet below:

- Mitigate flooding in residential neighborhoods through the implementation of low impact development stormwater control measures described in the LID Toolkit to convey, capture, infiltrate, and clean stormwater runoff.

Under the "long term" project heading, add the description and LID Toolkit below:

Table 1-1, LID Toolkit provides a list of LID stormwater control measures. These stormwater control measures are consistent with the County's Post-Construction Requirements Handbook for facilities that can be implemented within the public realm to enhance stormwater capture, groundwater recharge, and reduce non-point source pollution. In addition to a basic description of the facility or strategy, the table describes how it may be applied to a site or within the public right-of-way.

**Table 1-1. LID Toolkit**

| LID Stormwater Control Measure | Description | Application Types |
|---|---|---|
| Biofiltration and Bioretention | Small-scale engineered landscape areas that capture and treat stormwater by temporarily ponding and filtering stormwater through vegetation, a specially engineered soil layer, and in some cases an aggregate layer. Depending on underlying soil infiltration rates, treated stormwater infiltrates into native soils or is conveyed to the underground storm system through a perforated pipe underdrain. | • Street edge planters<br>• Site-based rain gardens |
| Drywells | An underground structure that enhances infiltration by penetrating clay and other less permeable soil layers to allow more rapid infiltration of stormwater and aquifer recharge. Biofiltration systems can be used to pre-treat stormwater that is conveyed to drywell to remove suspended solids, particulates, and contaminants. | • Street edge planters<br>• Site-based rain gardens<br>• Site-based attached to roof downspouts or overland flow |
| Cistern | Above or below-ground container used to collect and store stormwater for use as irrigation or, if treated, for additional uses. | • Site-based attached to roof downspouts or overland flow |

| | | |
|---|---|---|
| Infiltration Trench | Shallow aggregate filled trench that collects and infiltrates stormwater. Located where they will intercept surface flow. Runoff is stored in the void space of aggregate layer and infiltrates into the underlying native soil. | • Parallel to roadway<br>• At perimeter of parking lots<br>• Site-based to capture impervious runoff |
| Impervious Surface Reduction/ Disconnection | The practice of disconnecting stormwater conveyance to redirect from tight-lined and impervious surfaces and then routing to low impact development features. | • Street ROW impervious surface reduction (road diet)<br>• Site-based to redirect/ capture impervious runoff |
| New Landscape | Replacing compacted soils, sod, and impervious surfaces with new mulched landscape area provides multiple stormwater management functions including erosion control, reduced stormwater runoff, and filtering to provide water quality benefits. | • Street ROW planter strips<br>• Site-based planters |
| Pervious Pavement | Pavements comprised of a permeable surface with an underlying aggregate base course. Pervious pavements allow stormwater to pass through the surface and infiltrate, where soils permit. Types include pervious concrete, pervious asphalt, and permeable pavers. | • Street parking stalls<br>• Parking lots<br>• Pedestrian walkways<br>• Bicycle facilities<br>• Site surfaces |
| Pervious Pavement Trench | Linear strip of pervious pavement surface overlying an infiltration trench. | • Parallel to roadway<br>• At perimeter of parking lots<br>• Site-based to capture impervious runoff |
| Settling Basin (sediment chamber, forebay, etc.) | A structural feature, such as a chamber or forebay, incorporated at the inlet of a basin or bioretention/biofiltration facility to provide an area for sediment capture and removal. | • Street ROW or site-based prior to biofiltration and bioretention facility |
| Soil Amendment | Conventional landscape areas amended (tilled in) with organic compost provide multiple stormwater management functions including erosion control, reduced stormwater runoff, and filtering to provide water quality benefits. | • Street ROW planter strips<br>• Site-based landscape planters<br>• Street tree pits |
| Subsurface storage/ chambers | Underground facilities used to collect and store stormwater for use as irrigation or to retain and infiltrate into native soils. | • Site-based attached to roof downspouts or overland flow |

| | | |
|---|---|---|
| Trash Capture Devices | Devices incorporated into other stormwater management facilities that include filters and screens to allow for capture and removal of trash. | • Street ROW or site-based prior to biofiltration and bioretention facility<br>• Site-based prior to rain gardens<br>• Site-based prior to subsurface storage chambers |
| Tree Planting | Tree canopies provide surface area that captures rain and allows it to evaporate, roots take up water and open soils to promote infiltration. | • Street trees<br>• Parking lot trees<br>• Site trees |

*Note: Additional resources for low impact development design are located on the Central Coast Low Impact Development Initiative website: https://www.centralcoastlidi.org.*

## 1.3 Stormwater Management Inventory and Assessment

This section summarizes the stormwater management challenges facing Oceano, provides a brief overview of the findings from background research and field assessment, and summarizes community and grant funding drivers.

The community of Oceano experiences flooding in localized areas because in its early stages of urbanization, stormwater conveyance and flood control infrastructure were not incorporated into development standards that currently exist. In addition, the high infiltration rates of native soils were sufficient to accommodate runoff. As Oceano and other communities upstream urbanized, the infiltrative soils were no longer capable of absorbing the increased runoff. Contributing to this, shallow topography and development such as the railroad, levees, airport, and agricultural operations have filled in historic conveyance paths to the Arroyo Grande Creek Channel, resulting in flooding along Highway 1 and in low points of the community. An analysis of sub-watersheds that drain to Oceano and existing flood data was completed. Exhibit 1, Drainage Management Area Analysis Map illustrates the contributing drainage management areas, associated flow concentrations, and documented locations where significant flooding occurs.

The project team met with OCSD staff to discuss their stormwater management objectives. The OCSD has expressed the following items as priorities and guidance for their future stormwater management capital investments for the Oceano community:

OCSD Primary Project Objectives:

- Decrease localized flooding on residential streets
- Help to reduce existing major flooding issues
- Improve beautification and contribute to revitalization
- Target unimproved streets to address “missing links” in the pedestrian network to improve pedestrian mobility across the community, including supporting safe routes to school
- Coordinate with existing and planned improvements including the County’s Oceano Revitalization Plan

## General Characteristics

Our review and assessment from the windshield tour, drainage analysis, and existing and proposed curb and gutter overlay identified the following general characteristics of the target area(s):

- Existence of undeveloped road edge conditions
- Existing sandy soils have high infiltration rates (County of San Luis Obispo "Oceano Drainage Improvements Project" geotechnical report supports use of infiltration facilities)
- Crowned streets and lack of underground stormwater infrastructure concentrates flows from drainage management areas (DMAs) along the uphill side of east-west streets.
- Inconsistent right-of-way improvements result in a "hopscotch" of frontage development and lack of accessible routes for pedestrians
- Interconnected street grid system
- Known localized watershed low spots where flooding occurs

## Prop 1 Criteria

Based on a Median Household Income Survey prepared in 2017 by the Rural Community Assistance Corporation and funded by the California State Water Resources Control Board, the Oceano Community Services District boundary is identified as a disadvantaged community (DAC) block group. The OCSD will be dependent upon grant funding to implement the LID projects described in this study. Proposition 1, administered by the State Water Board, will provide $200 million in grant funds for multi-benefit stormwater management projects across California. Up to $20 million of these grant funds will be allocated for projects that directly benefit a DAC. In addition, DACs may request a match reduction provided representatives from the DAC have been or will be involved in the planning and implementation process and that the project will directly benefit the DAC community. Prop 1 Stormwater evaluation criteria are listed below. Those that apply to the Oceano LID projects are in bold:

- **Pollutant load reduction from the site (quantity of stormwater runoff captured/treated)**
- **Water conservation (reducing existing water use, capture and reuse onsite, and capture/infiltrate into groundwater basin)**
- **Education, outreach, capacity building**
- **Flood damage reduction (acres reduced)**
- Habitat improved, restored, or protected
- Fishery benefits

## Coordination and Partnerships

Success of the Oceano LID Project will require coordination with certain key organizations. Below is a list of organizations and associations identified for coordination along with notes on status of coordination.

