



# A PLAN TO CONNECT THE OUTER CAPE COD BEACHES

Immediate Reliable Connectivity

February 22, 2019

In order to begin to adequately address the myriad of safety and economic concerns that are tied to the increase of Shark activity in the waters surrounding Cape Cod. One factor requires immediate attention, enhancing the ability for our residents, visitors, and first responders to be able to communicate effectively, if the need arises, while on our beaches or within the National Seashore.

OpenCape in conjunction with Centerline Communications have prepared a plan that addresses the need to expand fiber connectivity to ten (10) beaches initially and utilize small cell or DAS (Distributed Antenna System) technology to offer enhanced cellular connectivity in locations that are notorious for their lack of connectivity.

Furthermore, we have included an example of the type of technologies that could be deployed once the system is in place should Towns and the National Seashore choose to use shark mitigation technologies to further protect our beaches.





To: Senator Julian Cyr  
Representative Sarah Peake  
Representative Randy Hunt  
Representative Will Crocker  
Representative Timothy Whelan  
Representative David Vieira  
Representative Dylan Fernandes  
David Panagore, Town Administrator, Provincetown  
Cheryl L. Andrews, Chair, Provincetown Select Board  
Rae Ann Palmer, Town Administrator, Truro  
Robert Weinstein, Chair, Truro Select Board  
Daniel Hoort, Town Administrator, Wellfleet  
Janet Reinhart, Chair Wellfleet Select Board  
Jacqueline Beebe, Town Administrator, Eastham  
Wallace F. Adams II, Chair, Eastham Select Board  
John Kelly, Town Administrator, Orleans  
Alan McClennen Jr, Chair Orleans Select Board  
Jill Goldsmith, Town Administrator, Chatham  
Dean P. Nicastro, Chair Chatham Select Board  
Christopher Clark, Town Administrator, Harwich  
Julie E. Kavanagh, Chair Harwich Select Board  
Dan Knapik, Town Administrator, Yarmouth  
Brian Calstrom, Superintendent, National Seashore  
Kathy Tevyaw, Deputy Superintendent, National Seashore  
Eugene Curry, Cape Cod Technology Council  
Wendy Northcross, Cape Cod Chamber of Commerce

Fr: Steven Johnston, Chief Executive Officer & Executive Director, OpenCape Corporation

Re: Addressing Connectivity Issues at Outer Cape Beaches

Dt: February 22, 2019

As residents of the Cape & Islands, we all share a common bond and I am confident that we reacted similarly when we learned of the tragic shark attacks that occurred in August and September, most notably the fatal incident that claimed the life of Arthur Medici.

While Wildlife Management and Ocean/Beach policies and procedures are well beyond the scope of OpenCape's not-for-profit mission, one element of the equation is not. **Connectivity and Communications**, specifically at the Outer Cape beaches which are not just underserved, but for the most part are unserved.

When we learned of the fatal attack we immediately tasked a group internally to develop a viable plan for eliminating any impediments to ensuring our beaches and the National Seashore had access to world-class, robust, real-time connectivity. This was a topic I have discussed with many of you since my tenure at OpenCape began, but the urgency was never sufficient to make the solution a priority. That all changed on September 15<sup>th</sup>, besides the critical public safety issue for our residents, visitors, and first responders.... this also becomes a significant economic development issue for our Towns & Businesses that can and will impact our Region for decades if left unchecked.

In the pages that follow is a plan, including budget requirements and timelines, that are actionable and can begin to be implemented prior to July 1, 2019. We have made several broad assumptions on locations and functionality that allows for flexibility and scalability. We fully realize that the answer to this incredibly complex issue does not lie with one magic bullet, but rather will include a multi-pronged, long term strategy. Our focus for this document was to offer information and elements of a solution that can be implemented sooner vs later, as we realize the time sensitivity of this issue. In crafting our approach, OpenCape looked for feedback and input from organizations that shared our desire for making a positive contribution toward improving the situation and had the technical expertise to meet our objectives, most notably Centerline Communications of Sandwich (Centerline installed the DAS/Small Cell Network at Gillette Stadium). Furthermore, we included an example of technology that becomes viable once reliable connectivity is established on these beaches. Smart Marine Systems and their Clever Buoy product is one potential example of technology that could be utilized and deployable in 2019 should towns decide they want to utilize that level of shark mitigation.

Our goal in sharing this information is to equip Town Managers, the Cape & Islands Delegation and National Seashore officials with accurate data with regards to what is possible in terms of using technology to offer more proactive elements to any shark mitigation plan. Beyond the obvious uses, connecting the Outer Cape beaches offers a myriad of ancillary, long-term benefits that range from public safety to scientific research to residential/business service, environmental impact studies and beyond.

It would be incredibly short-sighted not to further leverage the OpenCape Network for its maximum benefit. As we all realize, this is not an issue that will disappear overnight, in fact, it will likely expand across the breadth of the Cape & Islands. By taking bold and immediate action connecting these ten (10) Outer Cape beaches we are providing a tool that can be utilized for the entirety of the useful life of the fiber (approximately 30 years). Towns, as well as, the National Seashore, outside agencies and businesses will now have the flexibility to test technologies and utilize the Network in innovative ways to find the most appropriate solutions. As part of this process, we also may find that Cape Cod becomes a pivotal destination for

researchers and Blue Economy technologists who are seeking to study and research relevant solutions with global implications. In short, while the presence of these Apex predators in our waters may provide certain challenges in the short-term, ultimately it may assist the Cape in diversifying our workforce and creating technology jobs based on our special relationship with the Ocean.

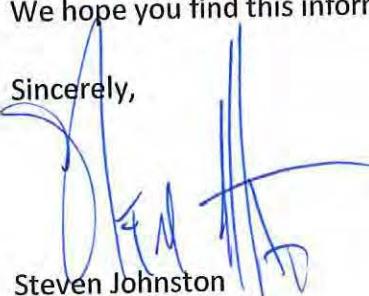
OpenCape and our Board of Directors have confirmed that we would donate any connectivity required for Towns or the National Seashore to utilize the Network for shark mitigation activities.

If you have questions or need additional information regarding any part of this proposal I have included the appropriate contact information for each section.

- **Appendix A:** OpenCape Build Plans, Timelines and budget for building Fiber into ten (10) Outer Cape Beaches.
- **Appendix B:** Centerline Communications Initial Distributed Antenna Solution (DAS)/Small Cell planning for targeted locations.
- **Appendix C:** Smart Marine Systems and their Clever Buoy product. One example of technologies that could be utilized to offer proactive shark awareness/mitigation. Detailed information, as well as, a 3-year deployment plan are included

We hope you find this information useful in addressing this critically important situation.

Sincerely,



Steven Johnston  
OpenCape Corporation

## **Connecting Outer Cape Beaches**

OpenCape created an initial list of ten (10) beaches for connectivity. This list can be augmented or expanded on as further discussion happen, realizing that this initial budget was based on these locations.

The list as currently configured includes:

1. Coast Guard Beach, Eastham
2. Nauset Light Beach, Eastham
3. Nauset Beach, Orleans (Nauset Beach Build Plans not Included in this Document, but the budget is)
4. Marconi Beach, Wellfleet
5. Head of the Meadow Beach, Truro
6. Race Point Beach, Provincetown
7. Ballston Beach, Truro
8. LeCounts Hollow Beach, Wellfleet
9. White Crest Beach, Wellfleet
10. Cahoon Hollow Beach, Wellfleet

Additional Beaches that Could be Added in this initial Phase

Herring Cove, Provincetown  
Newcomb Hollow, Wellfleet

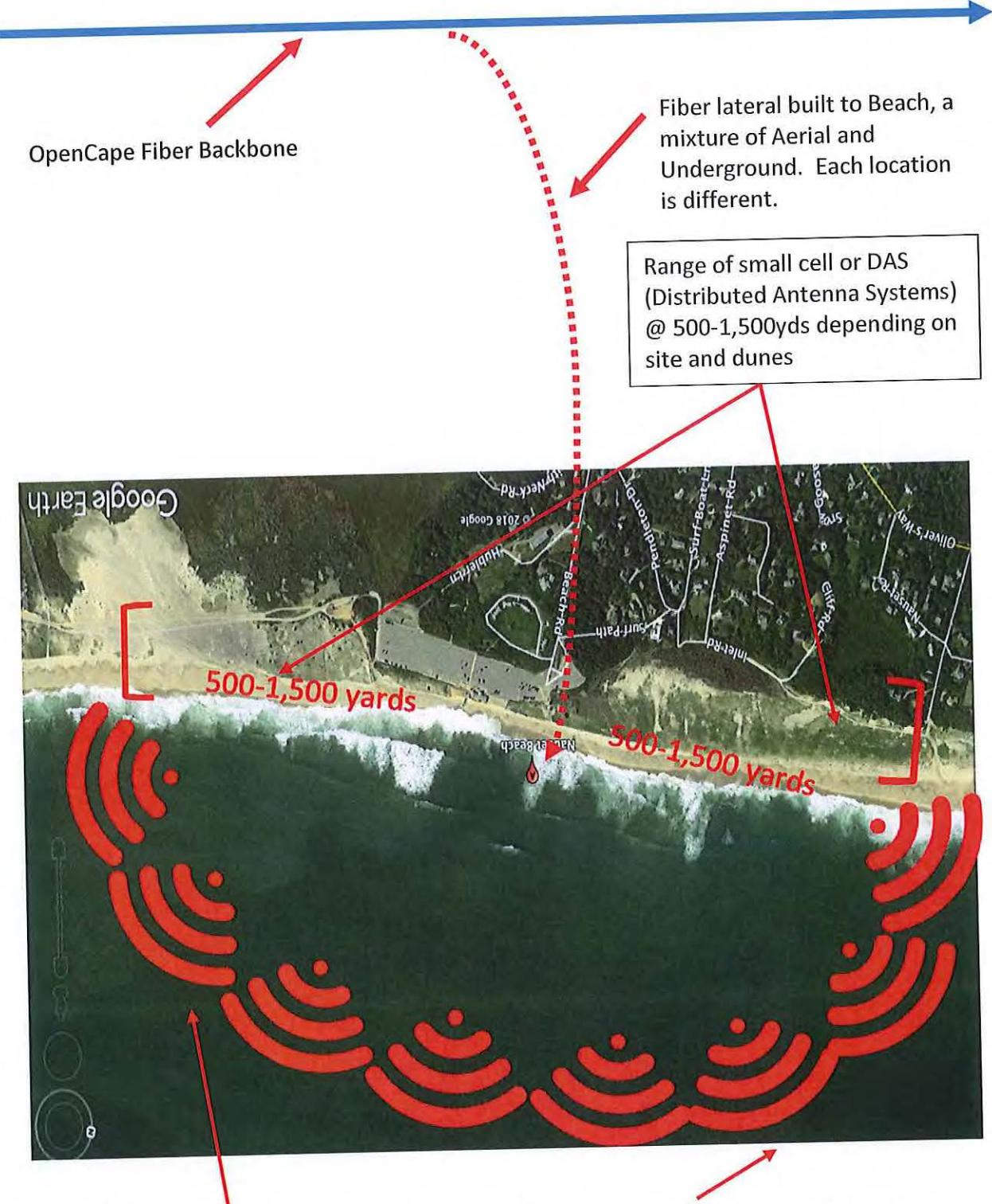
## **Building into the Outer Cape Beaches and National Seashore**

### **Why Fiber Makes Sense for the Outer Cape and Why OpenCape is the ideal Provider!**

OpenCape is the only provider that offers a 100% fiber network on CapeCod and owns some 500 miles of fiber on the Cape, Islands and Southeastern Mass. We currently connect in Providence and Boston to provide redundancy for our growing cadre of clients that includes; Joint Base Cape Cod, Southcoast Hospitals, Cape Cod Healthcare, Bridgewater State University, Mass Maritime Academy, 17 of the 18 Cape High Schools and 45+ schools on and off Cape, as well as, a myriad of business large and small and municipal public safety offices (Fire, Police, EMS).

Furthermore, OpenCape is an open access Network, which means utilizing our Network to build into the National Seashore and the Outer Cape beaches ensures that other providers who may want access down the road, would be able to access our fiber. If another provider built into the Seashore, they are under no such mandate to allow such open access.

The concept for each location is as follows:



Should Towns/Seashore decide to utilize technologies like Clever Buoy they would now be able to access the connectivity available at the beach, this same connectivity would be accessible to first responders, lifeguards, visitors, etc.

## **OpenCape Construction Estimate**

In order to build Fiber into the Ten (10) locations described above and based on our preliminary desktop and onsite estimates, OpenCape would need to run approximately 66,597 linear feet of fiber, via aerial and underground pathways, and attach to @ 227+- utility poles.

This proposal can be scaled up or down based on the ultimate desire to connect additional or fewer locations. While we attempted to offer an average cost per mile estimate, each location requires a detailed individual calculation based on the distance of the aerial and underground pathways, while some beaches are fully accessible via existing pole lines, others require significant underground work to reach.

**OpenCape's construction estimate to reach the 10 beaches selected would be \$ 1,386,472.24 with another \$185,000 set aside for prevailing wage adjustments if needed. For a total of \$ 1,571,472.24**

OpenCape would request an annual maintenance payment in order to properly maintain this fiber, normally this could be offset by adding customers, but based on the remote nature of the Outer Beaches and the lack of significant businesses. An appropriate figure based on the scale of the build would be \$150,000 per year.

This estimate includes the following:

- All Underground Construction
- All Aerial Construction
- Splicing, Termination, Testing and Demarc CPE's
- Engineering, including special permitting
- Permitting, Licensing and Make Ready Fees

The cost to add the following locations to this estimate would be approximately:

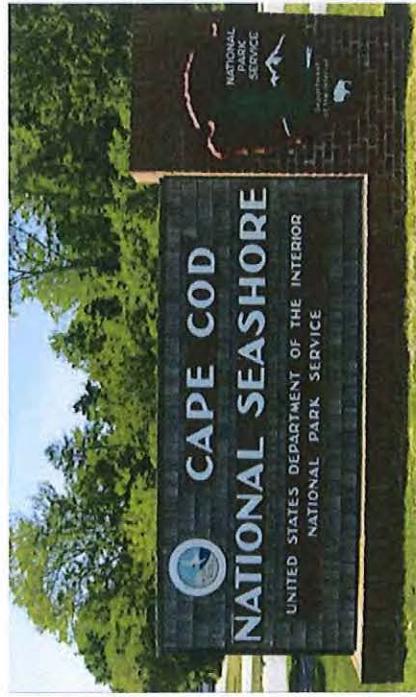
Herring Cove, Provincetown = @ 3,957 lf of Aerial Build & 5, 570 of Underground @\$162,430  
Newcomb Hollow, Wellfleet = @ 8,747 lf of Aerial Build & 600 lf of Underground @\$155,647

A detailed estimate for the initial 10 locations follows on the next page.

