

# Overcoming Challenging and Difficult Sites

by

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# What Makes a Site Difficult?

- ❁ Soils
- ❁ Surface Waters
- ❁ Topography
- ❁ Limited Space / Setbacks / Access
- ❁ Self Inflicted (Owner and/or Contractor)
- ❁ Regulatory Constraints
- ❁ Aesthetic Concerns

# Soils

- ❁ Soil Type (Clays and Poorly Drained Soils)
- ❁ Depth to Groundwater (Seasonal)
- ❁ Depth to Restrictive Layer (Rock, Saprolite, Clay, etc.)
- ❁ Rocky (Out Crops, Boulders, Rocks, etc.)
- ❁ Sands (Where in Soil Profile, Dunes, etc.)
- ❁ Fill





TREE PROTECTION AREA  
DO NOT ENTER  
Zona de protección de árboles  
No entrar

# Surface Waters

- ❁ Lakes, Reservoirs & Ponds
- ❁ Wetlands, Marshes, Swamps, etc.
- ❁ Rivers & Creeks
- ❁ Ditches & Swales
- ❁ Floodplains, Floodways, Flood Prone Soils, Etc.





# Topography

- ❁ Steep Slopes
- ❁ Flat
- ❁ Widely Diverse Terrain
- ❁ Drainage Features





# Limited Space / Setbacks / Access

- ✿ Available Soils and Location
- ✿ Shape of Lot / Property
- ✿ Size of Lot / Property
- ✿ Setbacks to Wells, Property Line, Natural Features, etc.
- ✿ Access During Construction, Operations, Maintenance, etc.



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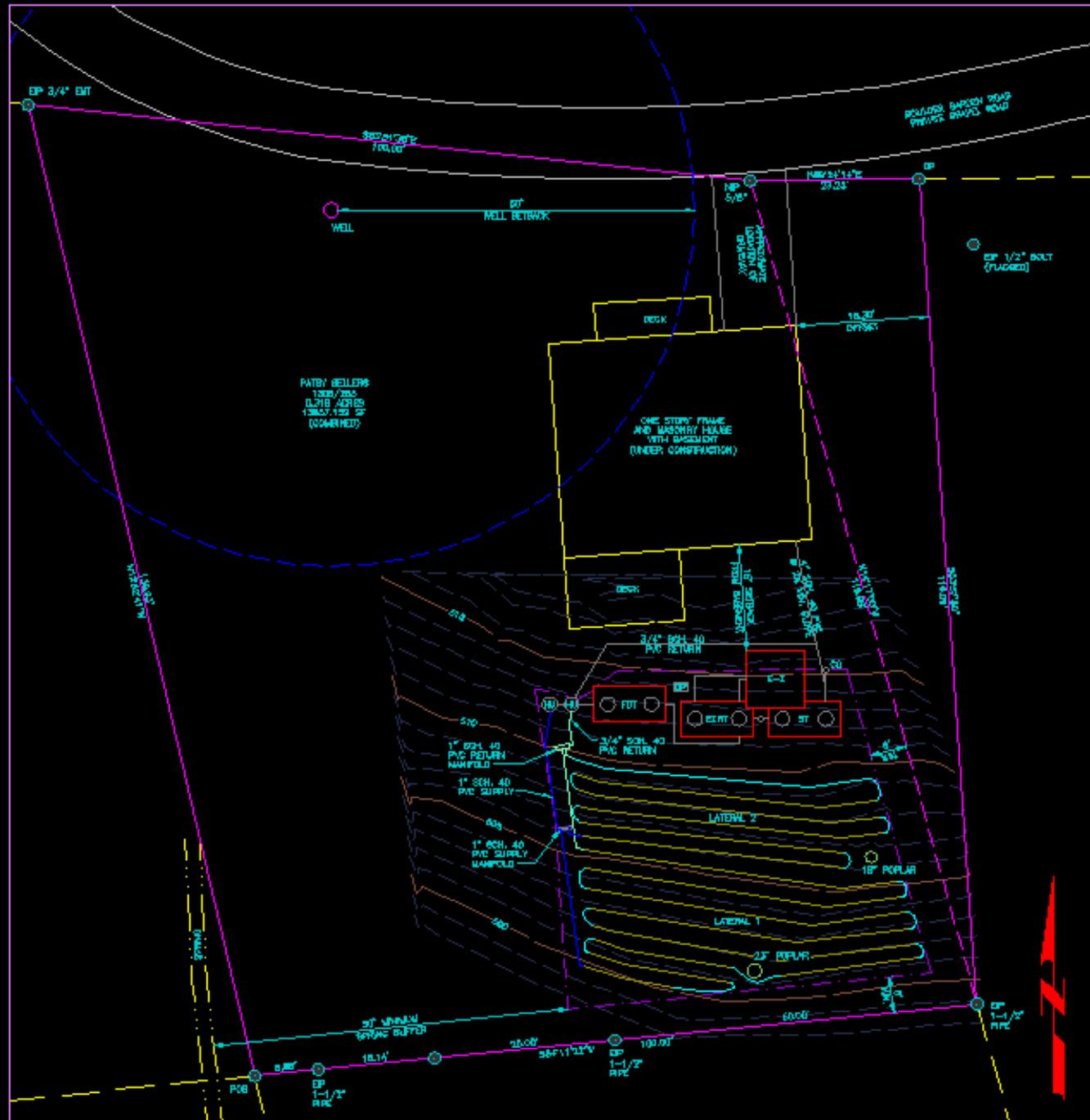
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FIELD LATERAL  
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EACH PUMP,