1. County of San Luis Obispo
    - Projects must be well-coordinated with the County's Integrated Regional Water Management Plan (IRWMP). The project team coordinated with County staff to complete the project scoring worksheets to place and prioritize the Oceano LID project on the IRWM list.
    - On June 11th, met with OCSD staff and County Public Works staff to review preliminary concepts for the LID project and walk the proposed project locations.
    - To be eligible for Prop 1 funding, projects must be included on the County's Stormwater Regional Plan (SWRP) project list. The project team coordinated with County staff and their consultants to complete the Project Benefits Questionnaire and the Qualitative Metrics Weighting spreadsheet to facilitate project ranking.

- The project team coordinated with the County of San Luis Obispo to provide project data for ranking and placement on the County's Integrated Regional Water Management (IRWM) Implementation List. Out of 25 qualified submissions the project was ranked at seventh.

2. Lucia Mar Unified School District/Oceano Elementary School
    - One of the conceptual sub-projects is a subsurface storage facility proposed for the Oceano Elementary playfield that would capture stormwater for reuse as irrigation of the playfield. If this conceptual project is supported by the OCSD Board, the OCSD will initiate contact with the Lucia Mar Unified School District and Oceano Elementary School administration.
3. Habitat for Humanity Eco District
    - The County in partnership with Habitat for Humanity received Prop 84 Sustainable Communities grant funding to implement an Eco-District in the community of Oceano. The objective is to provide this underserved community with a clear path for projects that achieve resilience and greenhouse gas (GHG) reductions.
    - The project team met with the OCSD General Manager and Max Muscarella, who was in the process of working on a community needs assessment as part of the Eco District planning process. Mr. Muscarella provided information on a report being developed by Mike Britton at the County that summarizes existing subsurface stormwater facilities, existing and proposed curb and gutter, and existing drainage basins. The project team obtained a copy of the related curb and gutter line work, which was used to inform the location of the proposed designs.
    - Mr. Muscarella provided recommendations for consideration when planning for the public outreach portion of the project, including further coordination with Habitat for Humanity CEO, Julia Ogden, and the organization One Cool Earth.
4. One Cool Earth
    - According to Mr. Muscarella (above) One Cool Earth has a grant to work in Oceano that includes projects with rain gardens and tree planting. Contact should be made with One Cool Earth as part of public outreach component.

## 1.4 Opportunities for Multi-Beneficial LID Projects

Based on information gathered from the stormwater management inventory and assessment, the Oceano Revitalization Plan, and meeting with OCSD staff, the project team developed alternative concepts for incorporating strategies from the LID Toolbox as applicable to the physical characteristics of Oceano and in alignment with community planning, stormwater management objectives, and grant funding drivers. Below is a list of the five Alternative LID Concept Projects, a summary of the stormwater performance calculations carried out, and descriptions for each site-specific LID Concept Project.

### Stormwater Performance

Preliminary stormwater calculations were developed to estimate the runoff volumes that will be captured by the project alternatives. Drainage Management Areas (DMAs) were approximated for each project alternative based on a site visit. Stormwater management performance was estimated for each project alternative for the following parameters:

1. Stormwater retention/infiltration capacity and related ability to treat/infiltrate the 85th percentile, 24-hour storm event.
2. Average annual stormwater runoff volume retained/infiltrated.

Retention/infiltration capacity was based on Stormwater Control Measure (SCM) design and ability of the native soils to infiltrate stormwater. Additionally, performance was compared to the retention/infiltration volume needed to meet the 85th percentile, 24-hour storm event, which is the standard event-based performance for stormwater projects under the Central Coast Water Board's Post-Construction Requirements for Stormwater Control and therefore, a good water quality design target for voluntary community projects. The performance calculations are provided in an Excel spreadsheet (Appendix A: Oceano LID Concepts Stormwater Calculations). Project performance estimates will be refined through the more detailed process carried out to develop the Final Feasibility Study.

**LID project concepts:**

**Alternative A – Warner Street (13th Street to 17th Street)**
Description: Evaluate redesign of Warner Street to incorporate LID strategies, including soil amendment, drought-tolerant landscape, tree planting, and bioretention facilities. Additional "multi-benefit" improvements proposed for the concept include ADA ramps and sidewalk and Class II bicycle lanes. See Exhibit 2 for the Alternative A - Warner Street LID Concept Plan.

Performance: Primary focus is treatment and capture of smaller, more frequent storm events. Flooding during small storm events will be reduced but it is anticipated that flooding during large storm events may not be alleviated. Preliminary stormwater calculations for the Warner Street LID Concept are provided in Appendix A: Oceano LID Concepts Stormwater Calculations.

**Alternative B – 17th Street (Beach Street to Paso Robles Street)**
Description: Evaluate redesign of 17th Street to incorporate LID strategies, including soil amendment, drought-tolerant landscape, tree planting, and bioretention facilities. Additional "multi-benefit" improvements proposed for the concept include new ADA ramps and sidewalk and a reduction in road width/impervious surface area that replaces the two-way travel lanes with a one-way street with Class III bikeway markings. See Exhibit 3 for the Alternative B - 17th Street LID Concept Plan.

Performance: Primary focus is treatment and capture of smaller, more frequent storm events. Flooding during small storm events will be reduced but it is anticipated that flooding during large storm events may not be alleviated. Preliminary stormwater calculations for the 17th Street LID Concept are provided in Appendix A: Oceano LID Concepts Stormwater Calculations.

**Alternative C – 19th Street (Beach Street to Paso Robles Street)**
Description: Evaluate redesign of 17th Street to incorporate LID strategies, including soil amendment, drought-tolerant landscape, tree planting, bioretention facilities, and permeable pavers. Additional "multi-benefit" improvements proposed for the concept include ADA ramps and sidewalk and a reduction in road width/impervious surface area that replaces the two-way travel lanes with a one-way street with Class III bikeway markings. See Exhibit 4 for the Alternative C - 19th Street LID Concept Plan.

Performance: Primary focus is treatment and capture of smaller, more frequent storm events. Flooding during small storm events will be reduced but it is anticipated that flooding during large storm events may not be alleviated. Preliminary stormwater calculations for the 19th Street LID Concept are provided in Appendix A: Oceano LID Concepts Stormwater Calculations.