CODE	DESCRIPTION	PART NUMBER	UM	QTY	UNIT
<b>Prevailing Wage: NO</b>					
<b>Underground Construction</b>					
MOB	Mobilization		LS	1	\$ 10,000.00
701	Plow / Trench / Bore Place 1-1.25" SDR 13.5 Innderduct	NU-01	LF	24,035	\$ 24.00
705	Place Handhole	NU-05	EA	26	\$ 650.00
709	Riser Installation	NU-09	EA	10	\$ 400.00
301	Place Fiber Cable in Existing Conduit	U-01	LF	27,420	\$ 1.50
9027	1.25" SDR 13.5 Innderduct	125 ID	LF	24,035	\$ 0.75
9030	24" x 36" Polymer Concrete HH w/ H20 Lid	HH2436	EA	2	\$ 550.00
9028	2" RGS Riser	2RISER	EA	1	\$ 185.00
9027	1.25" SDR 13.5 Innderduct	125 ID	LF	1	\$ 0.75
9030	24" x 36" Polymer Concrete HH w/ H20 Lid	HH2436	EA	2	\$ 550.00
9028	2" RGS Riser	2RISER	EA	1	\$ 185.00
1002	ALTOS® Loose Tube, Gel-Free Cable, 24 F, Single-mode (OS2)	024EU4-T4701D20	LF	28,800	\$ 0.37
9018	Police Details - Estimate (Invoiced at Cost Plus 10%)	M-18	MH	425	\$ 60.00
<b>Total</b>					
\$ 705,623.00					
<b>Aerial Construction</b>					
611	Zone 6 - Travel Charge - Technician/Lineman with Vehicle	T-30	EA	6	\$ 850.00
612	Zone 6 - Traval Charge - Technician/Lineman	T-31	EA	6	\$ 550.00
203	Install 1/4" EHS Strand and Hardware	A-03	LF	42,362	\$ 0.47
204	Lash Fiber Cable to Strand	A-04	LF	48,585	\$ 0.85
615	Zone 6 - Labor Rate Per Diem Charge (Percent)	T-34	%	58,715	\$ 0.20
9001	1/4" EHS Strand and Hardware	M-01	LF	42,362	\$ 0.60
9002	Lashing Materials	M-02	LF	48,585	\$ 0.15
9003	Snow Shoe - Standard Plastic	M-03	EA	35	\$ 75.00
1002	ALTOS® Looso Tube, Gel-Free Coble, 24 F, Single-mode (OS2)	024EU4-T4701D20	LF	50,000	\$ 0.37
9018	Police Details - Estimate (Invoiced at Cost Plus 10%)	M-18	MH	325	\$ 60.00
<b>Total</b>					
\$ 154,680.34					
<b>Splice, Terminate, Test &amp; Demarcation Point CPE</b>					
611	Zone 6 - Travel Charge - Technician/Lineman with Vehicle	T-30	EA	6	\$ 850.00
403	Prepare New OSP Enclosure - ADSS - Ring Cut Splice	S-03	EA	8	\$ 550.00
404	Prepare New OSP Enclosure - Standard Cable - Ring Cut Splice	S-04	EA	7	\$ 450.00
412	Install cable within a building	S-12	LF	681	\$ 3.00
407	Mount Patch Panel	S-07	EA	10	\$ 250.00
408	Splice Fiber	S-08	EA	540	\$ 15.00
409	Test Lateral - Up to 24 fibers. OTDR end Power Test at two wavelengths	S-09	EA	10	\$ 600.00
615	Zone 6 - Labor Rate Per Diem Charge (Percent)	T-34	%	22,793	\$ 0.20
9006	Tyco 450 D Splice Enclosure	M-06	EA	13	\$ 475.00
7001	Wall-Mountable Connector Housing (WCH), holds 2 CCH Connector Panels	WCH-02P	EA	10	\$ 94.00
8002	Close Connector Housing (CCH) Pigtail Cassette, loaded with CCH panel and	CCH-CS12-A9-P00RE	EA	10	\$ 417.00
8006	Splice Protection, Heat-Shrink Fusion Splice Protectors, 60 mm long, package	2806031-01	EA	11	\$ 69.00
Demarcation CPE and associated equipment					
<b>Total</b>					
\$ 68,829.60					
<b>Engineering</b>					
101	Aerial Fiber Design	E-1	LS	42,562	\$ 1.40
102	Pole Permitting	E-2	LF	227	\$ 33.00
103	Underground Fiber Design	E-3	LS	24,035	\$ 1.00
104	New Underground Construction	E-4	LF	24,035	\$ 2.25
Pre Construction - Estimates and Evaluation-OpenCape					
<b>Total</b>					
\$ 195,139.30					
<b>Permitting and Licensing Fees</b>					
Pole Permitting					
Pole Make Ready					
Miscellaneous Permits					
<b>Total</b>					
\$ 262,000.00					
<b>Total Engineering &amp; Construction Estimate</b>					
\$ 1,386,472.24					
<b>Prevailing Wage Adder</b>					
\$ 185,000.00					
<b>Grand Total</b>					
\$ 1,571,472.24					

### **Timeline**

OpenCape is prepared to begin immediately with the build out. As noted, the detailed build plans for each location have already been completed and are included in this document. In order to meet an aggressive completion deadline of July 1, 2019, we would need to begin as soon as possible. As such, we would start construction, licensing and permitting immediately as funds are approved.



Total Linear Feet: 66,000+  
Total New Poles: 227+



Coast Guard Beach



Head of the Meadow



Nauset Light Beach



Marconi Beach



Race Point Beach



Cahoon Hollow Beach



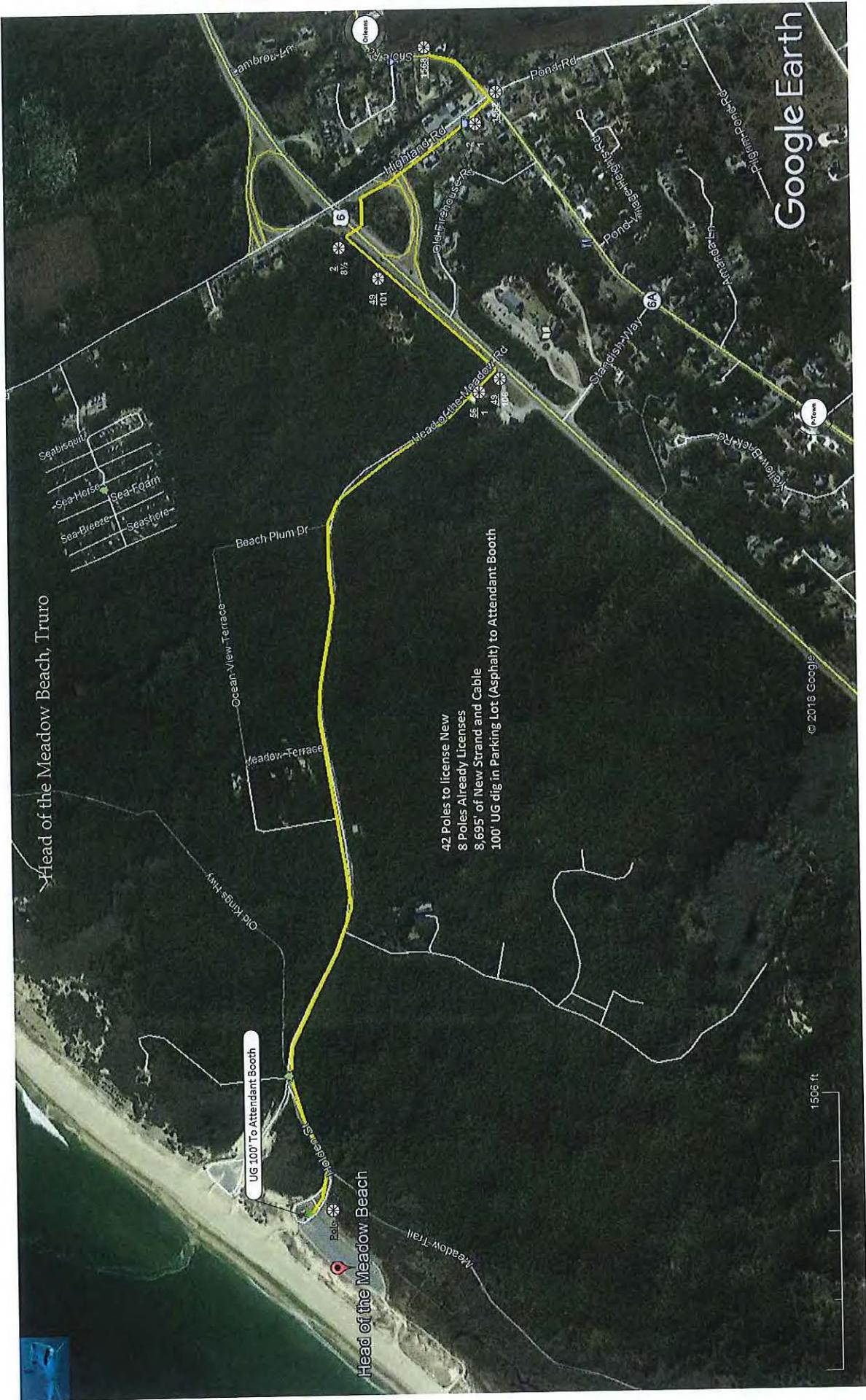
White Crest Beach



LeCounts Hollow



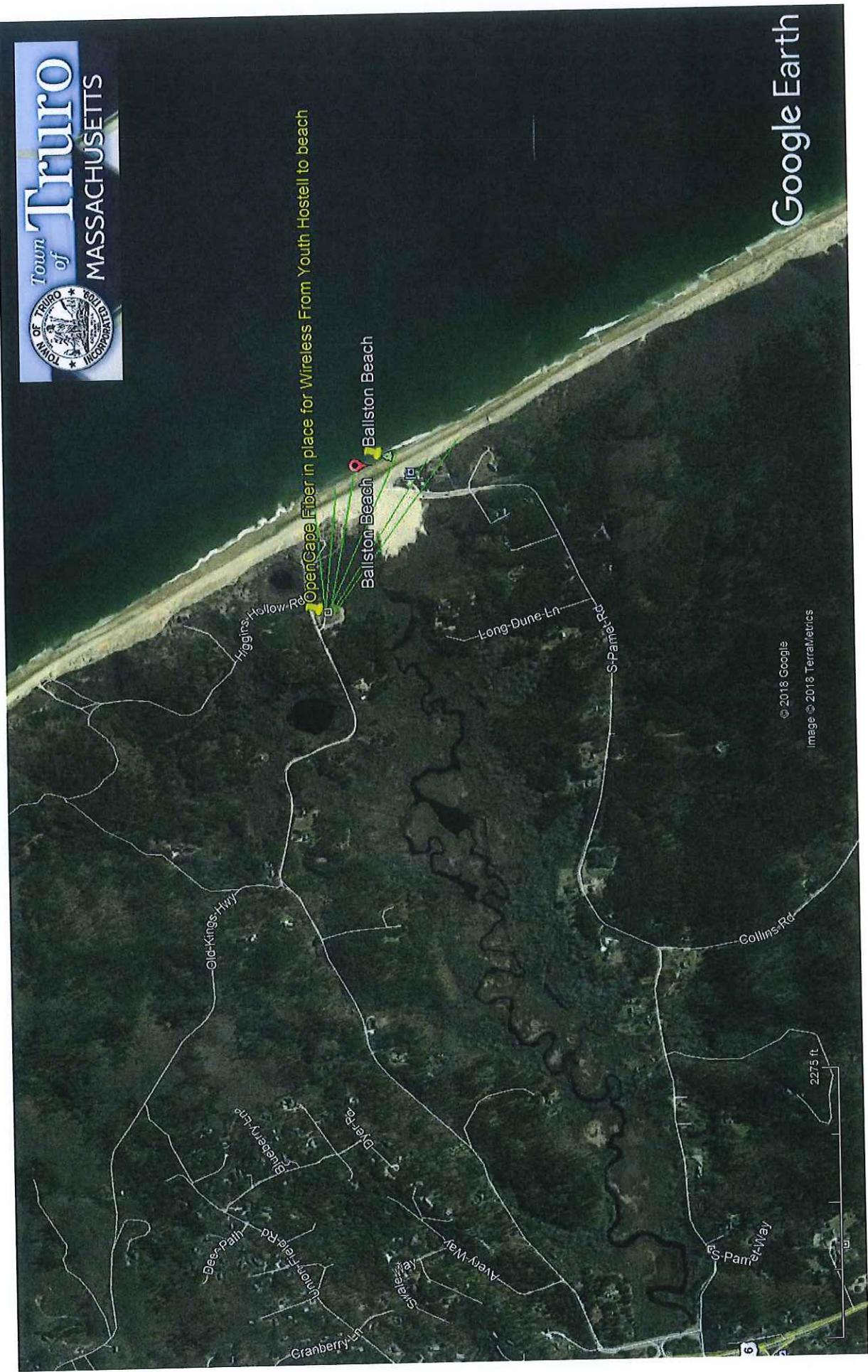
Ballston Beach







Google Earth



© 2018 Google

Image © 2018 TerraMetrics



SCALE: 1" = 200'



OPENCAPE

Location: TRURO, MA

Project #: PHASE 10

Job Title: Engineering

Engineer: USCS

Date Received: 01/23/12

LEGEND:

POLE  
SPANSPLICING  
CREDIT

AERIAL PATHWAY

BURIED PATHWAY

CENTRAL OFFICE

SLACK LOOP / MANT. COIL

NOTES:

PREPARED BY:  
**SYNERGETIC**  
Engineering Services  
Management Services  
www.synergetic.com