CONTROL PANEL, SHALL



- SUPPLY MANIFOLD
- CLEAN OUT
- CONTROL PANEL
- E-Z TREAT REDUC. TANK
- E-Z TREAT FOD FILTER
- FIELD DOSING TANK
- SEPTIC TANK
- HYDRAULIC UNIT



REVISIONS		
NO.	DATE	DESCRIPTION
1	00/00/00	PER
2	00/00/00	PER
3	00/00/00	PER
4	00/00/00	PER

PROJECT MANAGER: CSN PROJECT ENGINEER: ZLF  
 DRAWN BY: ALP CHECKED BY: CSN

DATE:  
 JANUARY 11, 2010



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**PATSY S. SELLERS**

**BOULDER GARDEN  
 SUBDIVISION LOTS 59 - 62  
 SUB SURFACE DRIP  
 IRRIGATION SYSTEM**

**WATAUGA COUNTY, NC**

**OVERALL SITE PLAN**

PROJECT NUMBER <b>A43201.00</b>	DRAWING NUMBER <b>C-101</b>
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1/11/10 - Patsy S. Sellers - Licensed Professional Engineer License No. 17082

# Self Inflicted (Owner and/or Contractor) Impacts

- ❁ Unrealistic Site Plan – Not Accounting for On-Site System
- ❁ Destroying On-Site Soils During Clearing and Construction, etc.