**Alternative D – Beach Street (21st Street to 24th Street)**
Description: Evaluate redesign of 21st Street to incorporate LID strategies, including soil amendment, drought-tolerant landscape, tree planting, and bioretention facilities Additional "multi-benefit" improvements proposed for the concept include ADA ramps and sidewalk and a reduction in road width/impervious surface area that replaces the two-way travel lanes with a one-way street with Class III bikeway markings. See Exhibit 5 for the Alternative D - Beach Street LID Concept Plan.

Performance: Primary focus is treatment and capture of smaller, more frequent storm events. Flooding during small storm events will be reduced but it is anticipated that flooding during large storm events may not be alleviated. Preliminary stormwater calculations for the Beach Street LID Concept are provided in Appendix A: Oceano LID Concepts Stormwater Calculations.

**Alternative E – Oceano Elementary School (Subsurface)**
Description: Evaluate locating a subsurface stormwater capture and storage facility beneath the playfield of Oceano Elementary School. The facility will be designed to capture stormwater runoff from the school site and adjacent streets. New catch basins will be incorporated where needed to convey overflow from the facility to the storm drain system. A filter and pump system will be included in the design to allow for reuse of stored water for irrigation of the 17th Street and 19th Street projects, new street trees planted south of the school, or the Oceano Elementary playfield turf. See Exhibit 6 for the Alternative E - Oceano Elementary School LID Concept Plan.

Performance: Primary focus is treatment, capture, and reuse of smaller, more frequent storm events. Flooding during small storm events will be reduced but it is anticipated that flooding during large storm events may not be alleviated. Preliminary stormwater calculations for the Oceano Elementary School LID Concept are provided in Appendix A: Oceano LID Concepts Stormwater Calculations.

## 1.5 Project Alternatives Estimates of Probable Cost

Project costs, including grant administration, design, and construction, were estimated for each alternative. Estimated project alternative costs are provided in Appendix B: Alternative LID Concepts Cost Estimates and represent grant administration, design, and construction costs estimated by the project team using past project experience and data for similar projects in the region. A 30 percent contingency above the values shown in the table is assumed given that the estimates were conducted at a concept design-level. Project budget estimates will be refined during the design phase of the project.

## 1.6 Initial Feasibility Analysis

A preliminary feasibility analysis of the five Project Alternatives was carried out to assess factors that relate to Oceano's stated objectives and grant funding drivers. The following factors were considered, including gray and green infrastructure performance, constraints, possible obstacles to implementation, cost, and overlapping multiple benefits. Table 1-2 documents this high-level assessment of the five Project Alternatives.

### Table 1-2. Alternatives Preliminary Feasibility Analysis

Responses:
1. Yes or No
2. Short description
3. NA (not applicable)
4. Not known

| Feasibility Factor | Project Alt. A | Project Alt. B | Project Alt. C | Project Alt. D | Project Alt. E |
|---|---|---|---|---|---|
| 1. Ability to route stormwater runoff to the facility(ies) | Yes | Yes | Yes | Yes | Yes |
| 2. Slope challenges (routing/siting) | No | No | No | No | No |
| 3. Reasonable native soil infiltration rates (water can infiltrate within 72 hours) | Yes[1] | Yes[1] | Yes[1] | Yes[1] | Yes[1] |
| 4. Depth to seasonal high groundwater adequate for infiltration | Not known | Not known | Not known | Not known | Not known |
| 5. Adequate space for facility(ies) siting | Yes | Yes | Yes | Yes | Yes |
| 6. Above-average sediment loads in runoff | Yes | Yes | Yes | Yes | Yes |
| 7. Pollutant “hot spots” in project drainage management areas (DMAs) | No | No | No | No | No |
| 8. Ability to design for adequate O&M access | Yes | Yes | Yes | Yes | Yes |
| 9. Requires land acquisition and/or easement | Yes[2] | Yes[2] | Yes[2] | Yes[2] | Yes |
| 10. Available street right-of-way adequate | Yes | Yes | Yes | Yes | N/A |
| 11. Location of utilities problematic | Yes | Yes | Yes | Yes | No |
| 12. Requires project | Yes | Yes | Yes | Yes | Yes |

| | | | | | |
|---|---|---|---|---|---|
| partners (e.g. school districts, Caltrans) | | | | | |
| 13. Project addresses multiple benefits (transportation, community livability, etc.) | Yes | Yes | Yes | Yes | No |

[1] Assumes highly infiltrative native soils based on historic information.

[2] County roads will likely require an easement/maintenance agreement.

### 1.7 Refined LID Project Alternatives Analysis and Summary

The project alternatives were initially evaluated using performance estimates based on high-level DMA approximations. Those performance estimates were included in the "Draft" version of this study. After the initial evaluation, LiDAR data and record drawings were obtained and used to refine the DMAs. The stormwater retention calculations were updated using the revised DMAs as were the evaluations and feasibility analysis of the alternatives. The updated performance estimates are reflected in Table 1-3.

**Table 1-3. LID Project Alternatives Summary**

| Project Concept Alternative | Cost | Meets 85% Criteria | Tributary Area (Acres) | 85% Volume Required (CF) | Volume Provided (CF) |
|---|---|---|---|---|---|
| Alternative A (Warner Street) | $2,310,000 | Yes | 7.98 | 11,839 | 23,314 |
| Alternative B (17th Street) | $1,900,000 | Yes | 2.48 | 3,681 | 21,733 |
| Alternative C (19th Street) | $1,728,000 | No | 17.21 | 25,553 | 17,585 |
| Alternative D (Beach Street) | $2,746,000 | No | 35.09 | 52,095 | 23,580 |
| Alternative E (Oceano Elementary) | $1,732,000 | Yes | 20.73 | 30,768 | 66,080 |

## EXHIBITS

The following exhibits are included with this report:

