Mid-Brays Bayou Communities: Housing the Next 60,000
Aspiration and Strategies

APPENDIX D: BEST PRACTICES VISIONING/ APPENDIX E: BEST PRACTICES HOUSE ELEVATION
Mid-Braes Bayou Resiliency & Revitalization Housing & Community Development Plan

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APPENDIX D: BEST PRACTICES VISIONING
QUAD ZERO STUDIO
Meyerland–The Flood-Adaptable Houston Community

Hurricane Harvey flooding impacted over 300,000 houses, one million cars, and 400 schools. The flood’s disruption to families, business, and entire neighborhoods has tested their physical and social resilience. The spring 2018 ARCH5500 QUAD ZERO studio in the Gerald D. Hines College of Architecture and Design explored strategies for climate-adaptable neighborhoods. Students worked with the Super Neighborhood Alliance and Meyerland Super Neighborhood to define resilience challenges for flood-prone Houston neighborhoods, illustrate flooding scenarios, prepare and evaluate flood resilience strategies, and recommend resilience design and actions. The scope of the project went beyond designing flood-proof houses, it included community and institutional services that make neighborhoods function. The QUAD ZERO studio explored neighborhood-scale reinvestment strategies meeting ambitious targets for reduction in greenhouse gas emissions, energy efficient design and energy production, storm-water management, and waste.

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VILLAGES OF MEYERLAND PROGRAM DEVELOPMENT
- Single Family Detached
- Small Lot
- Single Family
- High Density Apartments
- Low Density Apartments
- Walkups & Townhouses
- Education
- Religious
- Parks
- Grocery Stores
- Restaurants
- Retail
- High Density Office
- Low Density Office
- Service
- Storage
- Public Assembly

RESIDENTIAL DEVELOPMENT
- Single Family Detached (5,086 units, 4 DU/A)
- Small Lot Single Family (92 units, 1 Du/a)
- Walkups & Townhouses (910 units, 16 DU/A)
- Low Density Apartments (2,534 units, 20 DU/A)
- High Density Apartments (6,279 units, 44 DU/A)

COMMERCIAL DEVELOPMENT
- Grocery Stores (296,600 ft²)
- Restaurants (382,000 ft²)
- Retail (1,261,230 ft²)
- Low Density Office (1,410,410 ft²)
- High Density Office (89,070 ft²)
- Service (52,000 ft²)
- Storage (70,000 ft²)

Figure 1: Meyerland Program Development
Shady Meadows Village, A Community on the Bayou

Shady Meadows Village is the newest mixed-use housing development in greater Meyerland that caters exclusively to senior members of the community. Shady Meadows aims to create a continuity of care through offering varying levels of service all on one campus. Three different "neighborhoods" within the village offer comprehensive medical services based on the specific needs of the resident. Join us for your journey through retirement, with the reassured that you will not have to move facilities just for getting sick or injured.

Shady Meadows Retirement Village, welcome home...
NET ZERO Campus, for Today's Seniors & Tomorrow's Children

Passive Energy Strategies

1. Reflective TPO Roof
2. Skylight, allowing for natural daylighting of interior spaces
3. Deep Overhangs, reducing excess heat gain
4. High performance Low E double pane windows
5. Vegetation Shading the Western Facade
6. Natural ventilation through courtyard entry

Active Energy Strategies

7. 330 kW Photovoltaic Cells
8. Solar hot water panels for therapy pool
9. Raised floor ventilation system
10. Geothermal Wells
11. Bio-digester
### ENERGY USAGE

<table>
<thead>
<tr>
<th>Program</th>
<th>kHw/SF/MONTH</th>
<th>SQFT (1,000)</th>
<th>KWH PER MONTH</th>
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<tr>
<td>Daycare</td>
<td>1.73</td>
<td>16</td>
<td>2,819</td>
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<tr>
<td>Religious/ Workshop</td>
<td>.30</td>
<td>2.6</td>
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<tr>
<td>Library/ Community Center</td>
<td>1.07</td>
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<td>2,564</td>
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<tr>
<td>Commercial Retail-Strip</td>
<td>2.30</td>
<td>9.8</td>
<td>22,499</td>
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<tr>
<td>Commercial Office</td>
<td>1.64</td>
<td>6.6</td>
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<td>Restaurant</td>
<td>5.47</td>
<td>2</td>
<td>10,942</td>
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<tr>
<td>Senior Housing/ Assisted Living</td>
<td>1.69</td>
<td>42.8</td>
<td>72,128</td>
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<td><strong>TOTAL</strong></td>
<td></td>
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<td><strong>123,888</strong></td>
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### WASTE PRODUCED