REVISION HISTORY

DATE

DESCRIPTION

01/23/12

REV 1 INITIAL IFC

03/15/12

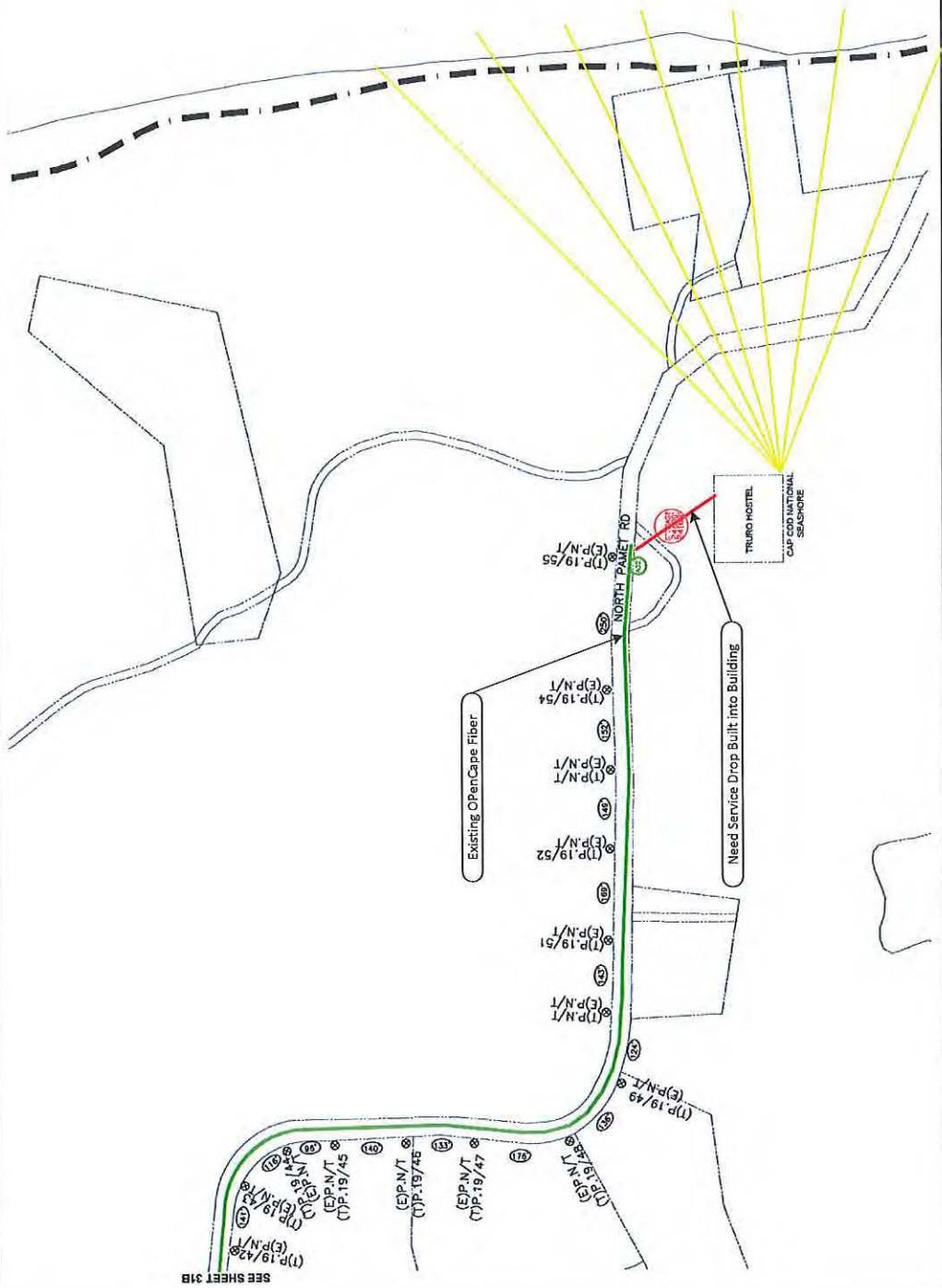
REV 4 REEL 1008

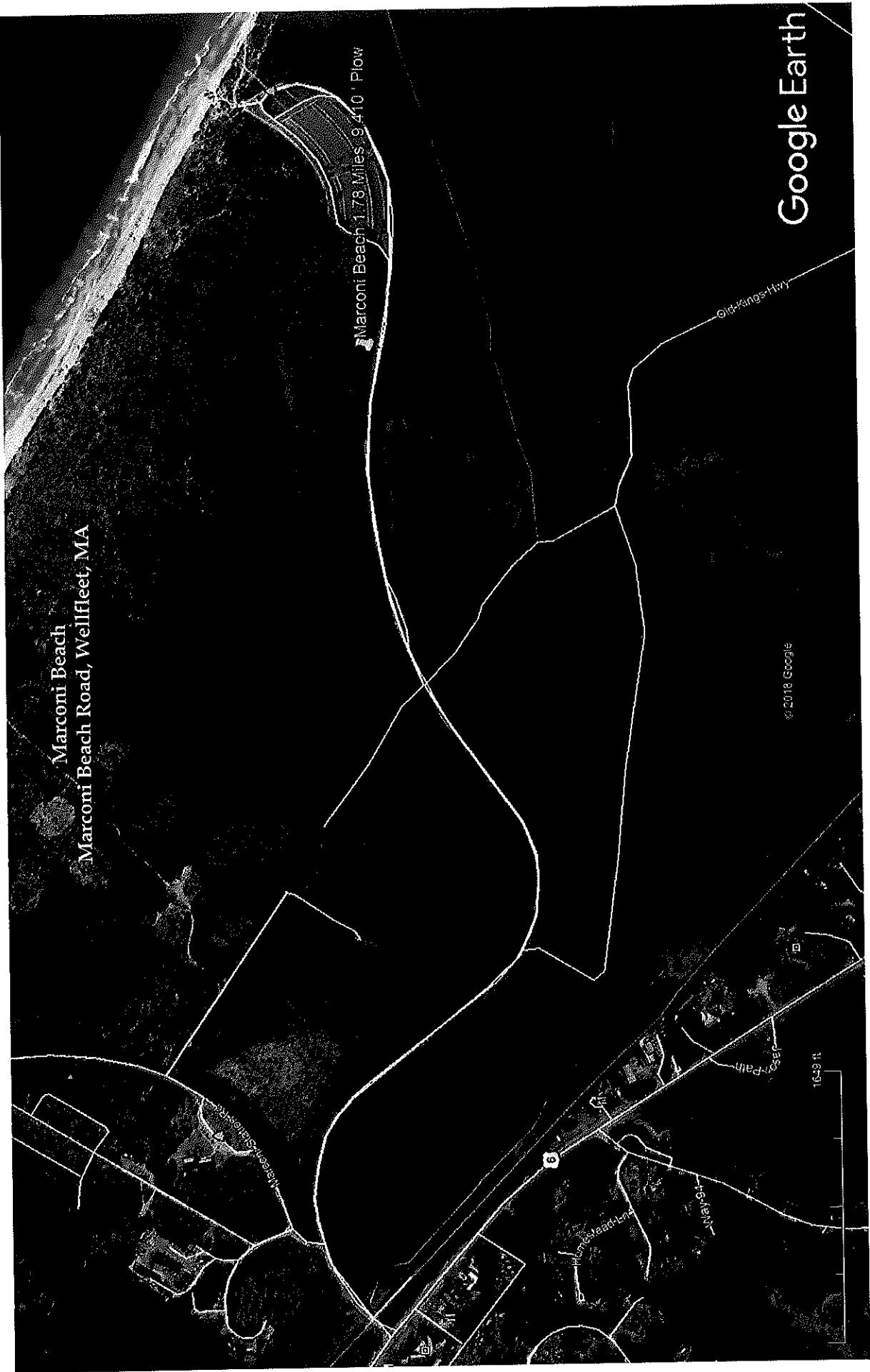
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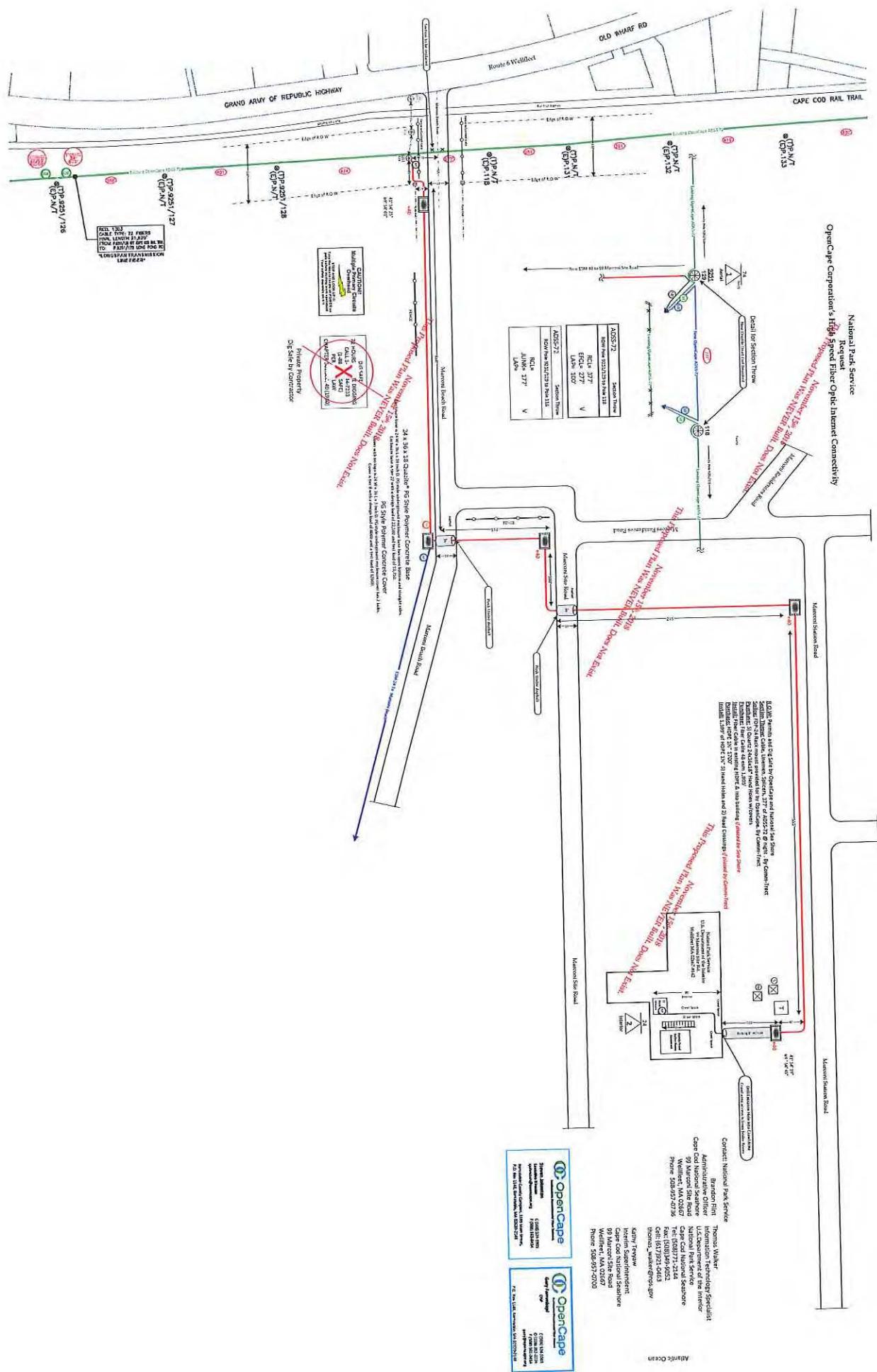
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AS-BUILT