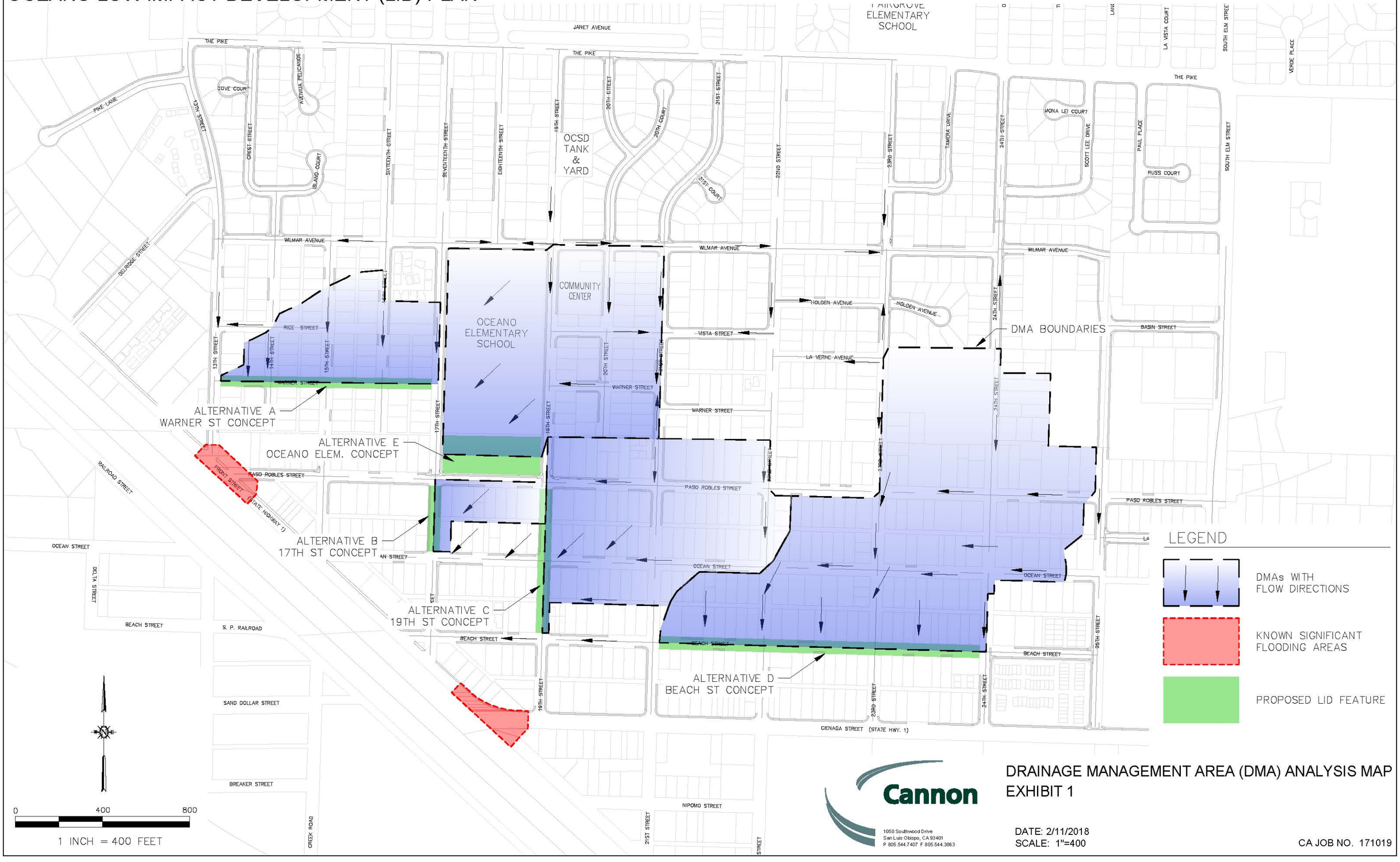
- Exhibit 1: Drainage Management Area Analysis Map
- Exhibit 2: Alternative A - Warner Street LID Concept Plan
- Exhibit 3: Alternative B - 17th Street LID Concept Plan
- Exhibit 4: Alternative C - 19th Street LID Concept Plan
- Exhibit 5: Alternative D - Beach Street LID Concept Plan
- Exhibit 6: Alternative E - Oceano Elementary School LID Concept Plan

## TECHNICAL APPENDICES

The following technical appendices are included with this report:

- Appendix A: Oceano LID Concepts Stormwater Calculations
- Appendix B: Alternative LID Concepts Cost Estimates

# OCEANO LOW IMPACT DEVELOPMENT (LID) PLAN




DRAINAGE MANAGEMENT AREA (DMA) ANALYSIS MAP
EXHIBIT 1

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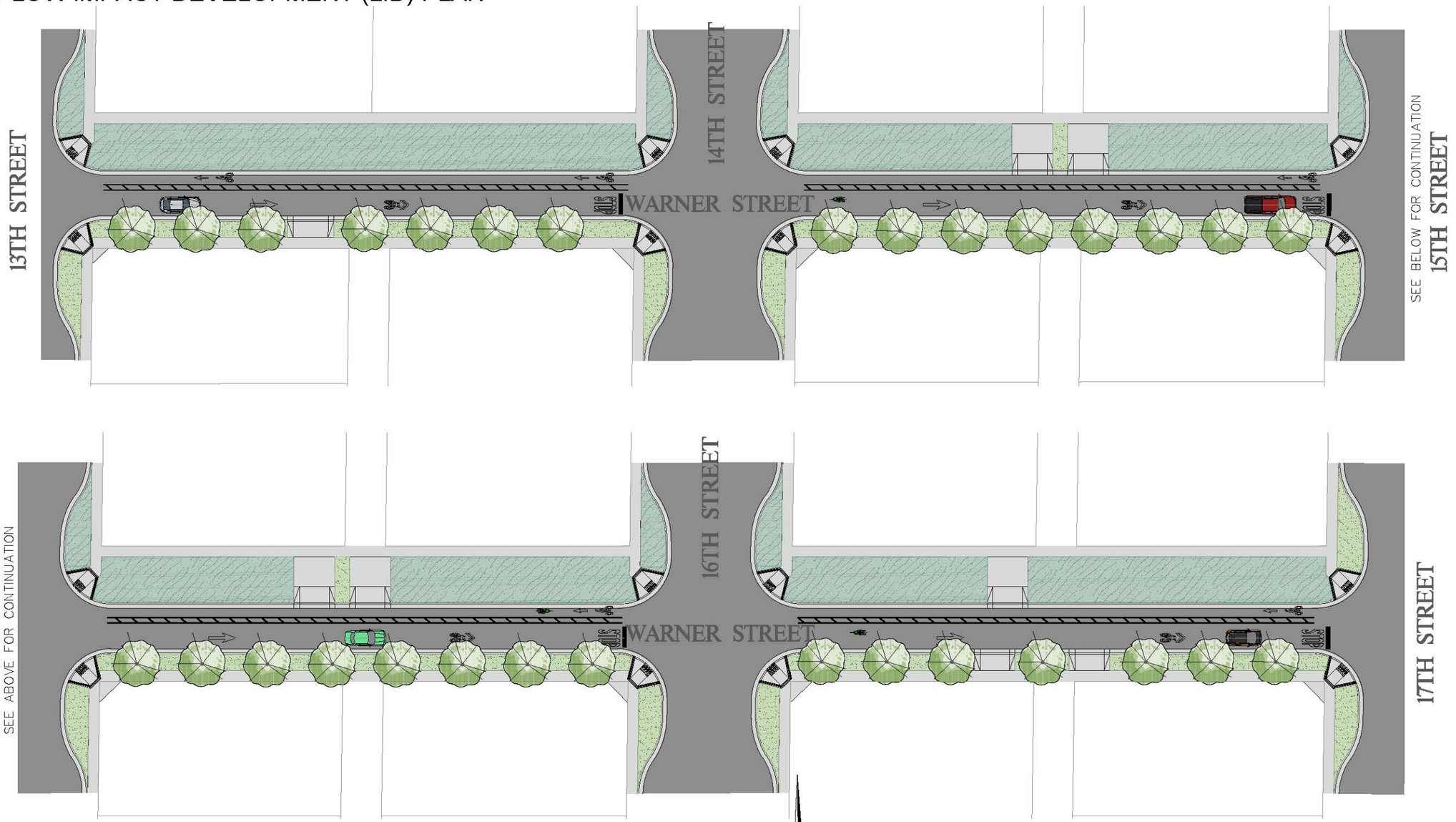
DATE: 2/11/2018
SCALE: 1"=400