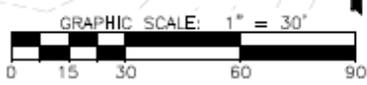
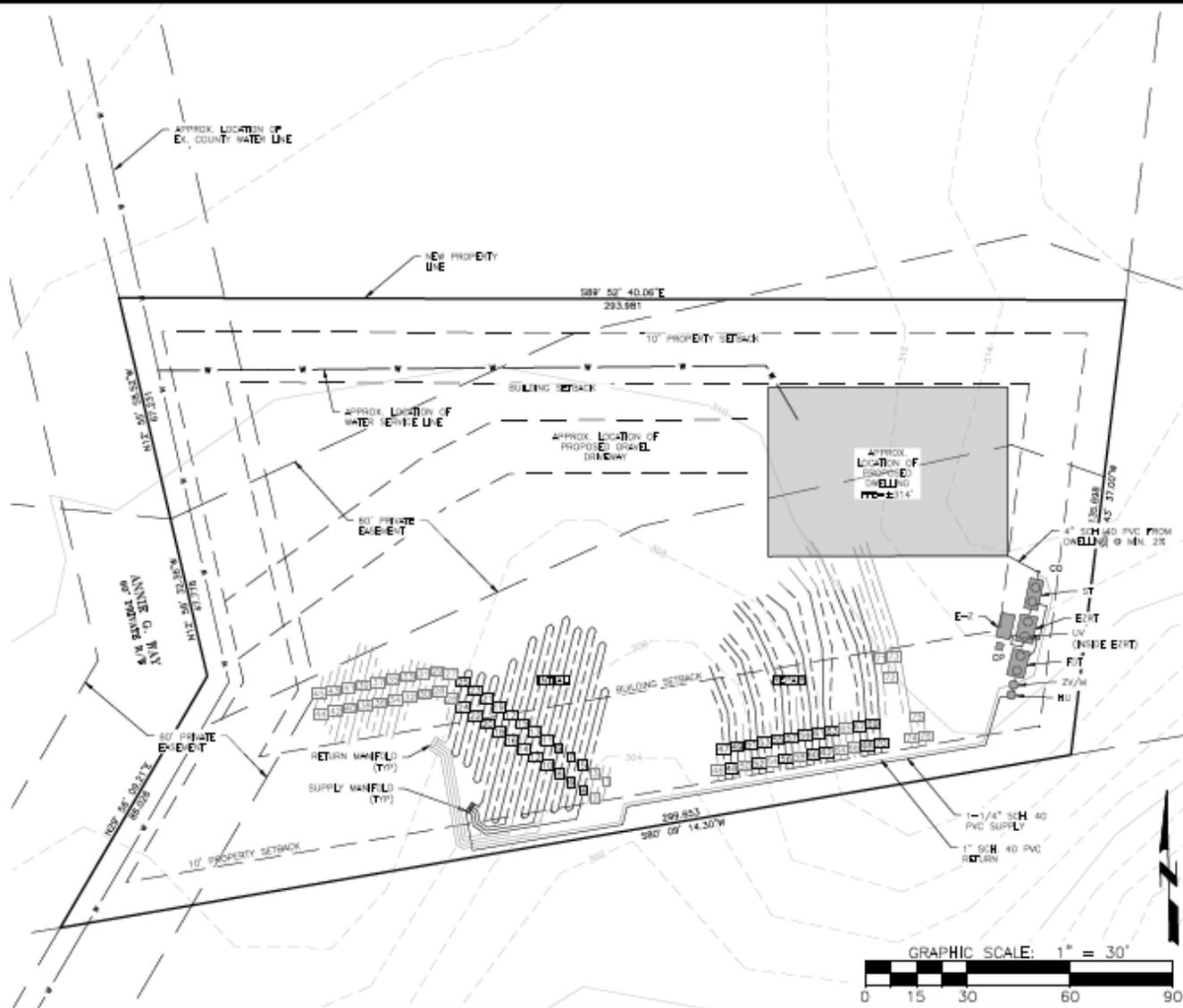
# Public Enemy No. 1 to On-Site Systems



**LEGEND**

- ADJACENT BOUNDARY
- BOUNDARY (PROPERTY)
- - - RIGHT-OF-WAY
- CONTOURS - 100'
- CONTOURS - INTERMEDIATE
- - - DRAIN FIELD (SEPTIC) AREA
- E — ELECTRIC LINE
- X — EXISTING FENCE
- WL — WETLANDS
- - - EDGE OF PAVEMENT
- - - 100 YEAR FLOOD PLAIN
- - - EXISTING STREAM
- - - INTIAL DRIP LINES (PLAGED)
- - - INTIAL DRIP LINES (INTERPOLATED)
- - - RETURN LINES (PLAGED)
- - - RETURN LINES (INTERPOLATED)
- - - RETURN LINES
- - - SUPPLY LINES
- DIVISION BOUND
- RETURN MANIFOLD
- SUPPLY MANIFOLD
- CLEAN OUT
- CP
- CONTROL PANEL
- E-T TREAT TANK
- E-T TREAT TREATMENT UNIT
- FIELD DOING TANK
- SEPTIC TANK
- HYDRAULIC UNIT
- ULTRAVIOLET DISINFECTION
- WATER
- ZONE VALVE