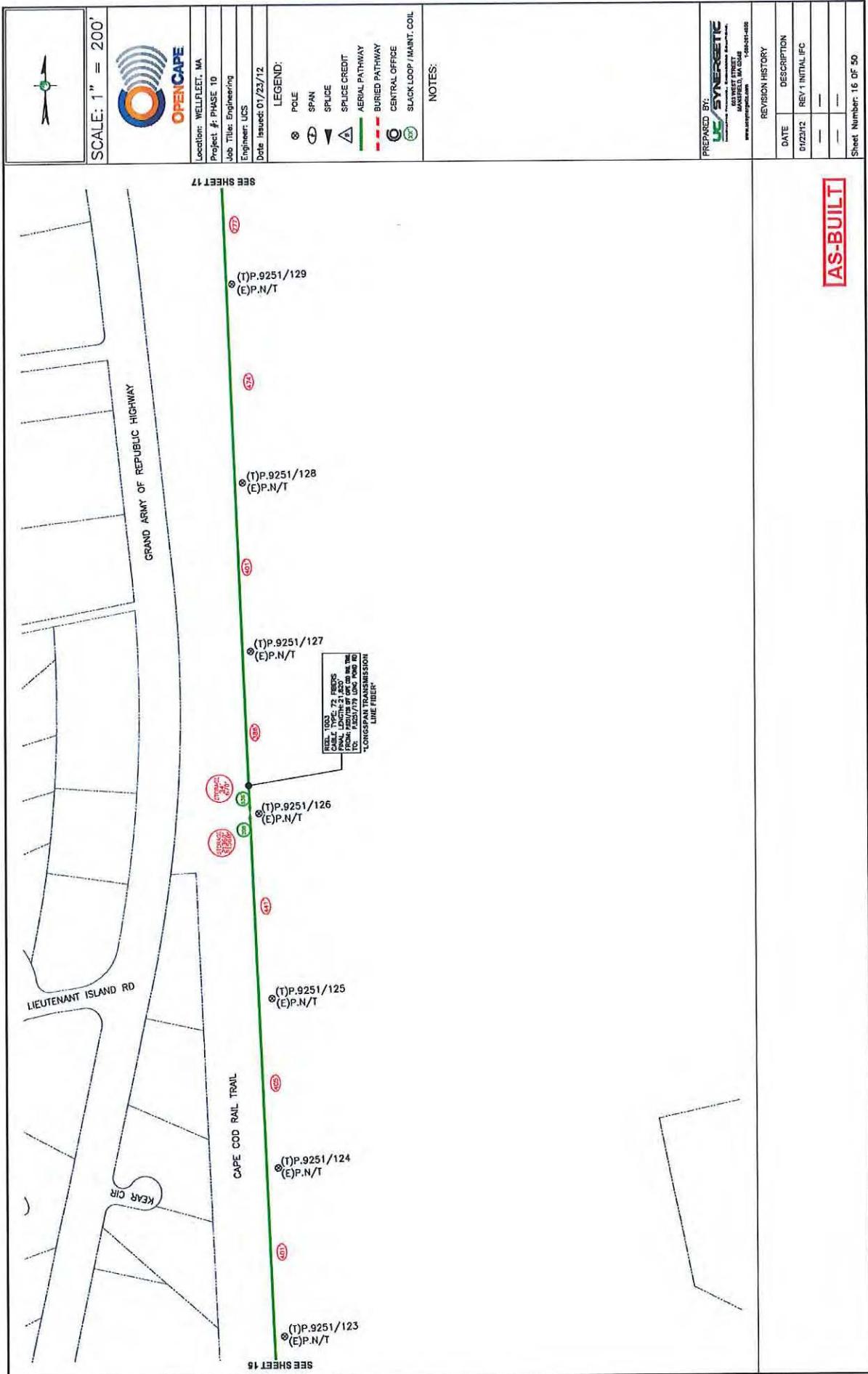
SEE SHEET 31B

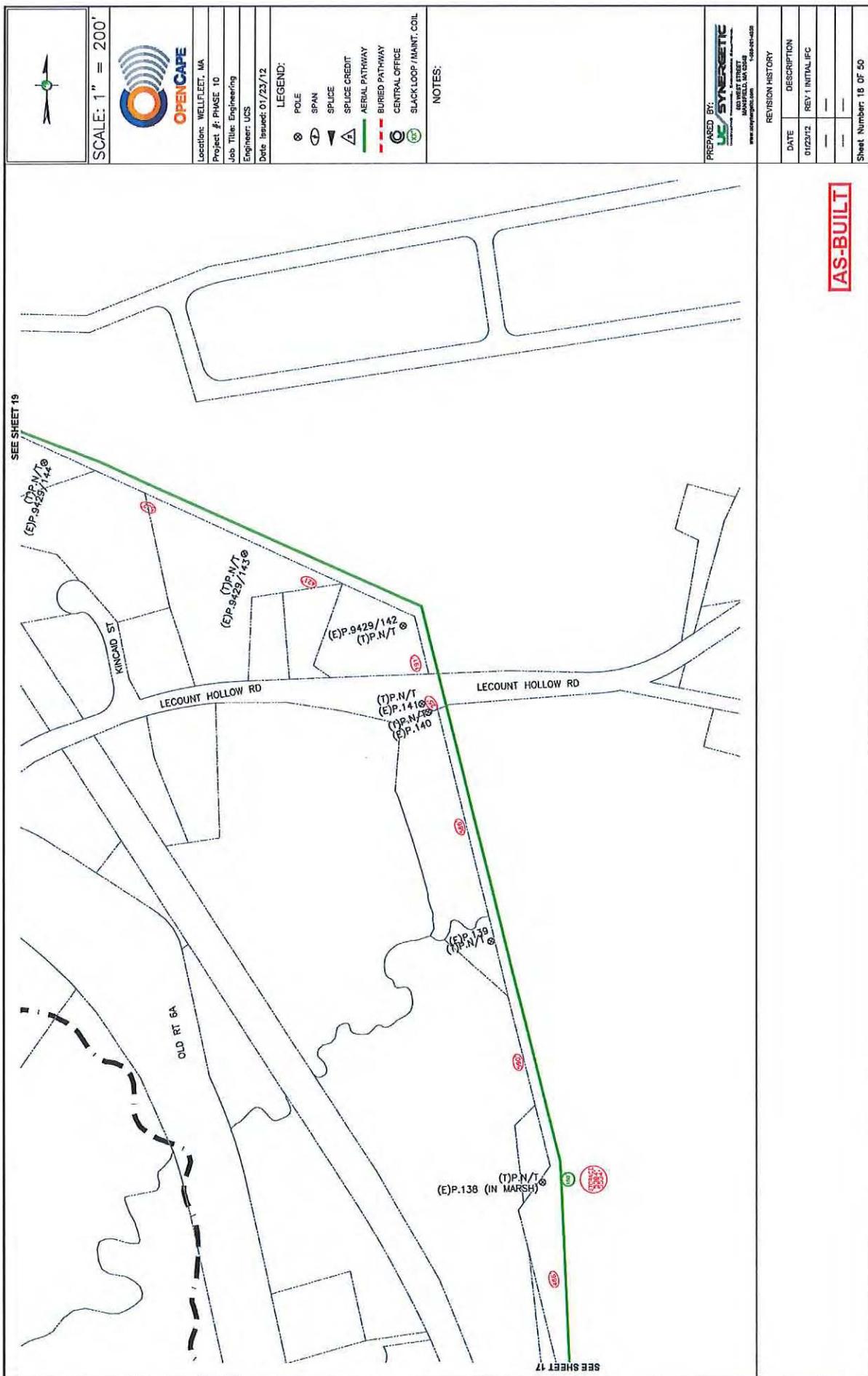








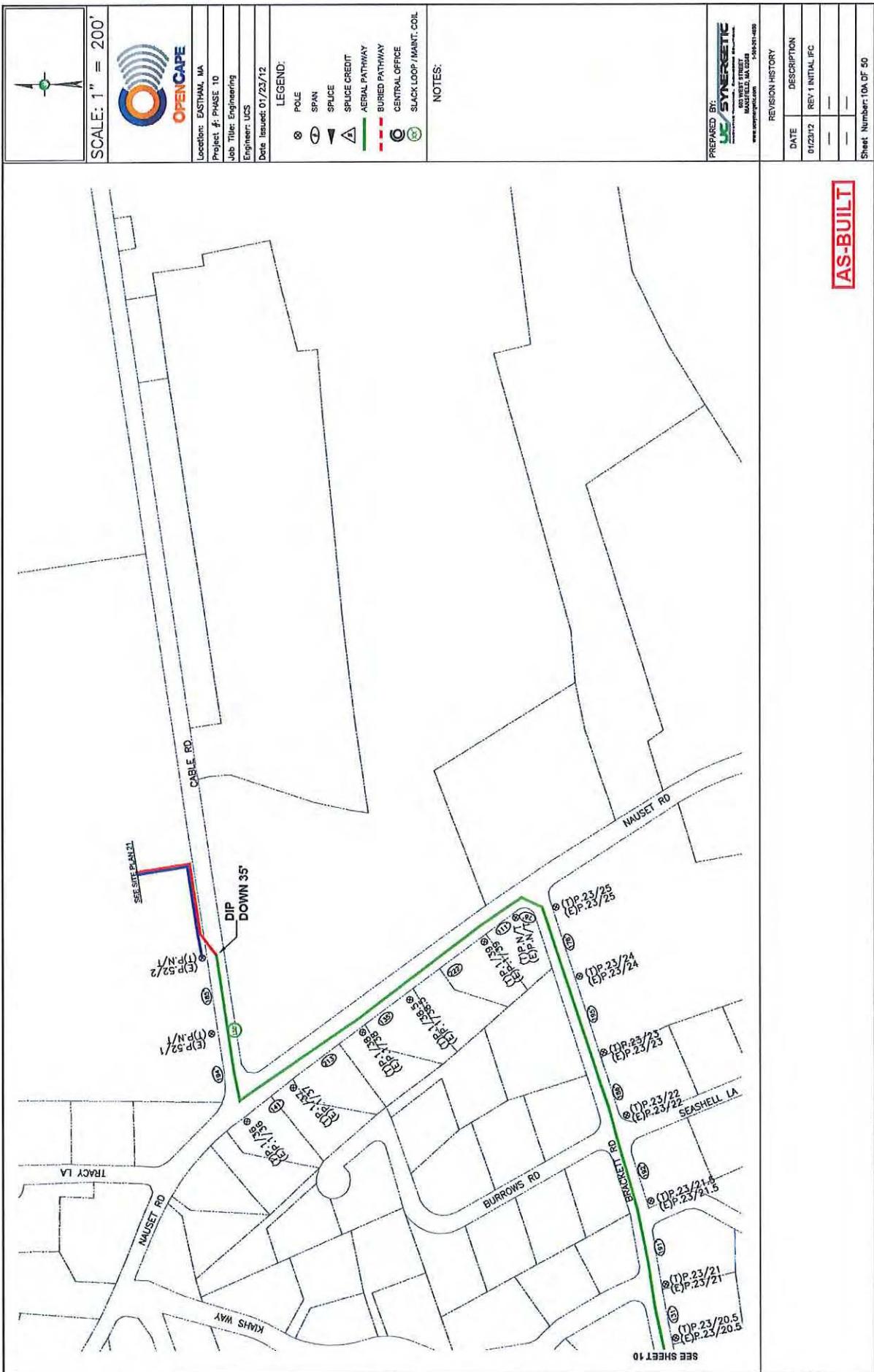


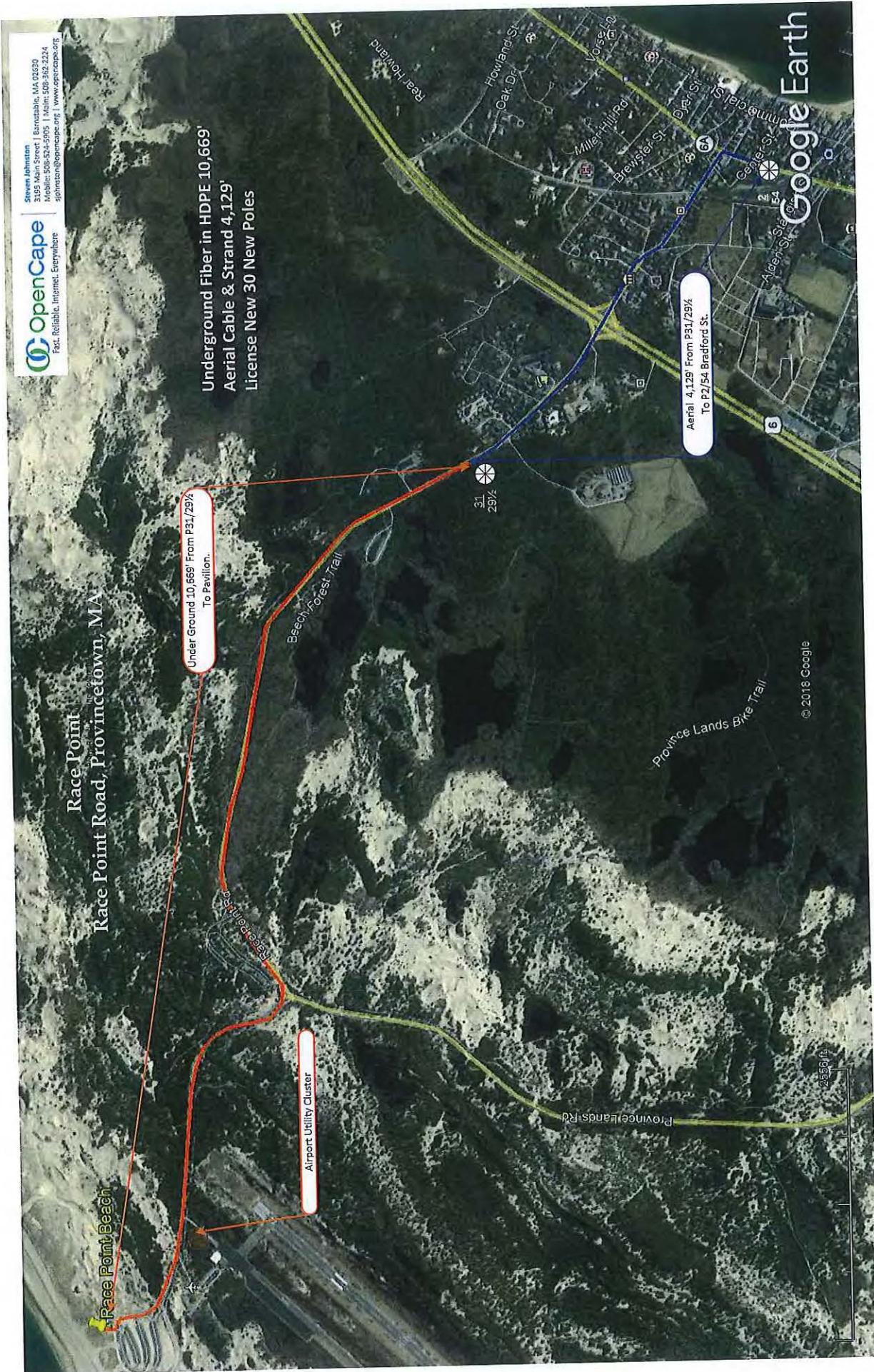


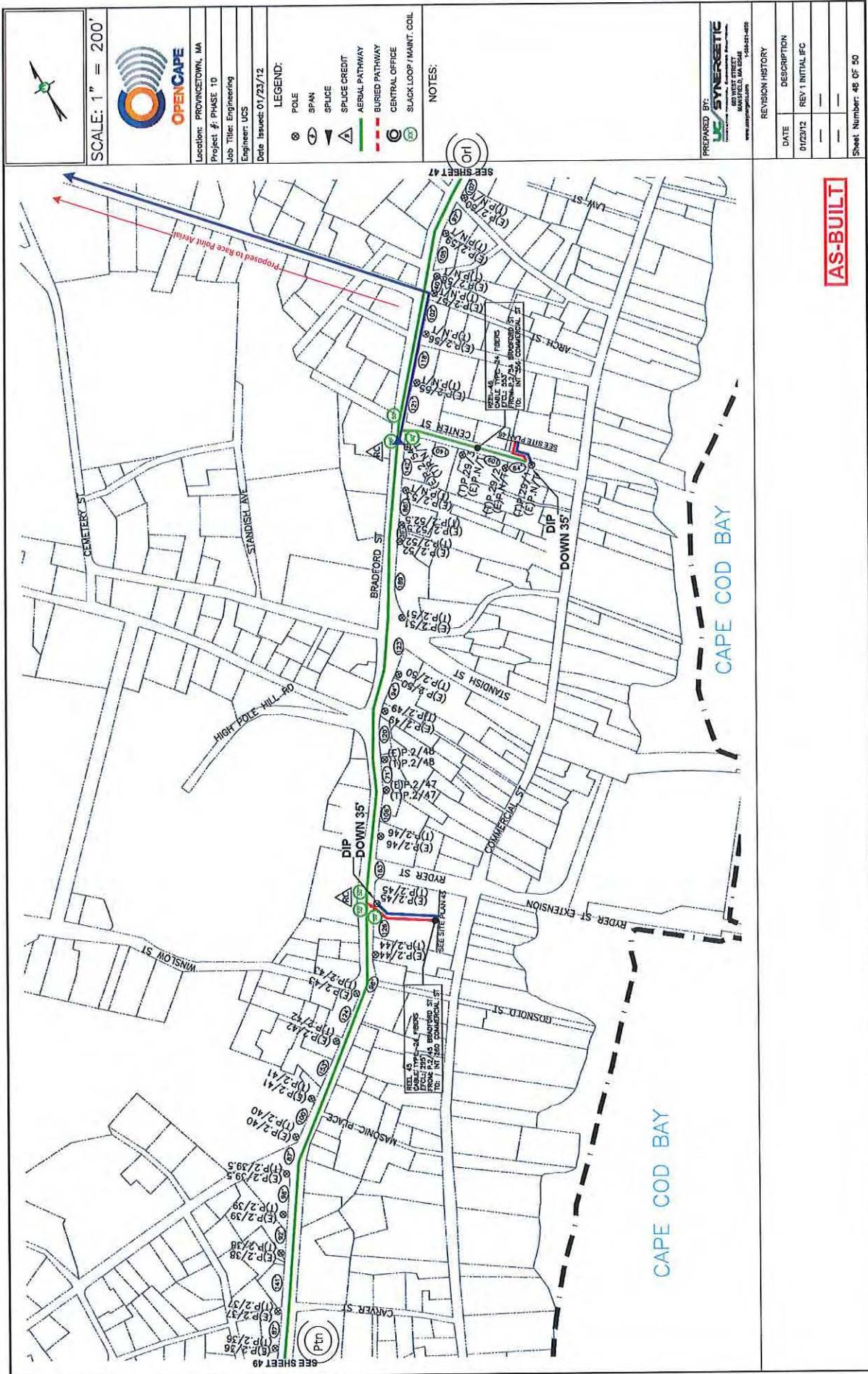
Google Earth

Drive-By Survey November 10<sup>th</sup>, 2018



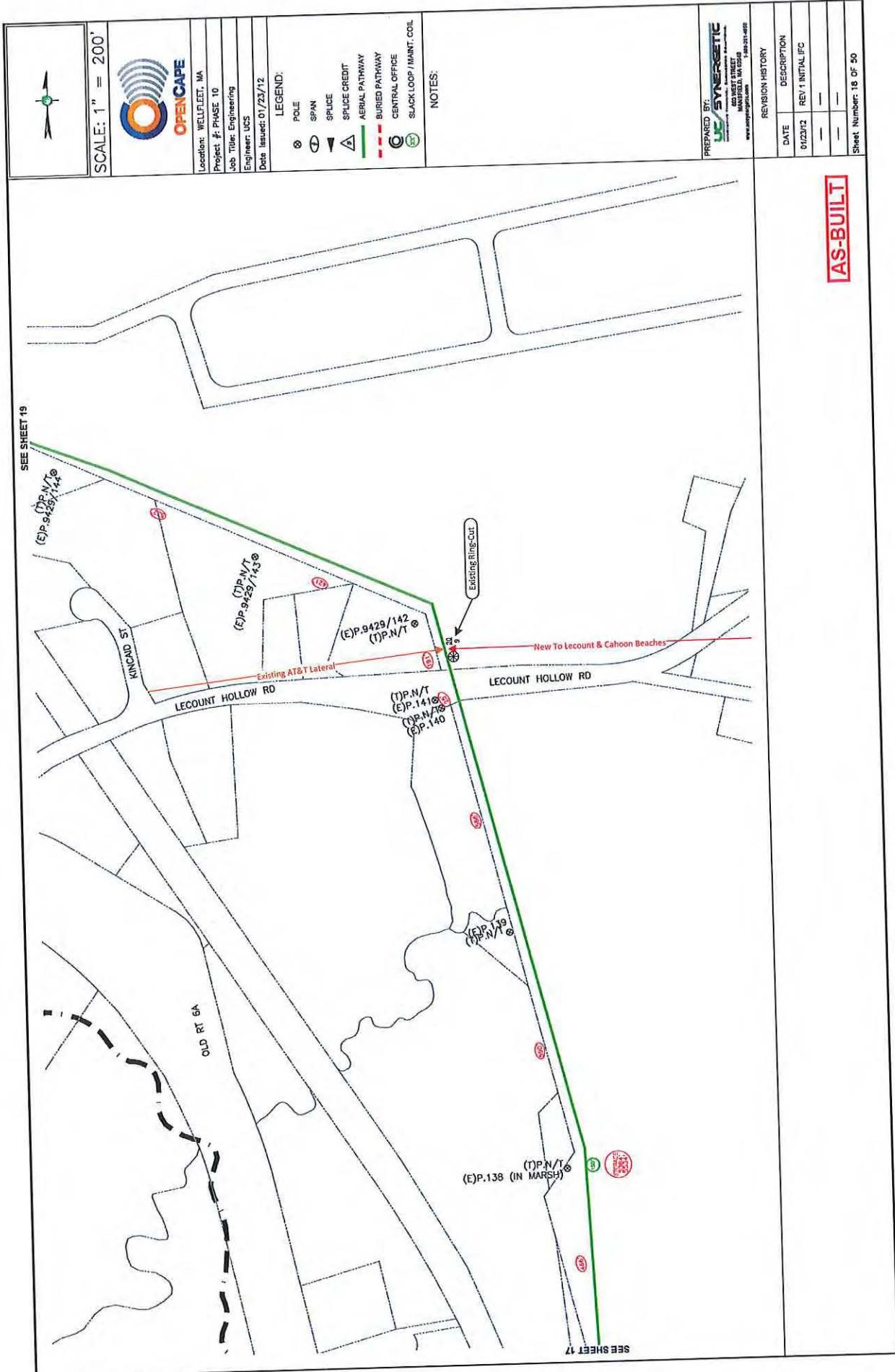






# Google Earth







Founded by Sandwich resident Joshua Delman in 2006, Centerline Communications is a turnkey professional services organization specializing in the development and maintenance of wireless telecommunications networks as well as commercial facility management solutions. The company offers nationwide services, with offices in four major cities.

Among the many national clients Centerline serves, they designed and completed the installation of the DAS (Distributed Antenna System) for Verizon at Gillette Stadium.

The following slides provide detail on how a DAS system would extend coverage on beaches, once the Fiber was in place. Centerline is working in concert with OpenCape and the National Seashore to create a design that would not interfere with the natural beauty the National Seashore provides to millions of visitors each year.

Based on the technical requirements for addressing the connectivity issues, Centerline was the ideal candidate to select for this project. Furthermore, their relationship with the cellular carriers adds a beneficial component to the project.

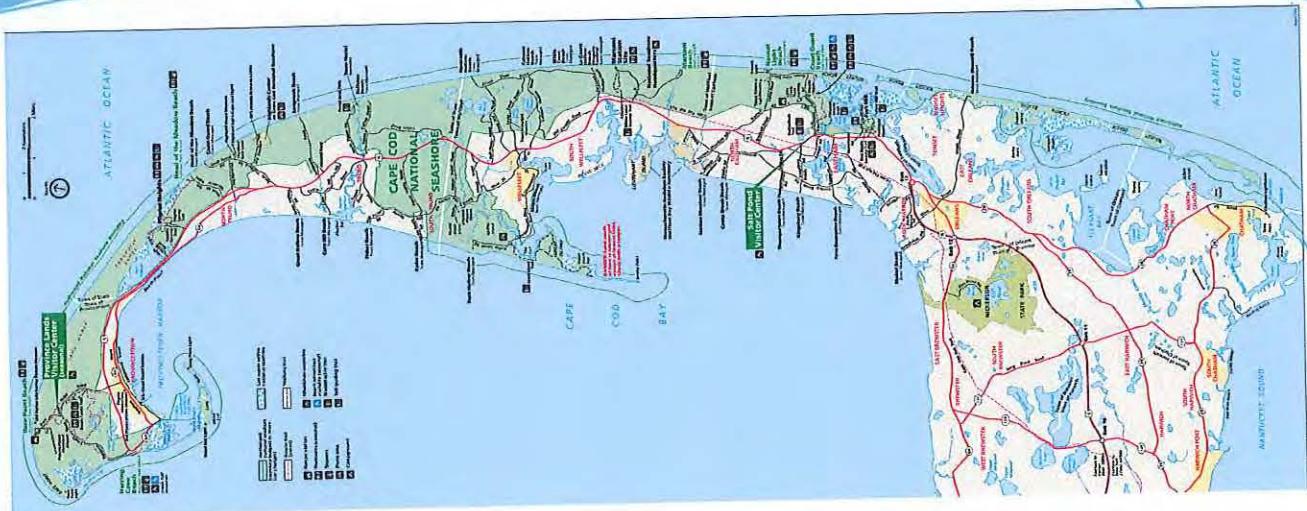
The DAS build out for the ten (10) beaches mentioned previously could cost as much as \$2,000,000. Centerline is confident that much of that cost can be recouped by Centerline via access fees provided by the major cellular carriers. At this time Centerline is not requesting funding for construction.