CA JOB NO. 171019

# OCEANO LOW IMPACT DEVELOPMENT (LID) PLAN




## LEGEND

- LID LANDSCAPE
- DROUGHT TOLERANT LANDSCAPE
- A/C PAVEMENT
- CONCRETE

N

0 40 80

1 INCH = 40 FEET

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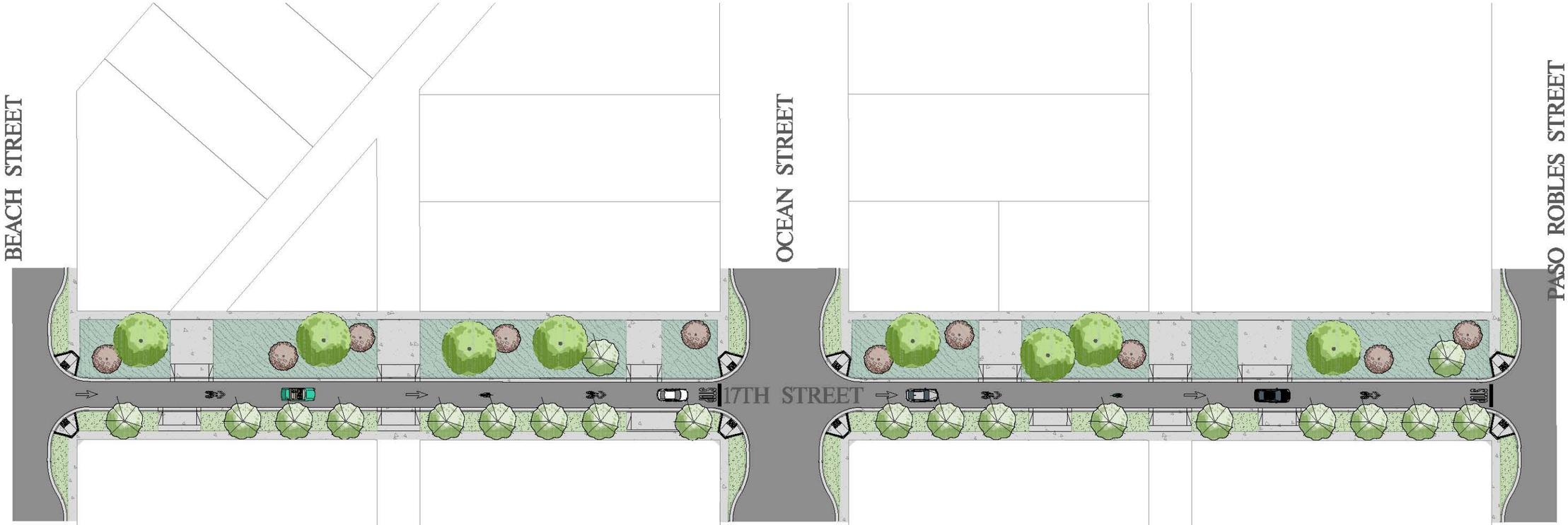
## ALTERNATIVE A - WARNER STREET LID CONCEPT (13TH STREET TO 17TH STREET) EXHIBIT 2

DATE: 2/11/2019
SCALE: 1"=40'

CA JOB NO. 171019

# OCEANO LOW IMPACT DEVELOPMENT (LID) PLAN




## LEGEND

- LID LANDSCAPE
- DROUGHT TOLERANT LANDSCAPE
- A/C PAVEMENT
- CONCRETE

0 50 100

1 INCH = 50 FEET

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## ALTERNATIVE B - 17TH STREET LID CONCEPT (BEACH STREET TO PASO ROBLES STREET) EXHIBIT 3

DATE: 2/11/2019
SCALE: 1"=50'

CA JOB NO. 171019

# OCEANO LOW IMPACT DEVELOPMENT (LID) PLAN


## LEGEND

- LID LANDSCAPE
- DROUGHT TOLERANT LANDSCAPE
- A/C PAVEMENT
- CONCRETE
- PAVERS

0 50 100

1 INCH = 50 FEET

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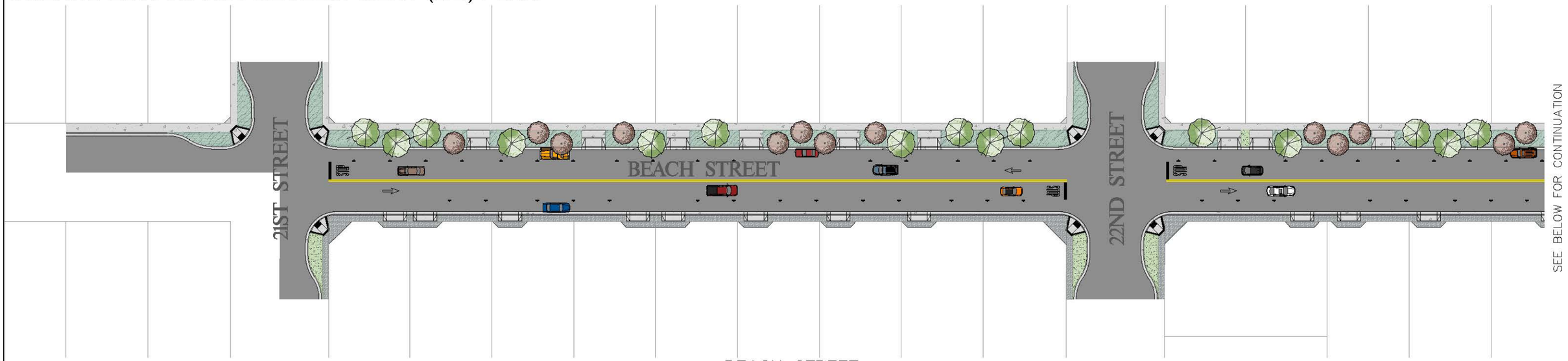
## ALTERNATIVE C - 19TH STREET LID CONCEPT (BEACH STREET TO PASO ROBLES STREET) EXHIBIT 4

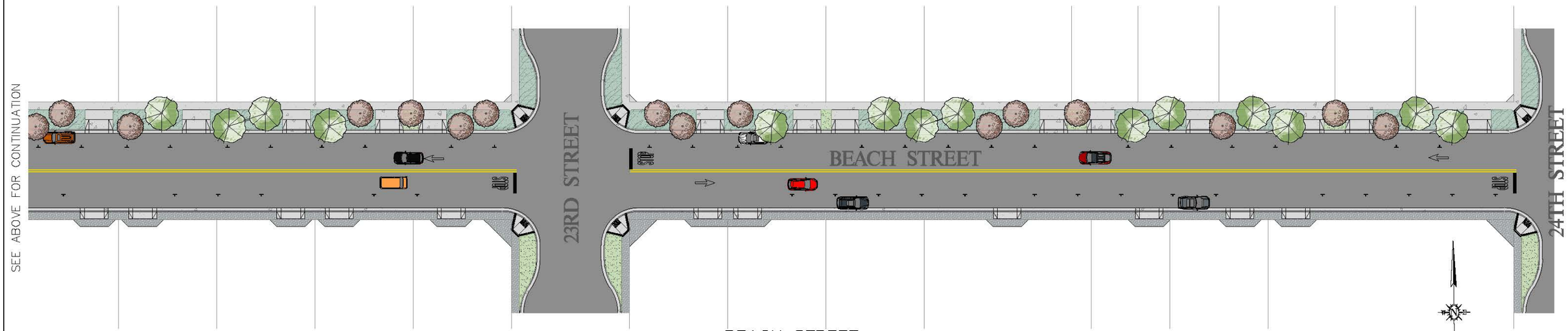
DATE: 2/11/2019
SCALE: 1"=50'