- NOTES:**
1. PARCELS AND TOPO TAKEN FROM NC ONE MAP. SITE PLAN AND SOILS INFORMATION TAKEN FROM SKETCH BY TRACY OWEN ENGINEERING.
  2. KEEP TANKS AND DRAIN LINES A MINIMUM OF 10' OFF OF PROPERTY LINES.
  3. KEEP SUPPLY LINES A MINIMUM OF 5' OFF OF PROPERTY LINES.



<p><b>MacCONNELL &amp; Associates, P. C.</b></p>	<p>891 CASCADE POINTE LANE, SUITE 103 CARY, NORTH CAROLINA 27513 P. O. BOX 039 MORRISVILLE, NORTH CAROLINA 27560 TEL: (919) 487-1239 FAX: (919) 318-6590</p>	<p>BY: DCB, JDH JOB # 1448091.00 DATE: 11/18/20</p>
<p>TERRY GALLAGHER 100 ANNE G. WAY SUBSURFACE DRIP SYS TEM WITH T5-8 TREATMENT</p>		<p>OVERALL SITE PLAN C-103</p>





# Regulatory Constraints

- ❁ Conflicting Regulations and/or Interpretations (i.e., Flood Prone Soils Definition)
- ❁ Outdated Regulations Which Do Not Allow Good Design Practice
- ❁ Regulatory Comments & Policy Not Based on Rules / Regulations

# Aesthetic Concerns

✿ Often Client Dictated

✿ Location / Visual



# Mitigate Challenging & Difficult Sites Through

- ❁ Partner with Regulators for Solution
- ❁ Good Science
- ❁ Good Technology
- ❁ Good Engineering
- ❁ Good Installation
- ❁ Good Operation & Maintenance
- ❁ Innovative & Creative Thinking to Comply with Regulations

# Methods to Address Soil Issues

- ❁ Pretreatment (Packed Bed Media Filters, ATUs, Disinfection, etc.)
- ❁ Disposal Option Methods (LPP, Drip Irrigation, Mound, Large Diameter Pipe, Sand Lined Trench, etc.)
- ❁ Disposal Option Products (Geotextile Sand Filter, Prefabricated Permeable Panel Block Panel, Enviro-Septic, Alternative to Aggregate, etc.)
- ❁ Address Features Directly (Remove Rocks, etc.)
- ❁ Groundwater Lowering System









CALL  
M...  
CUSTOM HOMES  
...