Centerline Communications  
750 W. Center Street, Suite 301  
W. Bridgewater, MA 02379  
(844) 748-8878

# Cape Cod National Seashore

Neutral Host Cellular Coverage Preliminary Design





The Cape Cod National Seashore (CCNS), created on August 7, 1961 by President John F. Kennedy, encompasses 43,607 acres (68.1 sq. mi; 176.5 km<sup>2</sup>) on Cape Cod, in Massachusetts. It includes ponds, woods and beachfront of the Atlantic coastal pine barrens ecoregion. The CCNS includes nearly 40 miles (64 km) of seashore along the Atlantic-facing eastern shore of Cape Cod, in the towns of Provincetown, Truro, Wellfleet, Eastham, Orleans and Chatham. It is administered by the National Park Service.

Notable sites encompassed by the CCNS include Marconi Station (site of the first two-way transatlantic radio transmission), the Highlands Center for the Arts (formerly the North Truro Air Force Station), the Dune Shacks of Peaked Hill Bars Historic District (a 1,950-acre historic district containing dune shacks and the dune environment), and the glacial erratic known as Doane Rock.

A former United States Coast Guard station on the ocean in Truro is now operated as a 42-bed youth hostel by Hostelling International USA.

There are approximately 225,000 year-round residents, and over 4 million tourists each year.

Centerline Communications has been requested to provide a preliminary design for a Neutral Host - Cellular Network based on the Cape Cod Nation Seashore Beach Sites that were provided on the following parameters for the Beach and Parking Areas:

Name	Longitude	Latitude	Altitude (ft)	Support Height (ft)	Support Type
Herring Cove Beach	-70.216852	42.044141	[13.12]	50	Freestanding Pylon
Marconi Beach	-69.962873	41.891158	[45.93]	50	Freestanding Pylon
Head of the Meadow Beach	-70.080035	42.051992	[26.25]	50	Freestanding Pylon
Nauset Lighthouse Beach	-69.951725	41.858871	[49.21]	50	Freestanding Pylon
Race Point Beach	-70.220098	42.078922	[39.37]	50	Freestanding Pylon

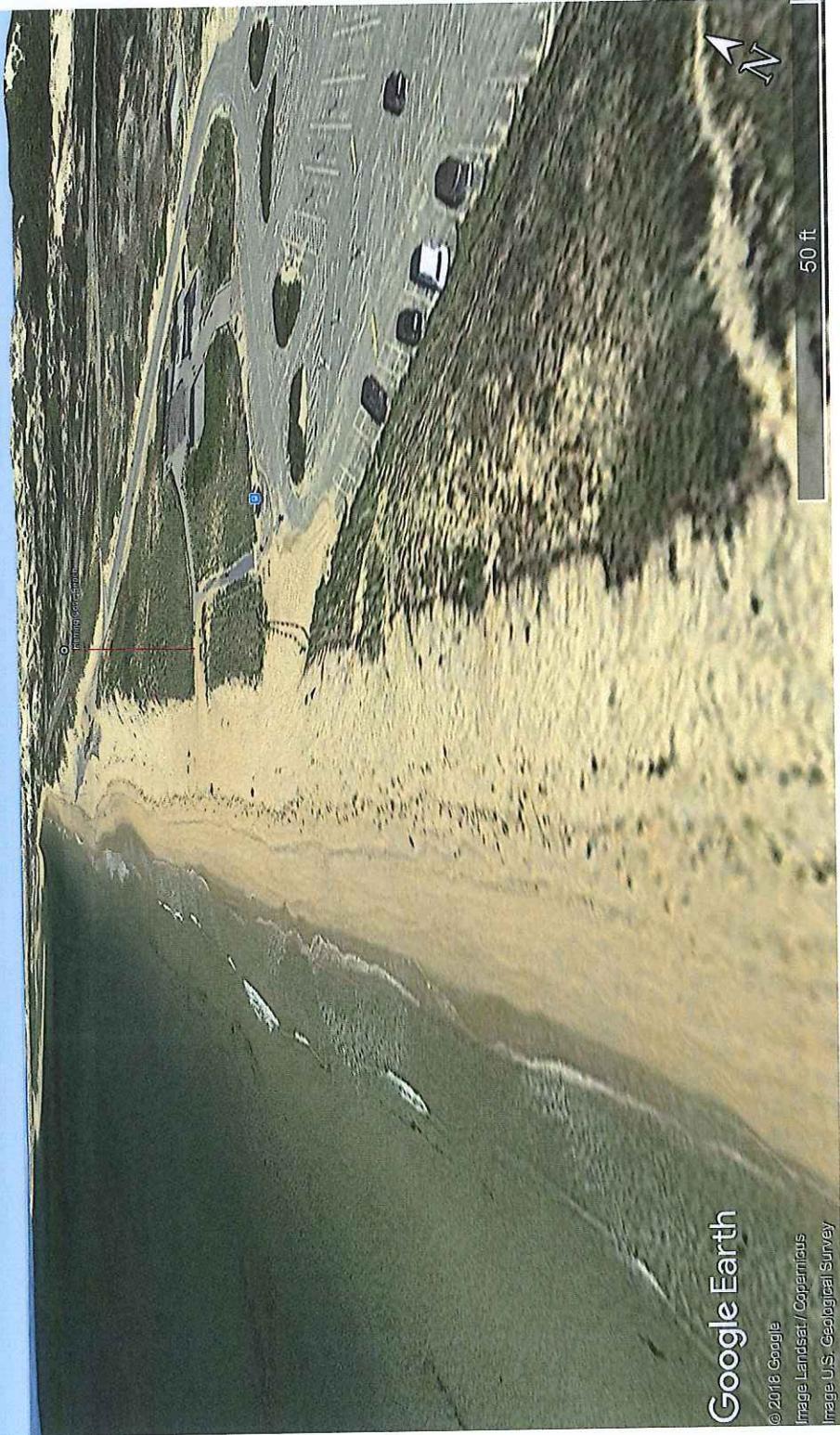
A general criteria was followed in the preliminary design format based:

- Design Was Based on a Neutral Host Format
- TX/RX Equipment Was Utilized as “Generic”
- Both 700 MHz and 2100 MHz Frequency Bands Were Utilized in the Design
- Design Was Based On a Small Cell 5-Watt Design At Each Site
- All TX/RX are in a 2x2 MIMO Configuration
- All Sites Were Plotted Utilizing Both a Sected Array and Omnidirectional Antenna
- All Sites were Based on a Design Height of 50' AGL
- All Sites were Chosen For The Best Overall Coverage
- Site Locations Were Chosen For The Best Overall Coverage

The Follow Slides Within This Presentation Illustrate the Plots That Have Been Prepared For the Visual Review Of the Preliminary Design Based on The Above Criteria. These plots In No Way Illustrate a Level Of Service or Reliability, They Are for Review Purposes Only.

## Herring Cove Beach - Google Earth Visual Of Design Area Terrain

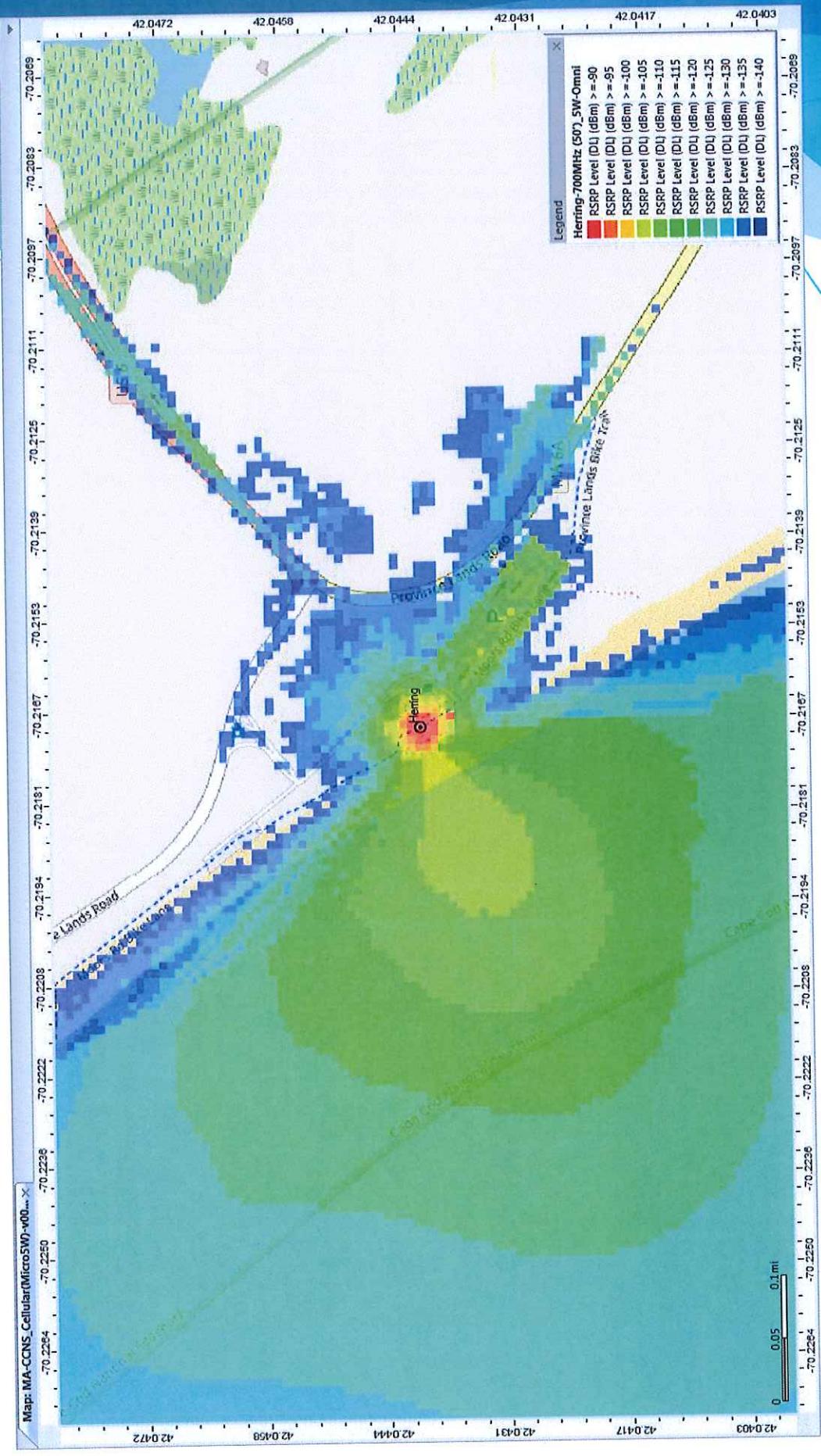
### Herring Cove Beach



Google Earth

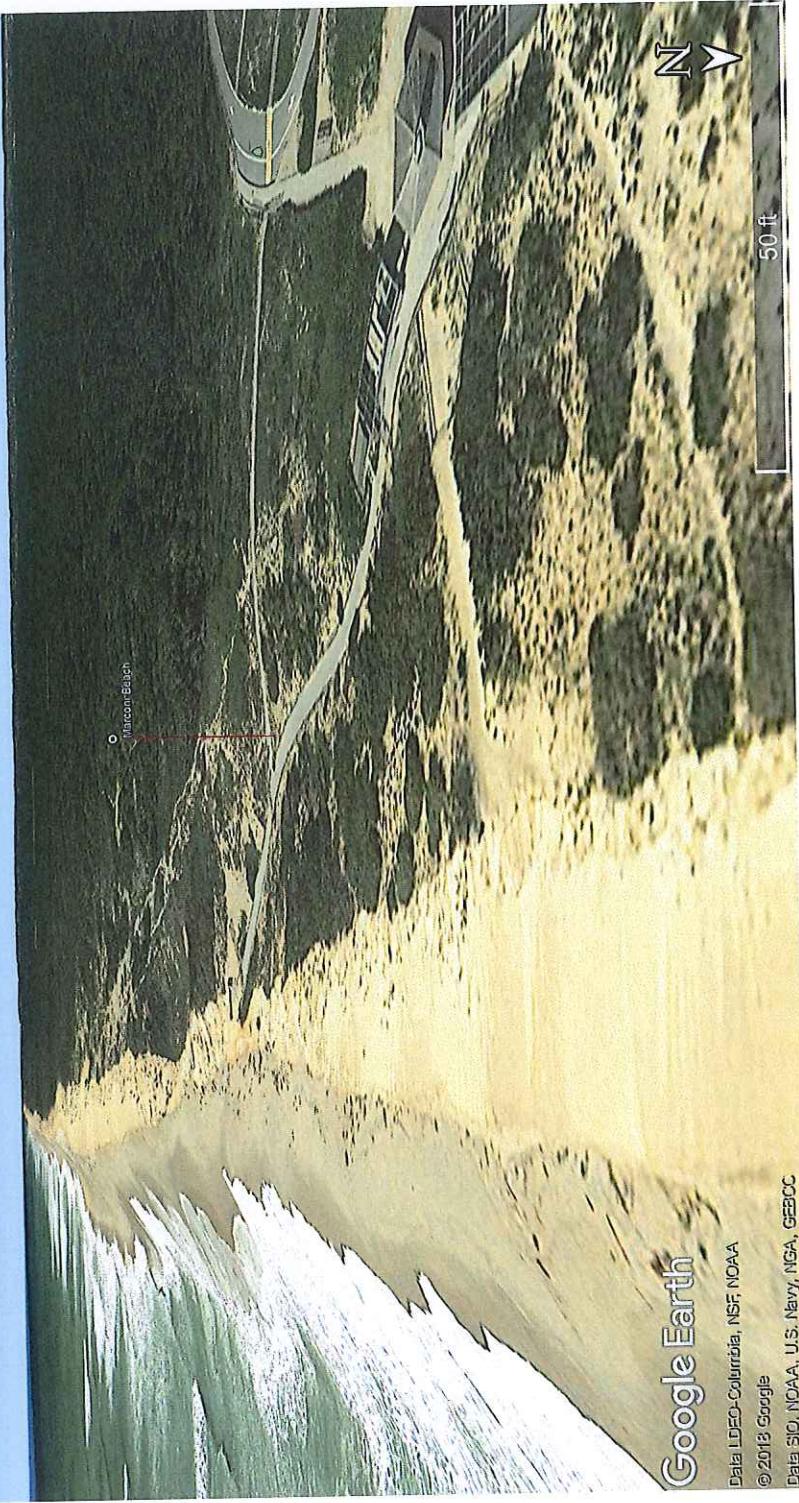
© 2018 Google  
Image Landsat / Copernicus  
Image U.S. Geological Survey