CA JOB NO. 171019

# OCEANO LOW IMPACT DEVELOPMENT (LID) PLAN




BEACH STREET




BEACH STREET

LEGEND

- LID LANDSCAPE
- A/C PAVEMENT
- PAVERS
- DROUGHT TOLERANT LANDSCAPE
- CONCRETE

0 50 100

1 INCH = 50 FEET

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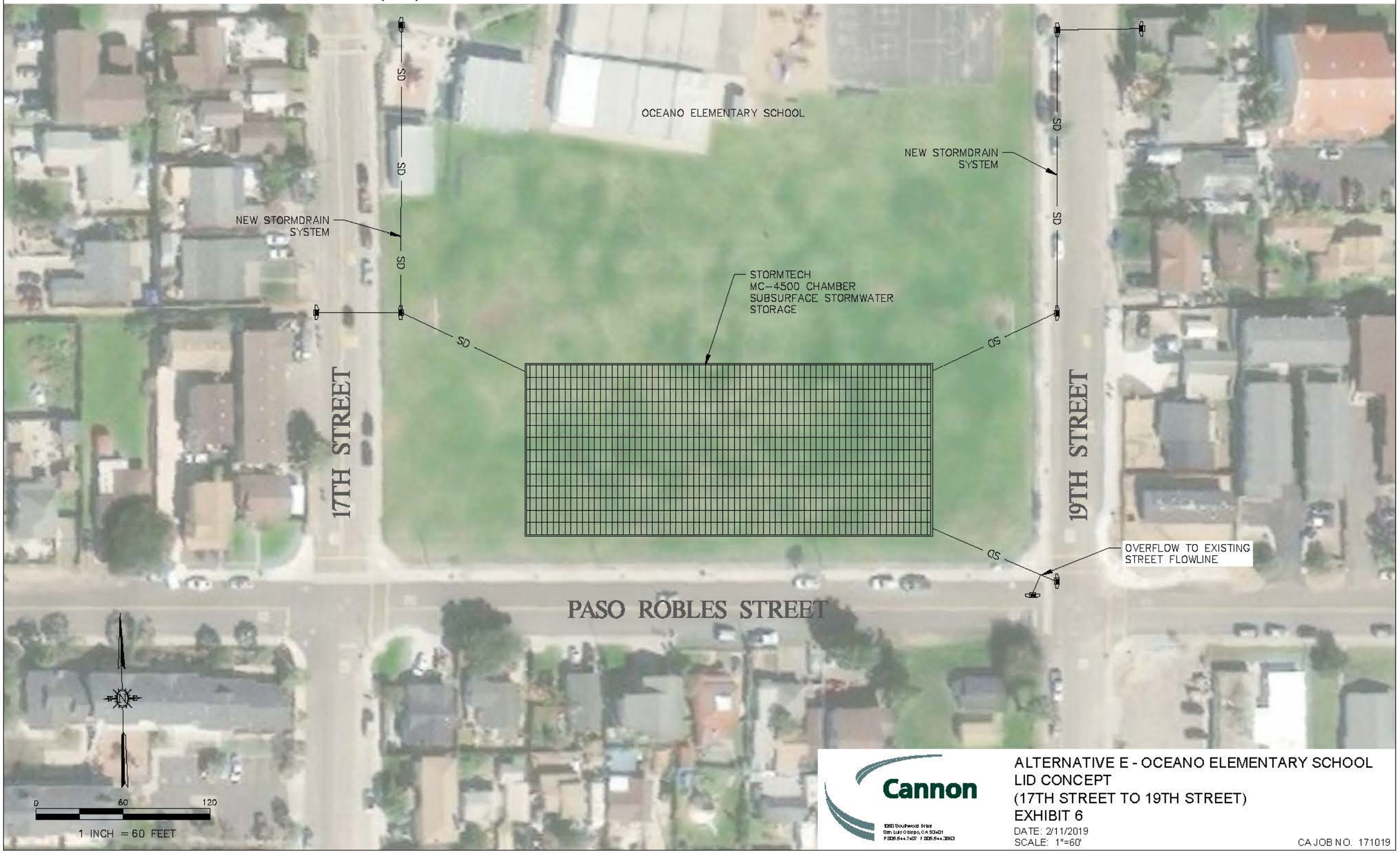
1050 Southwood Drive
San Luis Obispo, CA 93401
P 805.544.7407 F 805.544.3863

## ALTERNATIVE D - BEACH STREET LID CONCEPT (21ST STREET TO 24TH STREET) EXHIBIT 5

DATE: 2/11/2019
SCALE: 1"=50'

CA JOB NO. 171019

# OCEANO LOW IMPACT DEVELOPMENT (LID) PLAN




Cannon

1060 Southwood Drive
San Luis Obispo, CA 93401
P 805.544.7407 F 805.544.3863

ALTERNATIVE E - OCEANO ELEMENTARY SCHOOL
LID CONCEPT
(17TH STREET TO 19TH STREET)
EXHIBIT 6

DATE: 2/11/2019
SCALE: 1"=60'

CA JOB NO. 171019

# APPENDIX A: Oceano LID Concepts Stormwater Calculations

**Appendix A**

**Oceano LID Concepts Stormwater Calculations**

2/11/2019

| | |
|---|---|
| 85th% Rain Depth (in) | 1.0 |
| **Overall Watershed** | |
| Tributary Area (ac) | 83.49 |
| % Impervious | 0.60 |
| C Value | 0.41 |
| **85th% Runoff Volume Required (cf)** | **123,935** |
| **85% Treatment Flowrate Required (cfs)** | **6.83** |
| **Total Volume Provided with Improvements (cf)** | **152,291** |
| **Difference (Required vs. Provided)** | **(28,356)** |

| | |
|---|---|
| **Alternative A - Warner Street Concept** | |
| Tributary Area (ac) | 7.98 |
| % Impervious | 0.60 |
| C Value | 0.41 |
| **85th% Runoff Volume Required (cf)** | **11,839** |
| **Treatment DMA 1** | |
| Area Bioretention Soil (sf) | 13,714 |
| Avg Ponding Depth (in) | 6 |
| Planting Soil Depth (in) | 24 |
| Planting Soil void % | 30 |
| Drain Rock Depth (in) | 18 |
| Drain Rock void % | 40 |
| **Volume Provided (cf)** | **23,314** |
| Area Pavers (sf) | - |
| Depth of paver base (in) | 16 |
| Paver base void % | 40 |
| **Volume Provided (cf)** | **-** |
| **Total Volume Provided** | **23,314** |
| **Difference (Required vs. Provided)** | **(11,475)** |