# Methods to Address Surface Water Issues

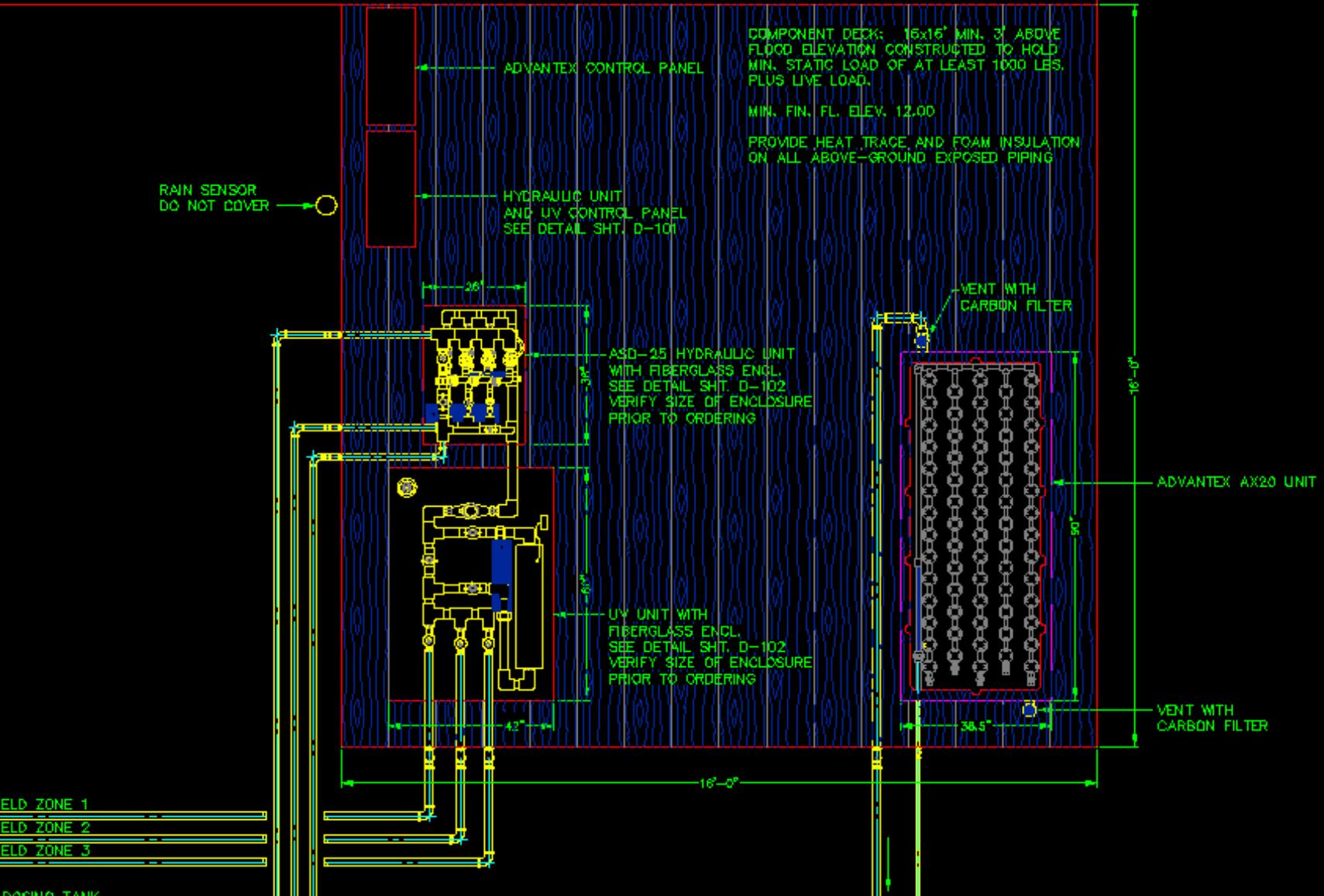
- ✿ Use Disinfection (TS-II) Even if Not Required
- ✿ Use Anti-Floatation Devices (Deadmen & Plates, etc.)
- ✿ Mound Up Treatment
- ✿ Treatment Elevated on Deck
- ✿ Water-Tight Tanks Vented Above Flood



Utility cabinet with electrical components and wiring.



- DWELLING -



# Methods to Address Topography Issues

- ✿ Retaining Walls
- ✿ Hand Dug Drain / Drip Lines
- ✿ Air Release Valves at High Points
- ✿ Fill and Redirect Drainage Swales / Ditches
- ✿ Use of Berms
- ✿ Use Final Grading to Correct Issues





# Methods to Address Limited Space / Setbacks / Access

- ✿ Use Higher Level of Treatment to Reduce Setbacks / Increase Loading Rate
- ✿ Engineer Flow Reduction
- ✿ Use Driveway and Traffic (H<sub>2</sub>O) Tanks
- ✿ Place Treatment Units Above Tanks
- ✿ Variances or Setback Waivers
- ✿ Off-Site Treatment and Disposal / Easements
- ✿ Construction Considerations (Use of Cranes, Hand Dug Trenches and Excavations, Schedule Construction, Plastic Tanks, Direction Drill, Multiple Smaller Tanks)