## Herring Cove Beach - 700MHz 5W Omnidirectional Site



## Marconi Beach - Google Earth Visual Of Design Area Terrain

### Marconi Beach



Google Earth

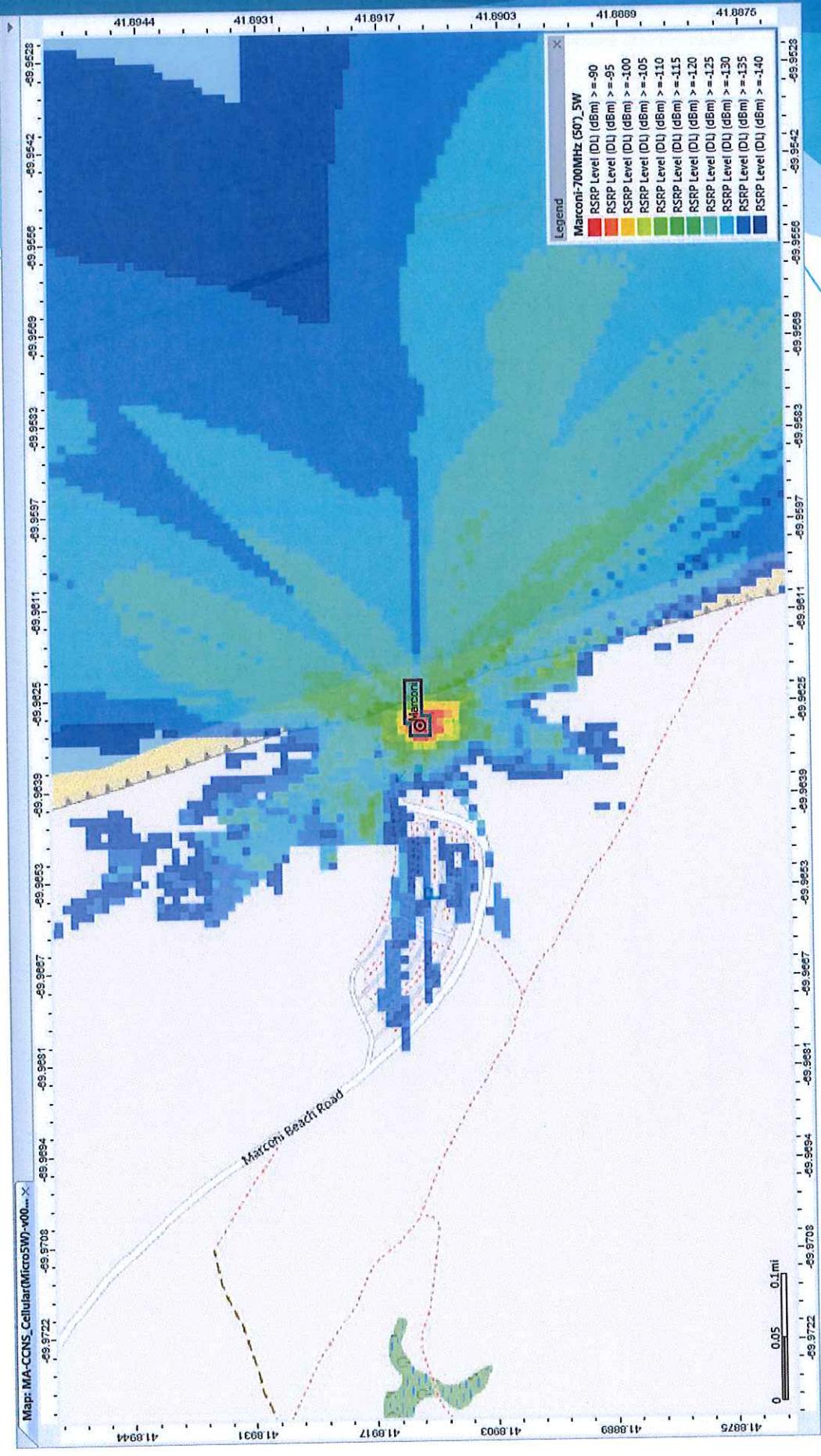
Data: DEO-California, NSF, NOAA

© 2012 Google

Data: SIO, NOAA, U.S. Navy, NGA, GEBCO

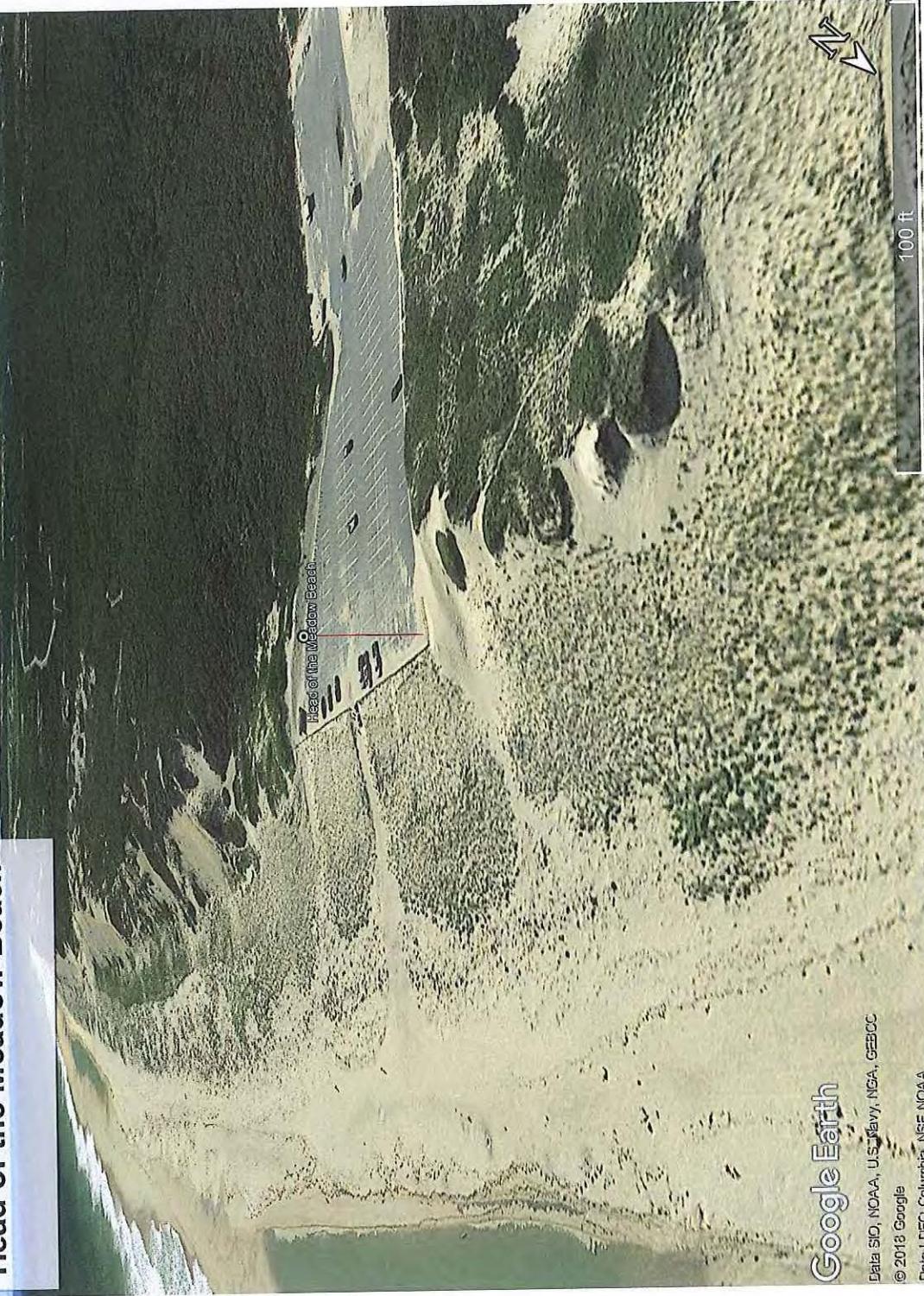


## Marconi Beach - 700MHz 5W Sectorized Site



## Head of the Meadow Beach - Google Earth Visual Of Design Area Terrain

### Head of the Meadow Beach



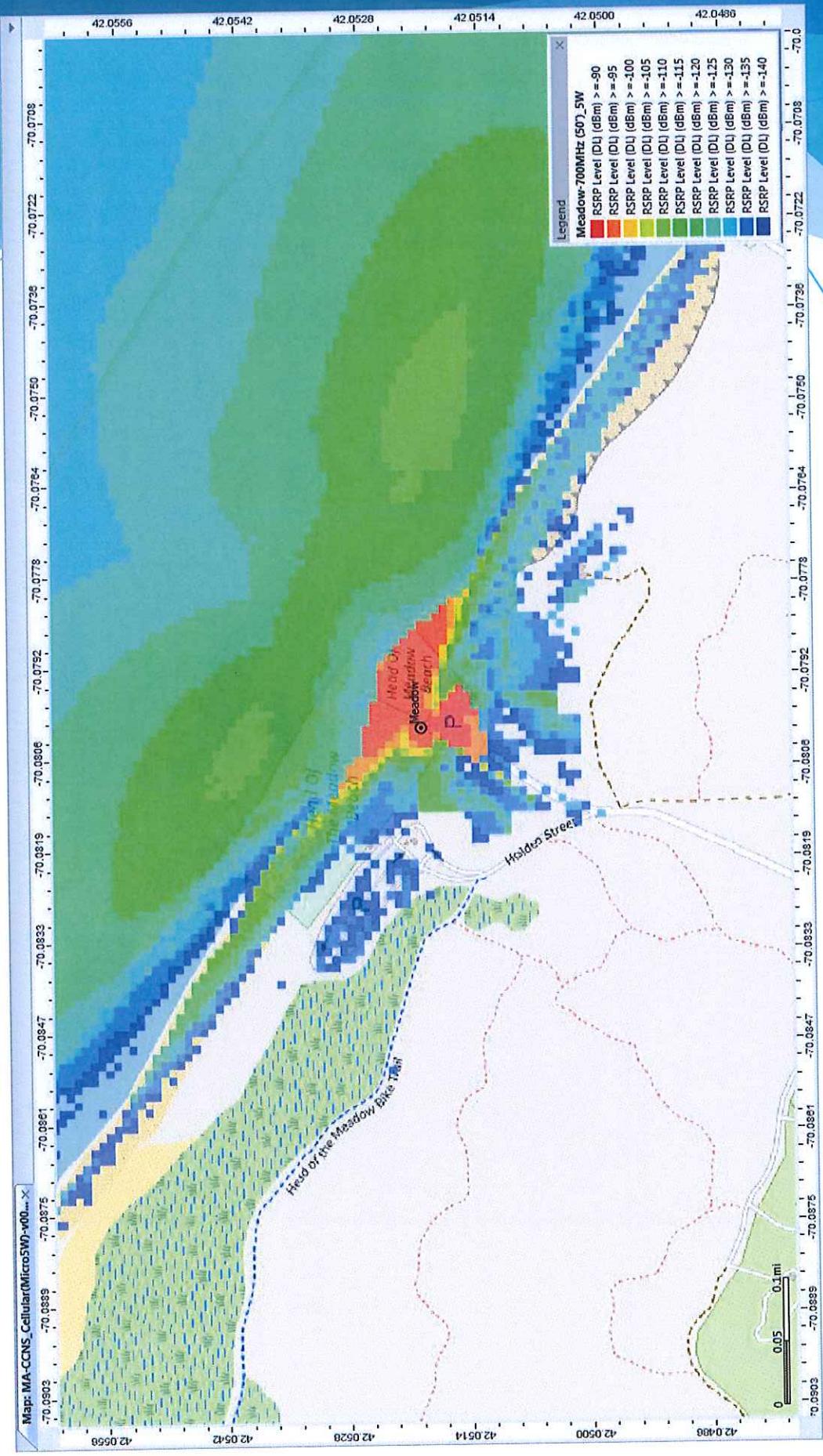
Google Earth

Data SIO, NOAA, U.S. Navy, NGA, GECC

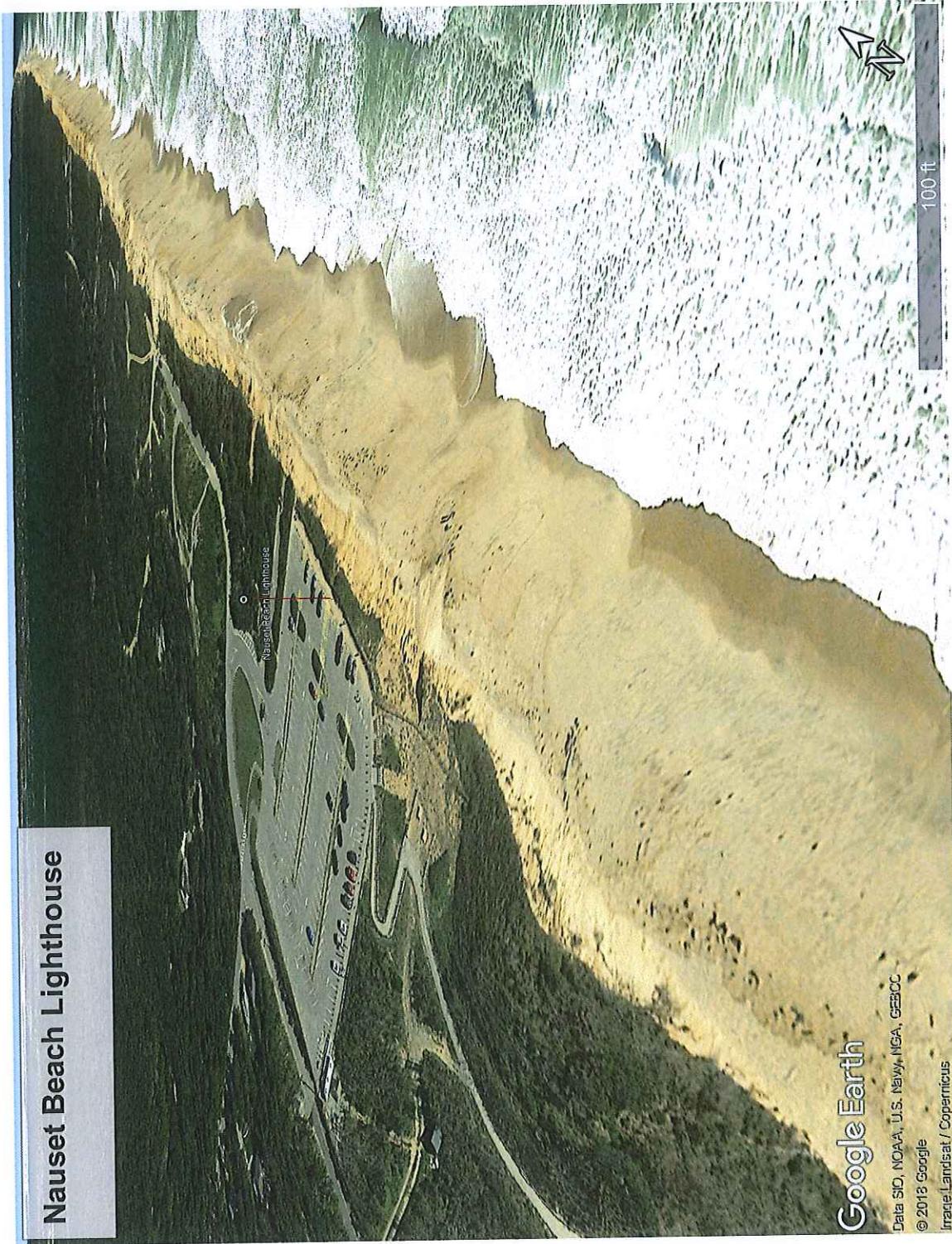
© 2018 Google

Data LDEO-Columbia, NSF, NOAA

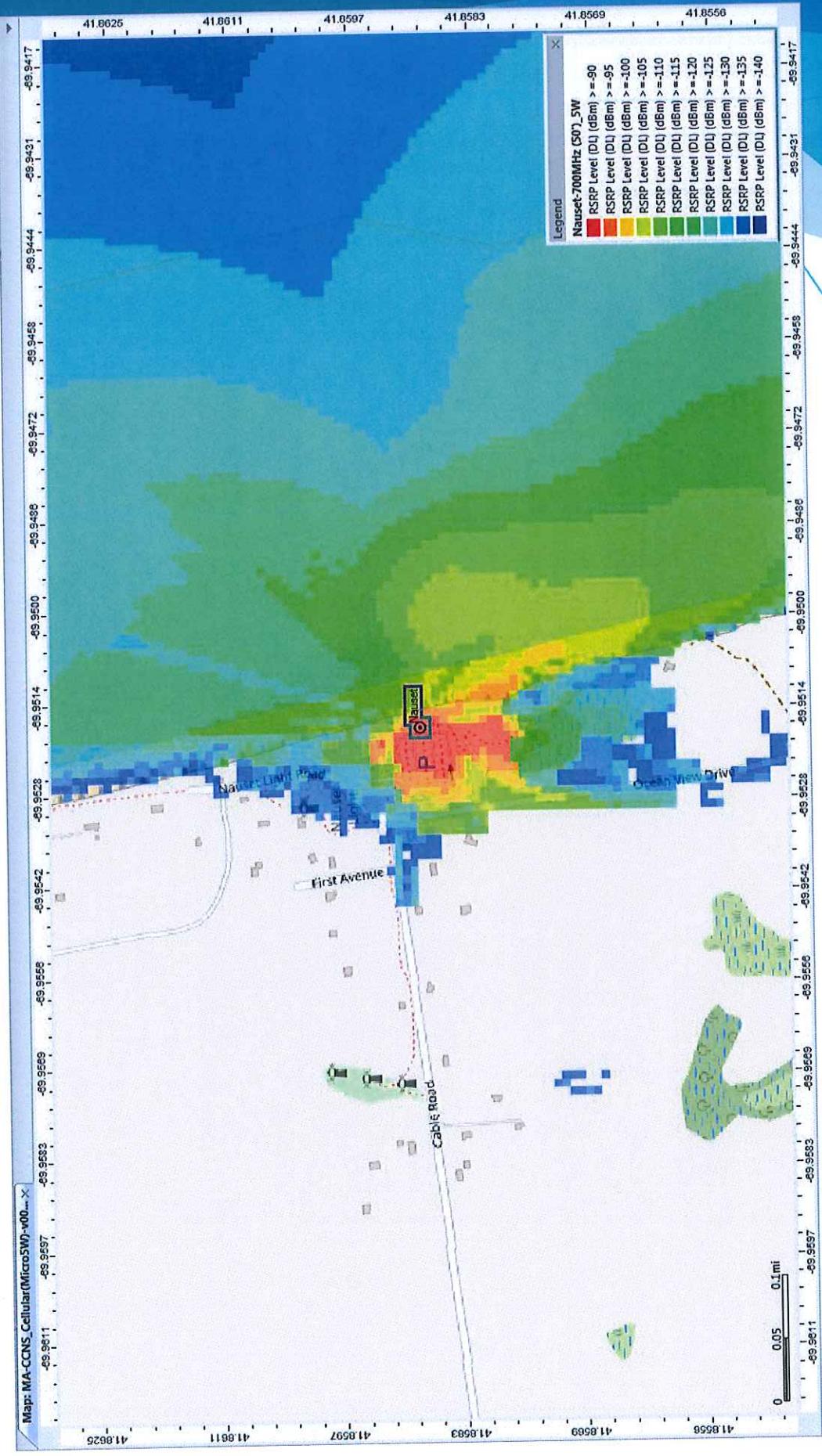
## Head of the Meadow Beach - 700MHz 5W Sectorized Site