**Appendix A**
**Oceano LID Concepts Stormwater Calculations**

| **Alternative B - 17th Street** | |
|---|---|
| Tributary Area (ac) | 2.48 |
| % Impervious | 0.60 |
| C Value | 0.41 |
| **85th% Runoff Volume Required (cf)** | **3,681** |
| **Treatment DMA 2** | |
| Area Bioretention Soil (sf) | 12,784 |
| Avg Ponding Depth (in) | 6 |
| Planting Soil Depth (in) | 24 |
| Planting Soil void % | 30 |
| Drain Rock Depth (in) | 18 |
| Drain Rock void % | 40 |
| **Volume Provided (cf)** | **21,733** |
| Area Pavers (sf) | - |
| Depth of paver base (in) | 16 |
| Paver base void % | 40 |
| **Volume Provided (cf)** | **-** |
| **Total Volume Provided** | **21,733** |
| **Difference (Required vs. Provided)** | **(18,052)** |

| **Alternative C - 19th Street** | |
|---|---|
| Tributary Area (ac) | 17.21 |
| % Impervious | 0.60 |
| C Value | 0.41 |
| **85th% Runoff Volume Required (cf)** | **25,553** |
| **Treatment DMA 3** | |
| Area Bioretention Soil (sf) | 9,786 |
| Avg Ponding Depth (in) | 6 |
| Planting Soil Depth (in) | 24 |
| Planting Soil void % | 30 |
| Drain Rock Depth (in) | 18 |
| Drain Rock void % | 40 |
| **Volume Provided (cf)** | **16,636** |
| Area Pavers (sf) | 1,779 |
| Depth of paver base (in) | 16 |
| Paver base void % | 40 |
| **Volume Provided (cf)** | **949** |
| **Total Volume Provided** | **17,585** |
| **Difference (Required vs. Provided)** | **7,968** |

**Appendix A**

**Oceano LID Concepts Stormwater Calculations**

| **Alternative D - Beach Street** | |
|---|---|
| Tributary Area (ac) | 35.09 |
| % Impervious | 0.60 |
| C Value | 0.41 |
| **85th% Runoff Volume Required (cf)** | **52,095** |
| **Treatment DMA 4** | |
| Area Bioretention Soil (sf) | 11,590 |
| Avg Ponding Depth (in) | 6 |
| Planting Soil Depth (in) | 24 |
| Planting Soil void % | 30 |
| Drain Rock Depth (in) | 18 |
| Drain Rock void % | 40 |
| **Volume Provided (cf)** | **19,703** |
| Area Pavers (sf) | 7,269 |
| Depth of paver base (in) | 16 |
| Paver base void % | 40 |
| **Volume Provided (cf)** | **3,877** |
| **Total Volume Provided** | **23,580** |
| **Difference (Required vs. Provided)** | **28,515** |

| **Alternative E - Oceano Elementary Concept** | |
|---|---|
| Tributary Area (ac) | 20.73 |
| % Impervious | 0.60 |
| C Value | 0.41 |
| **85th% Runoff Volume Required (cf)** | **30,768** |
| **Treatment DMA 1** | |
| StormTrap (118 x 280) 24" Depth Cells | 66,080 |
| **StormTech Volume Provided** | **66,080** |
| **Difference (Required vs. Provided)** | **(35,312)** |

# APPENDIX B: Alternative LID Concepts Cost Estimates

## Appendix B: Alternative LID Concepts Cost Estimate

## Alternative A - Warner Street

### Budget Estimate for Construction Cost

**Date** 2/13/2019
**City Project:** Oceano
**No. :** 171019

| Item Number | Item | Quantity | Unit | Unit Cost | Total Item Cost |
|---|---|---|---|---|---|
| **Project Managemnet** | | | | | |
| | Grant Funding Administration | 1 | LS | $29,015 | $29,015 |
| | Engineering | 1 | LS | $116,058 | $116,058 |
| | Construction Management | 1 | LS | $174,087 | $174,087 |
| **Site Work** | | | | | |
| | Roadway Excavation | 31,439 | SF | $1.30 | $40,871 |
| | Bioretention Excavation | 13,714 | SF | $1.30 | $17,828 |
| | Hot Mix Asphalt | 31,439 | SF | $1.50 | $47,159 |
| | Class 2 Base | 31,439 | SF | $1.50 | $47,159 |
| | Bioretention Cells | 13,714 | SF | $50.00 | $685,700 |
| | Minor Concrete - Curb Ramp | 16 | EA | $15,000.00 | $240,000 |
| | Minor Concrete - Curb and Gutter | 2,528 | LF | $50.00 | $126,400 |
| | Minor Concrete - Driveway | 2,078 | SF | $15.00 | $31,170 |
| | Minor Concrete - Sidewalk | 9,129 | SF | $10.00 | $91,290 |
| | Landscape and Irrigation | 1 | LS | $33,150.00 | $33,150 |
| | Curb Cuts | 28 | EA | $250.00 | $7,000 |
| | Signing and Striping | 1 | LS | $5,000.00 | $5,000 |
| **Construction Site Management** | | | | | |
| | Mobilization (5%) | 1 | LS | $40,000.00 | $40,000 |
| | Traffic Control | 1 | LS | $25,000.00 | $25,000 |
| | Erosion Control/SWPPP | 1 | LS | $20,000.00 | $20,000 |
| | | | | **Subtotal** | **$1,776,886** |
| | | | | **Contingency [30%]** | **$533,066** |
| | | | | **Total** | **$2,309,951** |

In providing opinions of probable construction costs, the City must understand that Cannon has no control over the costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable costs provided herein are made on the basis of Cannon's qualifications and experience. Cannon makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

EA = Each, LS = Lump Sum, LF = Lineal Feet, SF = Square Feet, SY = Square Yard, CY = Cubic Yard, TN = Ton

## Appendix B: Alternative LID Concepts Cost Estimate

## Alternative B - 17th Street

### Budget Estimate for Construction Cost

**Date** 2/13/2019
**City Project:** Oceano
**No. :** 171019

| Item Number | Item | Quantity | Unit | Unit Cost | Total Item Cost |
|---|---|---|---|---|---|
| **Project Managemnet** | | | | | |
| | Grant Funding Administration | 1 | LS | $0.00 | $23,956 |
| | Engineering | 1 | LS | $0.00 | $95,826 |
| | Construction Management | 1 | LS | $0.00 | $143,739 |
| **Site Work** | | | | | |
| | Roadway Excavation | 17,012 | SF | $1.30 | $22,116 |
| | Bioretention Excavation | 12,784 | SF | $1.30 | $16,619 |
| | Hot Mix Asphalt | 17,012 | SF | $1.50 | $25,518 |
| | Class 2 Base | 17,012 | SF | $1.50 | $25,518 |
| | Bioretention Cells | 12,784 | SF | $50.00 | $639,200 |
| | Permeable Pavers | 0 | SF | $25.00 | $0 |
| | Minor Concrete - Curb Ramp | 8 | EA | $15,000.00 | $120,000 |
| | Minor Concrete - Driveway | 5,375 | SF | $15.00 | $80,625 |
| | Minor Concrete - Curb and Gutter | 1,661 | LF | $50.00 | $83,050 |
| | Minor Concrete - Sidewalk | 6,192 | SF | $10.00 | $61,920 |
| | Landscape and Irrigation | 1 | LS | $29,255.00 | $29,255 |
| | Curb Cuts | 16 | EA | $250.00 | $4,000 |
| | Signing and Striping | 1 | LS | $5,000.00 | $5,000 |
| **Construction Site Management** | | | | | |
| | Mobilization (5%) | 1 | LS | $40,000.00 | $40,000 |
| | Traffic Control | 1 | LS | $25,000.00 | $25,000 |
| | Erosion Control/SWPPP | 1 | LS | $20,000.00 | $20,000 |
| | | | | **Subtotal** | **$1,461,341** |
| | | | | **Contingency [30%]** | **$438,402** |
| | | | | **Total** | **$1,899,744** |