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<th>SQFT</th>
<th>WASTE FACTOR</th>
<th>KWH PER MONTH</th>
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<td>Daycare</td>
<td>20 Students</td>
<td>1.0</td>
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<td>Religious/ Workshop</td>
<td>2,600</td>
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<td>Library/ Community Center</td>
<td>2,200</td>
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<tr>
<td>Commercial</td>
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<td>1,450</td>
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<tr>
<td>Office</td>
<td>6,600</td>
<td>.01</td>
<td>66</td>
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<tr>
<td>Restaurant</td>
<td>2,000</td>
<td>.01</td>
<td>96</td>
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<tr>
<td>Senior Housing/ Assisted Living</td>
<td>42,800</td>
<td>4.0</td>
<td>144</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>36 BEDS</td>
<td></td>
<td><strong>1866</strong></td>
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</table>
SEVEN ACRES RESILIENT REDESIGN
Design Statement

- The newly redesigned and resilient Seven Acres senior home will integrate communal spaces, extensive courtyards, and putting sustainable best practices in place.

Design Objectives

- Integration of courtyards
- Limiting the height of the building
- Extension of landscape towards the interior
- Communal spaces
- Sustainable strategy integration
**ENERGY**

1. GEOTHERMAL: REDUCE ALL OF THE AMOUNT OF HVAC MECHANICAL ENERGY
2. PHOTOVOLTAIC: TO SUPPLY ON SITE RENEWABLE ENERGY
3. OCCUPANCY SENSORS: TO REDUCE THE AMOUNT OF ENERGY BEING CONSUMED IN THE SPACE
4. LED LIGHTING: IN ORDER TO REDUCE THE VOLTAGE AND HEAT THAT REGULAR LIGHTING CAN EMIT

**WASTE**

1. COMPOST OF WATED FOOD
2. RECYCLING BINS IN KITCHEN AND RESIDENTIAL AREAS
3. CENTRAL AREA FOR PICK UP OF ANY EXCESS WASTE
4. USING THE FERTILIZER TO PRODUCE METHANE GAS FOR ENERGY USAGE
5. TAKING THE EXCESS OF YARD TRIMMING LANDSCAPE AND CONVERTING INTO FERTILIZER
6. MINIMIZING THE AMOUNT OF WASTE GOING TOWARDS LANDFILLS

**WATER**

- WATER CISTERN: TO COLLECT RAIN WATER TO BE USED FOR IRRIGATION AND GRAYWATER
- REUSE POTABLE WATER: TO BE USED FOR GRAYWATER IN TOILETS
- WATER CISTERN PURIFIER: TO CLEAN THE WATER IN ORDER TO BE DRINKABLE FOR THE RESIDENTS
- WATER EFFICIENT EQUIPMENT TO REDUCE THE AMOUNT OF WATER FLOW
- THE ROOF CAN COLLECT AROUND 41,716 CUBIC FEET OF WATER
PRECEDES
Henderson-Hopkins School

Trillium Creek Primary School
West Linn, Oregon
The New Definition of Education Space
Mid-Braes Bayou Resiliency & Revitalization Housing & Community Development Plan

The Sustainable Critical Facility

Explorer Elementary School Total: 61000 S.F
Total kWh per Month: 65552

Car: approximately 150 people, 9 miles in average
20 miles per gallon in average

9 (gallon)/20(miles,per gallon)*30(days)
*150(people)*33(kWh/g)
=66825 kWh/Mon

Totals:
66825+65552=132383 kWh/Mon

ENERGY

DEMAND
- SPACE HEATING
- AIR CONDITIONING
- WATER HEATING
- APPLIANCES, LIGHTING
- DAYLIGHT/MOTION SENSOR
- GEOTHERMAL
- PHOTOVOLTAIC (SOLAR PANEL) SYSTEM

-6.2% VENTILATION
-5% SHADE
-6% INSULATION
-17.2% AIR CONDITIONING ENERGY

TOTAL DEMAND REDUCTION: -50.1%, 65552 kWh/Mon need to reduce

-70% LED LIGHTING
-25% DAYLIGHT/MOTION SENSOR
-18% APPLIANCES, LIGHTING ENERGY

-125 SF/BOREHOLES
800 SF COVERED/BOREHOLES
School Site, 330040 SF
1466 TOTAL BOREHOLES
1466*800
+1172800 SF supported

4350 SF PHOTOVOLTAIC SYSTEM NEEDED
### WATER

**Wasterwater System**
- Treatment Wetlands
- Trickle Filter & Interpretive Kiosk
- Settling Tank
- Basement Tanks and Filters for Grey Water Storage

**Stormwater System**
- Roof Leaders Green Roof
- Aeration Course
- Rainwater Cistern
- Rain Garden "Flood Zone"

---

### WASTE

**MITIGATION: RECYCLING**
- PAPER
- RUBBER
- PLASTICS
- METALS
- GLASS

**MITIGATION: DIGESTIBLE**
- FOOD
- YARD TRIMMING

**School Unit: Student-300**
- Daily Waste 300 lbs/day
  - If 80% Recycling: 120 lbs/day
  - If 95% Recycling: 108 lbs/day