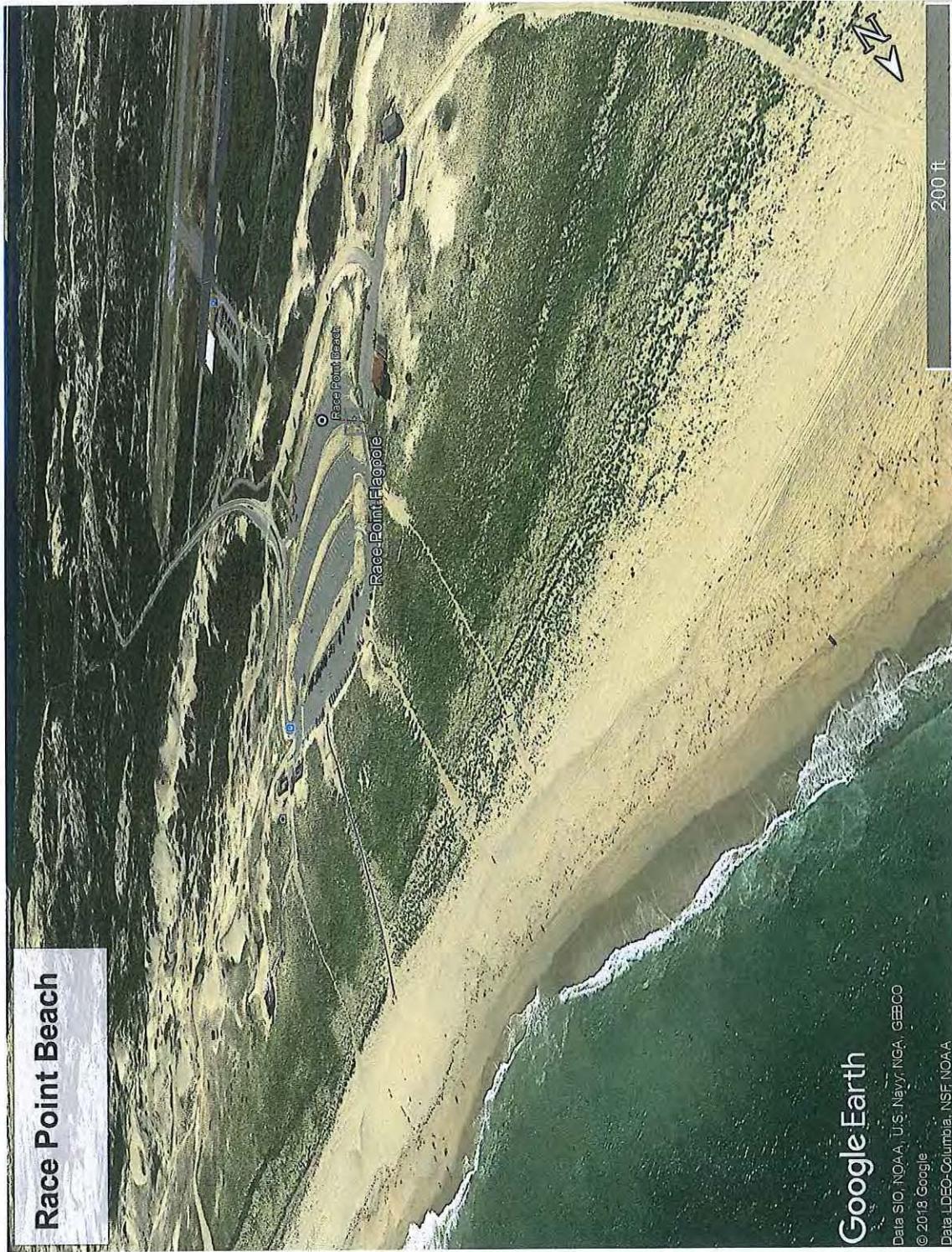
## Nauset Beach Lighthouse - Google Earth Visual Of Design Area Terrain



## Nauset Beach Lighthouse - 700MHz 5W Sectorized Site



## Race Point Beach - Google Earth Visual Of Design Area Terrain



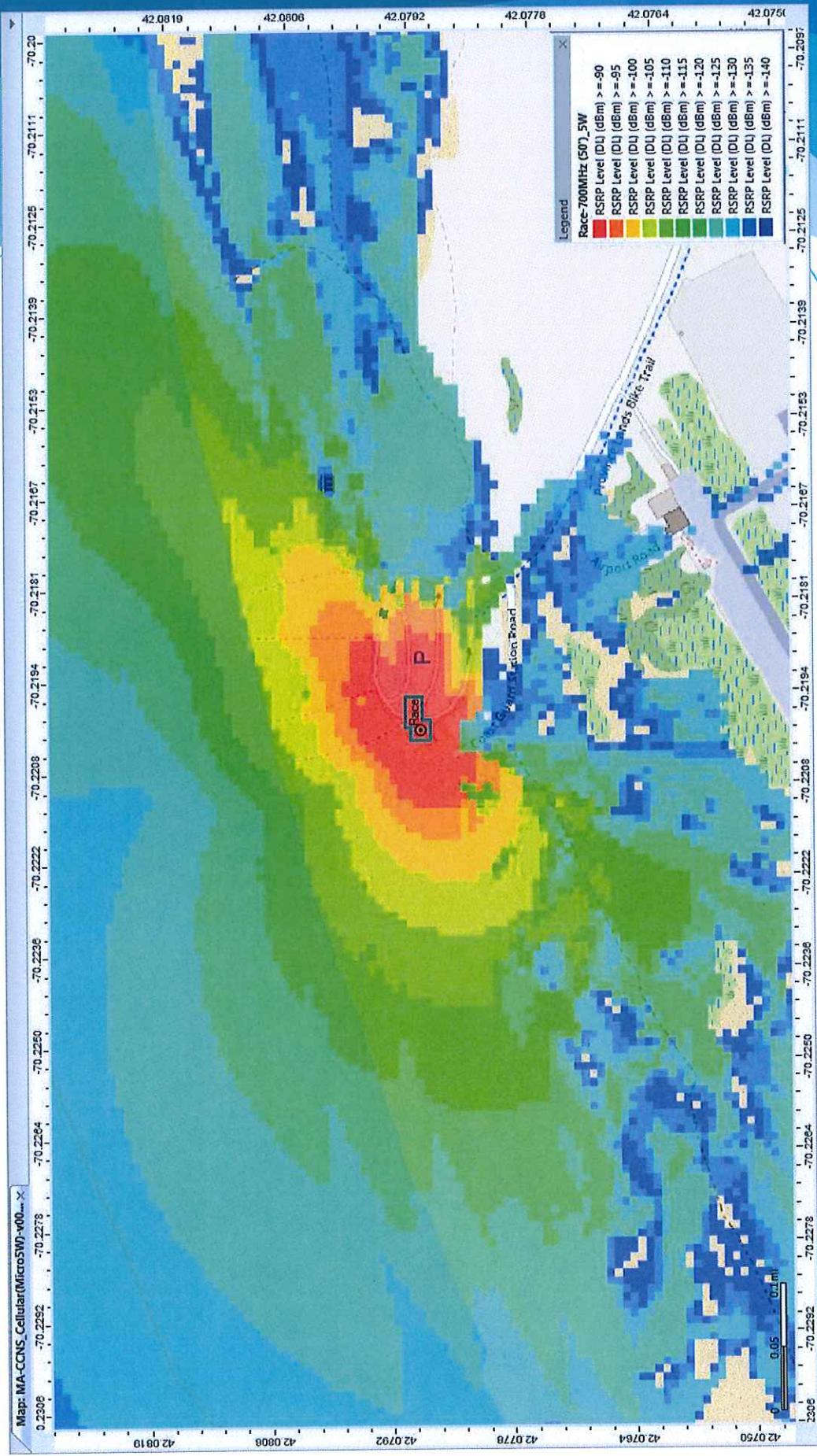
**Google Earth**

Data SIO, NOAA, U.S. NAVY, NGA, GBCO

© 2018 Google

Data LDEO-Columbia, NSF, NOAA

## Race Point Beach - 700MHz 5W Sectorized Site



# Appendix

Antenna Specifications - Sectorized

8-Port Two-Sector Antennas



8-Port Two-Sector Antenna 698-960/1695-2690 65°/65° 11/13dBi 2°/2°T with GPS								
Type No.	80010714			80010713				
Faceplate Colour	Brown			Gray				
Low Band	Electrical data per sector			Electrical data per sector				
Frequency range	MHz	698-960		698-960	824-934	824-934	850-960	
Polarization	*	+45°	+45°		+45°	+45°	+45°	
Gain	dBi	10.0			10.6		11.0	
<b>Horizontal Pattern:</b>								
Half-power beam width	*	70		67		65		
Front-to-Back ratio, copolar	dB	>26		>28		>28		
Cross polar ratio	dB	Typically <20		Typically <30		Typically <30		
Sector	°	>8		>8		>8		
<b>Vertical Pattern:</b>								
Half-power beam width	*	42		38		34		
Electrical tilt	*			2.5°/dB				
Impedance	Ω			50				
VSWR	Intersector		>25		>25		>25	
Isolation	Intersector		(698-960) >94%		(698-960) >90%		>25 dB (698-960)	
Intermodulation IM3	dBc						<-53 (2 x 45 dB carrier)	
Max. Power per channel	W						250 (at 50 °C ambient temperature)	
Max. Effective power	W						800 (at 50 °C ambient temperature)	

KOTHEREID

<i>nina</i>	0°	180°	0°	180°
698-960	698-960	1695-2690	1695-2690	
X	X	X	X	
65°	65°	65°	65°	
2°	2°	2°	2°	

KONTREIN

8-Port Two-Sector Antennas

High band	Electrical data per sector					
	1605-2890		2200-2490		2490-2960	
Frequency range	MHz	1695 - 1850	1850 - 1990	1990 - 2150	+45,-45	+45,-45
Polarization	°	+45,-45	+45,-45	+45,-45	+45,-45	+45,-45
Gain	dBi	13.3	13.3	13.5	13.6	14.0
Horizontal Pattern:						
Half-power beam width	°	60	60	60	53	60
Front-to-back ratio, conical	dB	> 30	> 30	> 30	> 30	> 30
Cross polar ratio	dB	Typically: 25 ≥ 30	Typically: 25 ≥ 30	Typically: 25 ≥ 30	Typically: 25 ≥ 10	Typically: 25 ≥ 10
Sector	0° ±60°					
Vertical Pattern:						
Half-power beam width	°	17.5	17.5	16.5	14.4	13.4
Electrical tilt	°					
Impedance	Ω					
VS/NR						
Isolation						
Intra-system	dBi					
Inter-system	dBi					
Intermodulation links	dBi					
Max. power per port	W					
Max. effective power for the antennas	W					

GPS specifications		Mechanical specifications	
	MHz		8 x 7-16 connector female
Frequency range	1575.42 ± 3	Input	Bottom
LNA gain	65	Connector position	kg
Pre-amp filtering	65	Weight	15.7
Polarization	Right-hand circular	Wind load	kg
H-plane beam width	Omni	Wind load (Flatbed Wind Speed = 10 km/h)	34.6
Explane half-power beam width	°	Max. wind velocity	N
Connector	Vdc	Through N or G port connector	138
DC power	-35 to +70	-35 to +70	32
Temperature range	°C		mph

All specifications are subject to change without notice.

The latest specifications are available at [www.kathrein.com](http://www.kathrein.com)  
All specifications are subject to change without notice.

All specifications are subject to change without notice.  
The latest specifications are available at [www.katrinusa.com](http://www.katrinusa.com).

Kathleen USA: Greenway Plaza II, 2400 Lakeside Blvd., Suite 650, Richardson TX 75088  
Phone: 214.238.8800 Fax: 214.238.8801 Email: info@kathleen.com

## Antenna Specifications - Sectorized (continued)

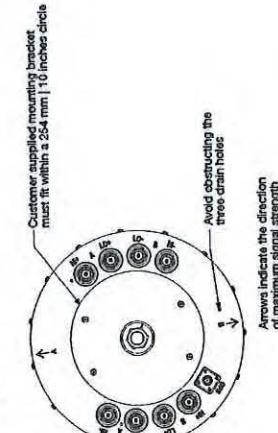
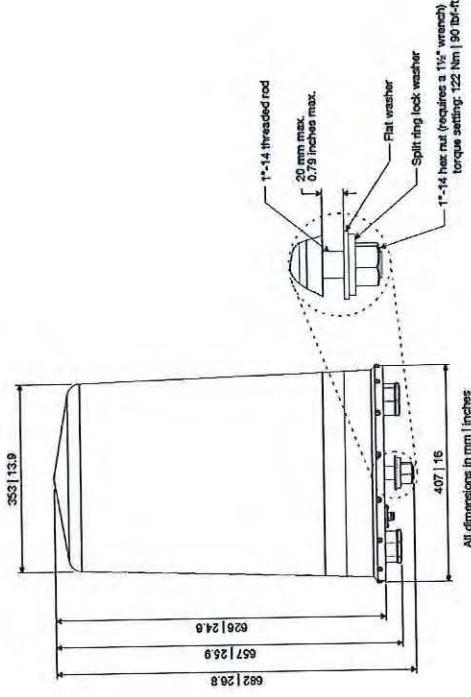
### Accessories General Information

### KATHREIN

**Reflected antenna: Aluminum, Radiator: Tin plated zinc.**  
**Antennas are radialized. The max. radome diameter is 407 mm / 16 inches. Fiberglas materials guarantees optimum performance with regards to stability, stiffness, UV resistance and painting.**  
**Radome colour 80010713: Brown.**  
**80010714: Grey.**

**Designed to be mounted on top of a utility pole using a custom mounting bracket supplied by the customer.**

#### Mounting:



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Kathrein USA, Greenway Plaza II, 2400 Lakeside Drive, Suite 1500, Richardson TX 75082  
 Phone: 214.238.3800 Fax: 214.238.3801 Email: [info@kathrein.com](mailto:info@kathrein.com)

30010713\_80010714 Page 3 of 3

### KATHREIN

### General Information about Panel Antennas

Kathrein cellular antennas are designed to operate under the environmental conditions as described in ETS 300 019-1-4 class 4.1 E.