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## Appendix B: Alternative LID Concepts Cost Estimate

## Alternative C - 19th Street

### Budget Estimate for Construction Cost

**Date** 2/13/2019
**City Project:** Oceano
**No. :** 171019

| Item Number | Item | Quantity | Unit | Unit Cost | Total Item Cost |
|---|---|---|---|---|---|
| **Project Managemnet** | | | | | |
| | Grant Funding Administration | 1 | LS | $21,789.70 | $21,790 |
| | Engineering | 1 | LS | $87,158.80 | $87,159 |
| | Construction Management | 1 | LS | $130,738.20 | $130,738 |
| **Site Work** | | | | | |
| | Roadway Excavation | 17,003 | SF | $1.30 | $22,104 |
| | Bioretention Excavation | 9,786 | SF | $1.30 | $12,722 |
| | Hot Mix Asphalt | 17,003 | SF | $1.50 | $25,505 |
| | Class 2 Base | 17,003 | SF | $1.50 | $25,505 |
| | Bioretention Cells | 9,786 | SF | $50.00 | $489,300 |
| | Permeable Pavers | 1,780 | SF | $25.00 | $44,500 |
| | Minor Concrete - Curb Ramp | 8 | EA | $15,000.00 | $120,000 |
| | Minor Concrete - Driveway | 5,170 | SF | $15.00 | $77,550 |
| | Minor Concrete - Curb and Gutter | 1,661 | LF | $50.00 | $83,050 |
| | Minor Concrete - Cross Gutter including Spandral | 0 | SF | $20.00 | $0 |
| | Minor Concrete - Sidewalk | 6,170 | SF | $10.00 | $61,700 |
| | Landscape and Irrigation | 1 | LS | $33,550.00 | $33,550 |
| | Curb Cuts | 16 | EA | $250.00 | $4,000 |
| | Signing and Striping | 1 | LS | $5,000.00 | $5,000 |
| **Construction Site Management** | | | | | |
| | Mobilization (5%) | 1 | LS | $40,000.00 | $40,000 |
| | Traffic Control | 1 | LS | $25,000.00 | $25,000 |
| | Erosion Control/SWPPP | 1 | LS | $20,000.00 | $20,000 |
| | | | | **Subtotal** | **$1,329,171** |
| | | | | **Contingency [30%]** | **$398,751** |
| | | | | **Total** | **$1,727,923** |

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## Appendix B: Alternative LID Concepts Cost Estimate

## Alternative D - Beach Street

### Budget Estimate for Construction Cost

**Date** 2/13/2019
**City Project:** Oceano
**No. :** 171019

| Item Number | Item | Quantity | Unit | Unit Cost | Total Item Cost |
|---|---|---|---|---|---|
| **Project Managemnet** | | | | | |
| | Grant Funding Administration | 1 | LS | $34,632.96 | $34,633 |
| | Engineering | 1 | LS | $138,531.84 | $138,532 |
| | Construction Management | 1 | LS | $207,797.76 | $207,798 |
| **Site Work** | | | | | |
| | Roadway Excavation | 73,905 | SF | $1.30 | $96,077 |
| | Bioretention Excavation | 11,590 | SF | $1.30 | $15,067 |
| | Hot Mix Asphalt | 73,905 | SF | $1.50 | $110,858 |
| | Class 2 Base | 73,905 | SF | $1.50 | $110,858 |
| | Bioretention Cells | 11,590 | SF | $50.00 | $579,500 |
| | Permeable Pavers | 7,269 | SF | $25.00 | $181,725 |
| | Minor Concrete - Curb Ramp | 13 | EA | $15,000.00 | $195,000 |
| | Minor Concrete - Driveway | 5,898 | SF | $15.00 | $88,470 |
| | Minor Concrete - Curb and Gutter | 3,569 | LF | $50.00 | $178,450 |
| | Minor Concrete - Cross Gutter including Spandral | 0 | SF | $20.00 | $0 |
| | Minor Concrete - Sidewalk | 7,220 | SF | $10.00 | $72,200 |
| | Landscape and Irrigation | 1 | LS | $8,445.00 | $8,445 |
| | Curb Cuts | 0 | EA | $250.00 | $0 |
| | Signing and Striping | 1 | LS | $10,000.00 | $10,000 |
| **Construction Site Management** | | | | | |
| | Mobilization (5%) | 1 | LS | $40,000.00 | $40,000 |
| | Traffic Control | 1 | LS | $25,000.00 | $25,000 |
| | Erosion Control/SWPPP | 1 | LS | $20,000.00 | $20,000 |
| | | | | **Subtotal** | **2,112,611.1** |
| | | | | **Contingency {30%}** | **$633,783** |
| | | | | **Total** | **$2,746,394** |

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## Appendix B: Alternative LID Concepts Cost Estimate

## Alternative E - Oceano Elementary School

### Budget Estimate for Construction Cost

**Date** 2/13/2019
**City Project:** Oceano
**No. :** 171019

| Item Number | Item | Quantity | Unit | Unit Cost | Total Item Cost |
|---|---|---|---|---|---|
| **Project Managemnet** | | | | | |
| | Grant Funding Administration | 1 | LS | $18,571.00 | $18,571 |
| | Engineering | 1 | LS | $74,284.00 | $74,284 |
| | Construction Management | 1 | LS | $111,426.00 | $111,426 |
| **Site Work** | | | | | |
| | Excavation | 42,000 | SF | $9.30 | $390,600 |
| | Drain Rock | 1,163 | CY | $80.00 | $93,040 |
| | Landscape and Irrigation | 1 | LS | $168,000.00 | $168,000 |
| | Curb Inlets | 8 | EA | $10,000.00 | $80,000 |
| | 24" Storm Drain Pipe | 790 | LF | $200.00 | $158,000 |
| | Pump (to feed irrigation system) | 1 | LS | $15,000.00 | $15,000 |
| | Underground Retention System (includes installation) | 1 | LS | $200,000.00 | $200,000 |
| **Construction Site Management** | | | | | |
| | Mobilization (5%) | 1 | LS | $40,000.00 | $40,000 |
| | Traffic Control | 1 | LS | $25,000.00 | $25,000 |
| | Erosion Control/SWPPP | 1 | LS | $20,000.00 | $20,000 |
| | | | | **Subtotal** | $ 1,393,921 |
| | | | | **Contingency [30%]** | **$418,176** |
| | | | | **Total** | **$1,812,097** |

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