**REDUCE**
- LESS EXCESSIVE PACKAGING
- DISCOUNT/OPTION FOR NO BAG
- WASTE REDUCTION TEMPLATE

**RECYCLE**
- BUYBACK/UPCYCLE PROGRAM
- DAMAGED GOODS TO DONATION

**REUSE**
- REUSABLE SHOPPING BAGS

---

**Roof Collection:** Roof(Leaders) Area: 20000SF, Rainfall 49.77 yearly, 995400 g/year
RE-IMAGINING A SUSTAINABLE FUTURE

ENERGY DEMANDS:
- ESTIMATED MONTHLY DEMAND 40,886 KWH
- ANNUAL EST. CONSUMPTION 490,632 KWH
- GROSS SQF 38,055 SQF

WATER:
- DEMAND REDUCTION 30%
  - RATED WATER FIXTURES
  - REUSABLE GREY WATER
  - LOCAL FLORA REQ. LESS IRRIGATION

- SUPPLY REDUCTION 70%
  - RAINWATER ROOF COLLECTION
  - RAINWATER COLLECTION THROUGH RETENTION SITES
  - GREYWATER COLLECTION FROM SUPPLY

WASTE:
- ONSITE REDUCTION 70%
  - RECYCLABLE/ORGANIC MATERIAL USE
  - BUY BACK PROGRAM
  - ON SITE WASTE ORGANIZATION/ RECYCLABLES PROGRAM

- OFFSITE REDUCTION 30%
  - SEWAGE WASTE TREATED AT BIOFUEL PLANT
  - GREEN WASTE COMPOSTED OFFSITE
MEYERLAND PLAZA

MASTERPLAN

100 YEAR FLOODPLAIN - POST BRAYS PROJECT

1/2 MILE

MEYERLAND PLAZA

MEYERLAND SQUARE

MEYERLAND VILLAGE

MEYERLAND SQUARE

MEYERLAND VILLAGE

BRAYS BAYOU PARK
SKY LIGHT RAIL TRANSIT CENTER

Sky Light Rail Transit Center
Transit Center as a Destination

Meyerland Mall  The Domain  Meyerland Pavilion  Great Lawn  Harmony Tower  The Lot

Meyerland: Present Day  Meyerland: 2030  Transit Extension
Net Zero Transit Center Precedents

John W. Olver Transit Center
Greenfield, Massachusetts
Strategies
- Locally sourced exterior material
- Brick + Copper + Stone
- 32 Geothermal Wells
- Ground mounted photovoltaic array
- Efficient Solar wall
- LED light fixtures
- Low flow water fixtures

Vacaville Transit Center
Vacaville, California
Strategies
- Roof mounted photovoltaics
- Refractive glass windshields
- Motion activated LED lights

Interior Aluminum Panels
Cladded Locally Sourced Wood
Wall Detail
Towards a Sustainable LRT Center

**Energy Strategies**
- Geothermal energy from geothermal wells
- Reduction in HVAC energy use
- Rooftop Photovoltaic Array for solar energy
- All LED light fixtures and motion-activated LED lights in offices
- Kalwall facade and roofing system to maximize day lighting and minimize solar gain
- Occupancy sensors will aid in accurately heating and cooling space when needed.

**Waste Strategies**
- Recycling bins in offices, café, and grand hall
- Overall recycling of the following: Paper, Plastic, Glass, Metals, and Rubber
- Grass recycling and using clippings as compost
- Usable food scraps from events as compost

**Water Strategies**
- Water efficient plumbing fixtures: ultra low flow toilets and urinals and low flow and sensor sinks
- Water efficient irrigation systems: low flow sprinklers and efficient irrigation scheduling
- Recycling Gray water for irrigation
- Rainwater roof collection
- Cistern to collect water for irrigation

[Diagram showing solar arrays, geothermal pumps, and shaded increased ventilation]

**Wall Section**
- Kalwall: Hurricane rated, high impact, increases daylight, decreases solar gain, increased shading
- Locally Sourced Wood: Effective insulator
- Kalwall + Vitro Glass:飓风等级, 高冲击力, 增加了日光, 减少了太阳热量, 增加了遮阳

*Wall Section Diagram (08/10)*
South-West Waste Water Treatment Plant Decommission & Redesign
BRAES BAYOU CENTER FOR ENVIRONMENTAL STUDIES

PROJECT DRIVERS & OBJECTIVES

1. CREATING FLEXIBLE WORKING ENVIRONMENTS
2. FACILITATING OPPORTUNITIES FOR SOCIAL GATHERINGS
3. INCREASING INDOOR - OUTDOOR INTEGRATION
4. ESTABLISHING COMPREHENSIVE SITE SUSTAINABILITY STRATEGIES

SUSTAINABILITY DESIGN STATEMENT
To create a model for sustainable design that will be an invaluable addition to the community by providing desirable working environments, learning facilities to educate the general public about local resiliency efforts, and maintaining the devised ecological implementations throughout the neighborhood.