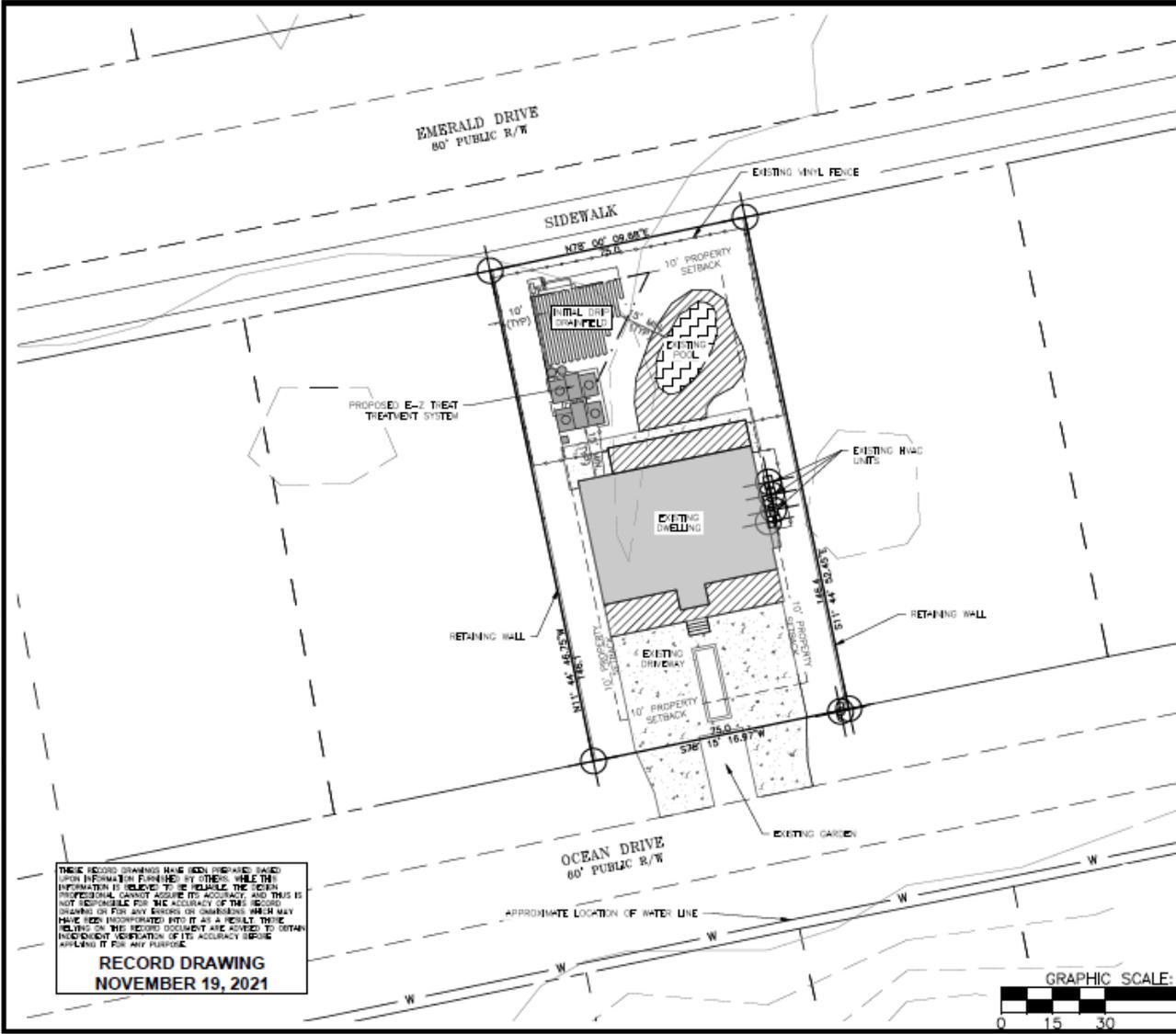
# Reuse System



# Coastal Rental Property

- ❁ Failed 3-Bedroom Conventional System in Fill
- ❁ Minimal Room
- ❁ Repair to 7-Bedroom
- ❁ Engineer Option Permit & Flow Reduction
- ❁ Advanced Pre-Treatment – Recirculation Media Filter Pods on Tanks with UV-Disinfection
- ❁ Bed with Drip Distribution in Corrugated Pipe in Virgin Sand

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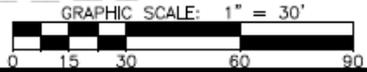
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**RECORD DRAWING  
NOVEMBER 19, 2021**

**LEGEND**

- ADJACENT BOUNDARY
- BOUNDARY (PROPERTY)
- RIGHT-OF-WAY
- CONTOURS - INDEX
- CONTOURS - INTERMEDIATE
- DRAIN FIELD (SEPTIC) AREA
- INITIAL DRP LINES (INTERPOLATED)
- RETURN LINES
- SUPPLY LINES
- FENCE LINES
- W WATER LINE
- RETURN MANHOLE
- SUPPLY MANHOLE
- CO CLEAN OUT
- CP CONTROL PANEL
- CTRT E-2 TREAT REPAIR TANK
- E-2 E-2 TREAT TREATMENT UNIT
- FOT FIELD DOSING TANK
- ST SEPTIC TANK
- HJ HYDRAULIC UNIT
- UV ULTRAVIOLET DISINFECTION
- ZV ZONE VALVE

1. PARCELS TAKEN FROM CARTERET COUNTY GIS. TOPO TAKEN FROM NC FDS. SITE PLAN AND SOIL INFORMATION PROVIDED BY CANDY SURVEYING & SOIL AND ENVIRONMENTAL CONSULTANTS, PA.
2. KEEP TANKS AND DRAIN LINES A MINIMUM OF 10' OFF OF PROPERTY LINES, AND 15' OFF OF POOL.
3. KEEP SUPPLY LINES AND MANHOLES A MINIMUM OF 5' OFF PROPERTY LINES.
4. KEEP TANKS AT LEAST 10' FROM FOUNDATION OR SHORE DURING INSTALLATION.
5. INSTALL INITIAL DRAINLINES ON CONTOUR WITH A MAXIMUM TRENCH DEPTH OF 36".
6. DEPTH FROM EXISTING GROUND SURFACE, PROVIDE MIN. 12" SEPARATION FROM SEASONAL SOIL WETNESS.
7. ANY ALTERATIONS TO THIS SYSTEM SHALL BE PRE-APPROVED BY THE ENGINEER.
8. REMOVE EXISTING FENCE AND VEGETATION ON THE PROPERTY WHERE ACCESS IS NEEDED.
9. CONTACT COUNTY FOR SIDEWALK CLOSURE PERMISSION.



<b>PROPOSED SITE LAYOUT</b>		<b>POL BEACH PROPERTIES, LLC</b>	
		208 OCEAN DRIVE TS-II PRETREATMENT BED WITH DRIP (REPAIR) - EOP	
<b>BY:</b>	NNC/PA	CARTERET COUNTY, NC	
	JOB #: A94801.00	C-104	
501 CASCADE PONTE LANE SUITE 103 CARY, NORTH CAROLINA 27513 P. O. BOX 129		DATE: 8/30/2021	
MORRISVILLE, NORTH CAROLINA 27560 TEL: (919) 467-1233 FAX: (919) 515-6510		<b>MacCONNELL &amp; Associates, P. C.</b>	











# Methods to Address Self Inflicted (Owner and/or Contractor) Impacts

- ✿ Partner with Regulators to Find Solution
- ✿ Flow Reduction
- ✿ Off Site Drainfields
- ✿ Increase Treatment









# Methods to Address Regulatory Concerns

- ✿ Partner with Regulators
- ✿ Lobby Elected Officials
- ✿ Change Policies / Staff Attitudes
- ✿ Privatization with Local Approval

# Methods to Address Aesthetic Concerns

- ❁ Properly Locating Treatment & Disposal Equipment
- ❁ Landscaping (Plants, Berms, etc.)
- ❁ Hiding Equipment (Hot Rocks, Building, Planters, etc.)
- ❁ Selection of Equipment & Treatment





Questions?



MacCONNELL  
& Associates, P. C.