PLACEMAKING DESIGN OBJECTIVES
To establish a center for environmental studies that will result in a greater degree of interactivity between employees, visitors, and neighborhood residents through flexible spaces, learning facilities, and exterior gathering locations.

SUSTAINABILITY OBJECTIVES
To incorporate bold standards for building performance that will be fulfilled through a comprehensive renewable energy portfolio as well as innovative design features that will facilitate the attainment of net-zero sustainability.

PROGRAMMING COMPOSITION

PROGRAMMING STACKING
BRAES BAYOU CENTER FOR ENVIRONMENTAL STUDIES

CIRCULATION
- PRIMARY CIRCULATION
- SECONDARY CIRCULATION
- INTERIOR CIRCULATION

STRUCTURE
- 3" GEOPOLYMER CONCRETE PLYNTH
- 6" GEOPOLYMER CONCRETE PLYNTH
- 500-YEAR FLOOD ELEVATION: 33.4'
- GROUND FLOOR ELEVATION: 60'

SUSTAINABILITY
- BUILDING-INTEGRATED PHOTOVOLTAICS
- SOLAR WATER HEATERS
- STACK VENTILATION
- SOLAR SHADING

ROOFTOP PHOTOVOLTAICS
- AERATING FOUNTAIN
- SOLAR SHADING
- CISTERNS
- TOP DAYLIGHTING
- SOLAR WATER HEATERS
- STACK VENTILATION
- NATURAL VENTILATION

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### Building Specs

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<tr>
<th>Administration Unit</th>
<th>Gross Square Footage</th>
<th>Efficiencies</th>
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<tr>
<td>Reception/Lobby</td>
<td>500 sq ft</td>
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<tr>
<td>Offices</td>
<td></td>
<td></td>
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<tr>
<td>- Admin</td>
<td>20,000 sq ft</td>
<td>1.44 Space Factor</td>
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<tr>
<td>- Open</td>
<td>76,000 sq ft</td>
<td>73% New Construction</td>
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<tr>
<td>Conference/Meeting Rooms</td>
<td>8,500 sq ft</td>
<td>1.60 Space Factor</td>
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<td>Computing</td>
<td>1,800 sq ft</td>
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<td>Data Center</td>
<td>1,300 sq ft</td>
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<td>Building Support/ Mechanical Rooms</td>
<td>1,300 sq ft</td>
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### Building Sustainability

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<th>Energy Demand</th>
<th>124,816 kWh/month</th>
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<td>Net-Zero Attainability</td>
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### Water

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<th>Demand Reductions</th>
<th>65% Reduction: 64,611 Gallons/month</th>
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<td>Mitigated Demand</td>
<td>22,614 Gallons/month</td>
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### Waste

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<th>55% Reduction: 22,027 lbs/month</th>
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<td>Mitigated Demand</td>
<td>9,913 lbs/month</td>
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### Energy

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### Building Integrated Photovoltaics

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<th>Fuel Cell Power Plant</th>
<th>1.4 MW Fuel Cell</th>
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<td></td>
<td>1,400 kW Power Rating</td>
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<td>235,000 BTU/h Heat Recovery</td>
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<td>2.25 GPM Water Discharge</td>
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<td>Monthly Output: 42,000 kWh</td>
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### Retention Irrigation Pond

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<th>Retention Pond Capacity</th>
<th>4,583,935 cu ft</th>
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<tr>
<td>Site Retention Capacity</td>
<td>1,654,240 cu ft</td>
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<tr>
<td>Total Capacity</td>
<td>5,218,573 cu ft</td>
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### Rooftop Stormwater Capture

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<th>Rooftop Stormwater Capture</th>
<th>932,613 Gallons Annually</th>
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<tr>
<td>Roof Area Collection</td>
<td>52,370 sq ft</td>
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<tr>
<td>Rainwater Capture Capactiy (in):</td>
<td>2,800 cu ft</td>
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<tr>
<td>Monthly Capture Potential</td>
<td>5,300 Gallons</td>
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### Waste-to-Energy Conversion

| Organic Waste Collected Daily | 158 lbs |
| Total Monthly Collection     | 1,440 lbs |
| Waste-to-Energy Conversion Efficiency | 40% |
| Total Monthly Output          | 956 kWh/month |

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APPENDIX E: BEST PRACTICES IN HOUSE ELEVATION

Source: Arkitektura 2018
APPENDIX D: BEST PRACTICES VISIONING/APPENDIX E: BEST PRACTICES HOUSE ELEVATION