The antennas exceed this standard with regard to the following items:

- Low temperature: -55 °C

- High temperature (dry): +60 °C

For antennas equipped with FlexRET: The electrical downtilt adjusting is designed to operate under the environmental conditions as described in the valid data sheet of the FlexRET.

Ice protection: Due to the very sturdy antenna construction and the protection of the radiating system by the radome, the antenna remains operational even under icy conditions.

Kathrein antennas fulfill the stated specifications after completion of the environmental tests as defined in ETS 300 019-2-4. The homogeneous design of Kathrein's antenna families uses identical modules and materials.

Extensive tests have been performed on typical samples and modules. The vibration test has been adapted relating to frequency and acceleration to the conditions of mast mounted antennas.

As a result of more stringent legal regulations and judgements regarding product liability, we are obliged to point out certain risks that may arise when products are used under extraordinary operating conditions.

The mechanical design is based on the environmental conditions as stipulated in ETS 300 019-1-4. Wind loads are calculated according to DIN 1055-4. The antennas may be used at locations where the anticipated peak wind velocity or gust wind speed lies within the maximum wind speed listed in the data sheet. We warrant the mechanical safety and electrical functionality under such conditions. The wind speeds are defined in accordance with the DIN, EN or TIA standards. This warranty makes allowance for the partial safety factors specified in those standards. Extraordinary operating conditions, such as heavy icing or exceptional dynamic stress (e.g. strain caused by oscillating support structures), may result in the breakage of an antenna or even cause it to fall to the ground. These facts must be considered during the site planning process.

The details given in our data sheets have to be followed carefully when installing the antennas and accessories. Site planning and installation must be carried out by qualified and experienced staff. All relevant national safety regulations must be upheld and respected. Incorrect site planning, faulty installation, as well as interfering surroundings on site, may lead to deviations in the electrical parameters compared to those specified in the respective data sheets.

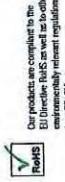
The connectors on this product are only suitable for connecting to the compatible counterpart. Please ensure that the connected cable has been fitted with a connector of the same standard, otherwise damage may occur.

The tilt values will be set to any arbitrary value in the given tilt range. These values are independent from the frequency band or antenna type and can vary between antennas and bands.

Hereby, Kathrein Werke KG declares that the radio equipment is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: <http://www.kathrein.com>

#### EU-RED

006.6000/a Subject to alteration



Rheinland

✓

Our quality assurance systems and our environmental management system apply to the entire company and are certified by TÜV according to EN ISO 9001 and EN ISO 14001.

All specifications are subject to change without notice.  
 The latest specifications are available at [www.kathrein.com](http://www.kathrein.com).

Kathrein GmbH, Greenway Plaza II, 2400 Lakeside Drive, Suite 1500, Richardson TX 75082  
 Phone: 214.238.3800 Fax: 214.238.3801 Email: [info@kathrein.com](mailto:info@kathrein.com)

Page 1 of 1



## Antenna Specifications - Omnidirectional

4-Port Omni Antenna	R1	Y1
Frequency Range	698-960	[1695-2690]
Dual Polarization	X	X
HPBW	360°	360°
Fixed Electr. DT	2°	2°

### 4-Port Omni Antenna

**KATHREIN**

4-Port Omni Antenna		
Frequency	R1	Y1
Frequency Range	698-960	[1695-2690]
Dual Polarization	X	X
HPBW	360°	360°
Fixed Electr. DT	2°	2°



4-Port Omni 698-960/1695-2690 360°/360° 6/9dBi 2°/2°T with GPS

Type No.	80010745			80010746		
Barcode Colour	Brown	Gray	R1	Brown	Gray	R1
Lowband						
Frequency range	MHz	698-960		880-960		
Polarization	%	45°-45		+45°-45		
Gain	dBi	5.0		6.0		6.5
Horizontal Pattern:				360 (with 1-8 dB nulls, typical)		
Half-power beam width	*					
Vertical Pattern:						
Half-power beam width	*			32°		34°
Electrical tilt	*			2, fixed		
Impedance	Ω			50		
VSWR						
Isolation	dB	>26, typ. 30		>28, RH/Y1		
Intersystem	dBc	<-150 (2 x 15 dBm carrier)				
Intermodulation IM3	dBc			250 (at 50 °C ambient temperature)		
Max. Power per Input	W					

4-Port Omni 698-960/1695-2690 360°/360° 6/9dBi 2°/2°T with GPS

GPS specifications		
Frequency range	MHz	1575.42 ± 3
USA gain	dBi	27 nominal
Pre-amp filtering	dB	-20 to +100 MHz
Polarization		Right-Hand circular
H-plane beam width	mm	30mm
E-plane half-power beam width	°	105
Connector	N female	
DC power	Vdc	-25-5, 15-25 mA
Temperature range	°C	-35 to +70

All specifications are subject to change without notice.

All specifications are subject to change without notice.  
The latest specifications are available at [www.kathreinusa.com](http://www.kathreinusa.com)

Kathrein USA, Germany, Plaza II, 2400 Lakeside Blvd., Suite 650, Richardson TX 75082  
Phone: 214-238-8800 Fax: 214-238-8801 Email: info@kathrein.com

Page 2 of 3 80010745, 80010746 Page 1 of 3

BluNotes, 80010745, 80010746 Page 1 of 3  
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Phone: 214-238-8800 Fax: 214-238-8801 Email: info@kathrein.com

# Antenna Specifications - Omnidirectional (continued)

## Accessories General Information

### KATHREIN

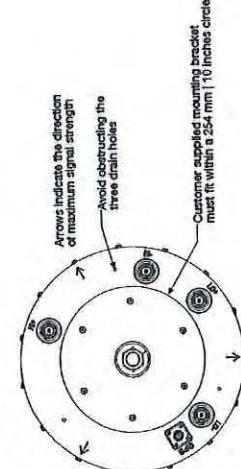
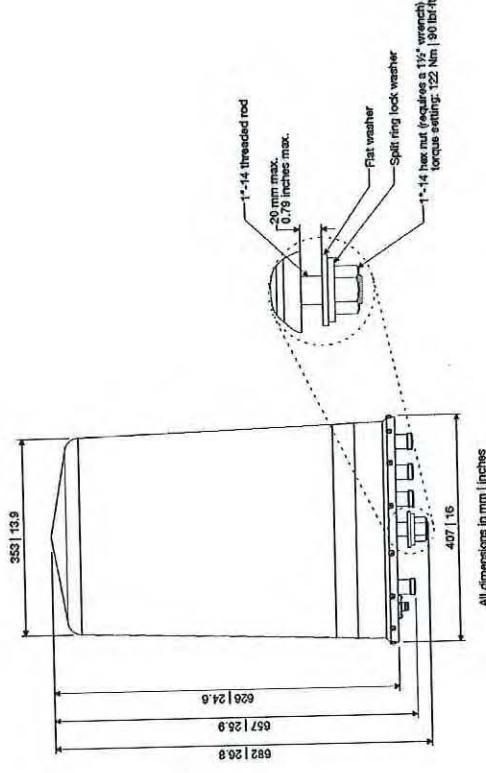
### General Information about Panel Antennas

### KATHREIN

**Antenna area:**  
Reflector screen: Aluminum, Ral color: Tin plated zinc.  
Omnidirectional panel antenna. The max. radome diameter is 500 mm and the height is 100 mm. The base material guarantees optimum performance with regards to stability, stiffness, UV resistance and painting.  
Radome colour standards: Brown, 80010745; Grey, 80010746.

Designed to be mounted on top of a utility pole using a custom mounting bracket supplied by the customer.

**Mounting:**



906.533/1a Subject to alteration.

Kathrein cellular antennas are designed to operate under the environmental conditions as described in ETS 300 019-1-4 class 4.1 E.

The antennas exceed this standard with regard to the following items:

- Low temperature: -65 °C
- High temperature (dry): +60 °C
- For antennas equipped with Flex-RET: The electrical downtilt adjusting is designed to be used under the environmental conditions as described in the valid data sheet of the Flex-RET.

**Ice protection:** Due to the very sturdy antenna construction and the protection of the radiating system by the radome, the antenna remains operational even under icy conditions.

Kathrein antennas fulfill the stated specifications after completion of the environmental tests as defined in ETS 300 019-2-4. The homogeneous design of Kathrein's antenna families uses identical modules and materials. Extensive tests have been performed on typical samples and modules. The vibration test has been adapted relating to frequency and acceleration to the conditions of most mounted antennas.

As a result of more stringent legal regulations and judgements regarding product liability, we are obliged to point out certain risks that may arise when products are used under extraordinary operating conditions.

The mechanical design is based on the environmental conditions as stipulated in ETS 300 019-1-4. Wind loads are calculated according to DIN 1055-4. The antennas may be used at locations where the anticipated peak wind velocity or gust wind speed lies within the maximum wind speed listed in the data sheet. We warrant the mechanical safety and electrical functionality under such conditions. The wind speeds are defined in accordance with the DIN, EN or TIA standards. This warranty makes allowance for the partial factors specified in those standards. Extraordinary operating conditions, such as heavy icing or exceptional dynamic stress (e.g. strain caused by oscillating support structures), may result in the breakage of an antenna or even cause it to fall to the ground. These facts must be considered during the site planning process.

The details given in our data sheets have to be followed carefully when installing the antennas and accessories. Site planning and installation must be carried out by qualified and experienced staff. All relevant national safety regulations must be upheld and respected. Incorrect site planning, faulty installation, as well as interfering surroundings on site, may lead to deviations in the electrical parameters compared to those specified in the respective data sheets. The connectors on this product are only suitable for connecting to the compatible counterpart. Please ensure that the connected cable has been fitted with a connector of the same standard, otherwise damage may occur.

The tilt values will be set to any arbitrary value in the given tilt range. These values are independent from the frequency band or antenna type and can vary between antennas and bands.

Herby, Kathrein Werke KG declares that the radio equipment is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: <http://www.kathrein.com>

906.533/1a Subject to alteration.

30010745\_80010746 Page 3 of 3

All specifications are subject to change without notice.

The above specifications are available at [www.kathrein.com](http://www.kathrein.com)  
Kathrein USA, Greenway Plaza II, 2400 Lakeside Blvd., Suite 650, Richardson TX 75082  
Phone: 214.258.8300 Fax: 214.258.8301 Email: info@kathrein.com

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Phone: 214.258.8300 Fax: 214.258.8301 Email: info@kathrein.com

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Our products are compliant to the  
environmental requirements as laid  
down in the RoHS Directive. As far as is  
known, no substances prohibited by  
RoHS Directive are present in our  
products.



Our quality assurance systems and our  
environmental management system apply  
to the entire company and are certified  
by TÜV according to DIN ISO 9001 and  
EN ISO 14001.

The above specifications are available at [www.kathrein.com](http://www.kathrein.com)  
Kathrein Werke KG, Greenway Plaza II, 2400 Lakeside Blvd., Suite 650, Richardson TX 75082  
Phone: 214.258.8300 Fax: 214.258.8301 Email: info@kathrein.com



Clever Buoy™ is an autonomous marine monitoring system developed by Australian company, Smart Marine Systems (**SMS**). The system is an ocean monitoring platform that specializes in detecting large marine life using state of the art sonar and identification software systems to relay critical information to authorities responsible for beach safety.

The monitoring system is designed to be deployed beyond the surf zone and utilizes a combination of acoustic receivers and multi beam sonar transducers that are mounted on the ocean floor coupled with newly developed detection software to scan for marine life. The system creates a “virtual net” at the deployment locations and once an object is detected in the area, the software interrogates the target’s swimming pattern to determine the type of object and potential species.

If the target is determined to exhibit shark like movement patterns, information is transmitted to lifeguards within seconds notifying them of the target and the location via a real-time mobile application with automated notifications and warning information.

Clever Buoy™ is unique in the market as a viable commercially-available shark mitigation method, using non-invasive technology solutions suitable to protect high intensity surf zones. The stability and robustness of the current Clever Buoy™ platform has been verified to sustainably operate in open ocean conditions 24 hours a day, 365 days a year, autonomously monitoring marine life and alerting the presence of large animals which could be a threat to beach users.

The following PowerPoint slides provide additional information on Clever Buoy, as well as, a suggested deployment strategy for Cape Cod with a proposed budget and timeline. For more information on Clever Buoy contact.

Mr. Craig Anderson  
Executive Director  
Smart Marine Systems  
Level 1, 31 Cliff Street  
Fremantle Western Australia 6160  
M: 0418 811 511 | P: 1300 524 392  
E: [craig.anderson@smartmarinesystems.com](mailto:craig.anderson@smartmarinesystems.com)

## Potential Clever Buoy Roll Out Plan

### Year 1 Role Out

6 – 8 Clever Buoy Telemetry Series  
1 Clever Buoy Virtual Net Series  
Estimated Cost - \$1M



## Year 2 Role Out

Additional 6 – 8 Clever Buoy Telemetry Series

Additional 3 Clever Buoy Virtual Net Series

Estimated Cost - \$2M



## Year 3 Role Out

Additional 6 – 8 Clever Buoy Telemetry Series

Additional 3 Clever Buoy Virtual Net Series

Estimated - \$2M



### NOTES

**Clever Buoy Telemetry Series** – Real time autonomous buoy with acoustic tag receiver with 500 yard radius coverage, full communications (3G/4G/Satellite), mobile application and MET Station.

This series will alert all tagged animals within a 500 yard area and relay information to identified end users via mobile application.

Equipment Cost Estimate - \$35k each (excluding delivery and installation)

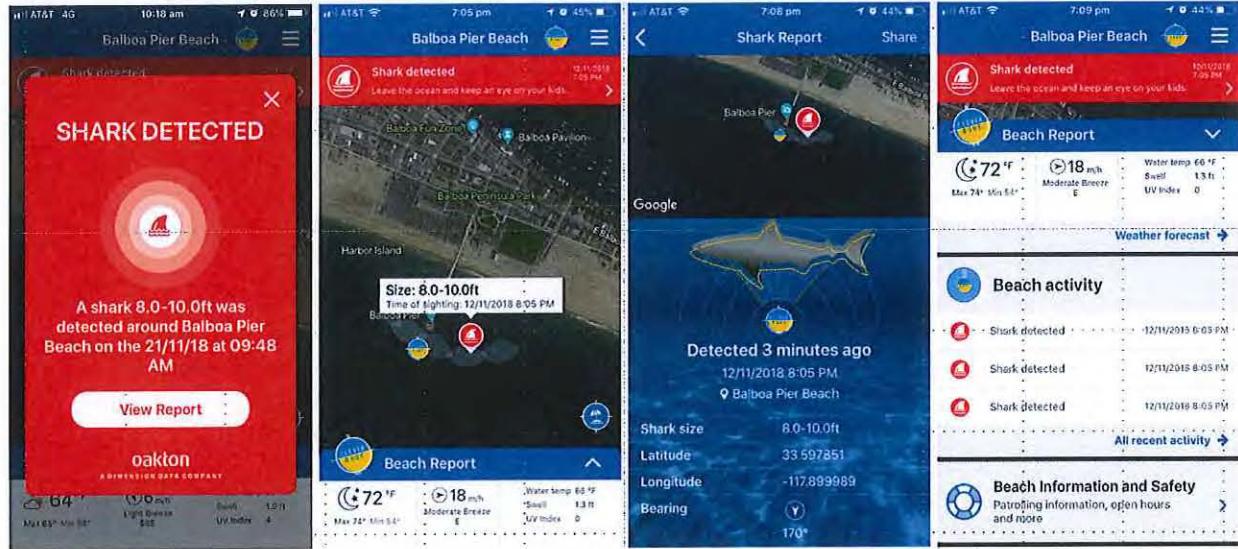
**Clever Buoy Virtual Net Series** – Real time autonomous buoy with acoustic tag receiver with 500 yard radius coverage, sonar shark detection system with 500 year linear coverage, full communications (3G/4G/Satellite) and MET Station. This series will alert all animals (tagged and untagged)within a 500 yard area and relay information to identified end users via mobile application.

Equipment Cost Estimate - \$500K each (excluding delivery and installation) or lease/hire at \$15K per month.

\*\*Delivery and Installation Costs require firm quotation from local marine service contractors.

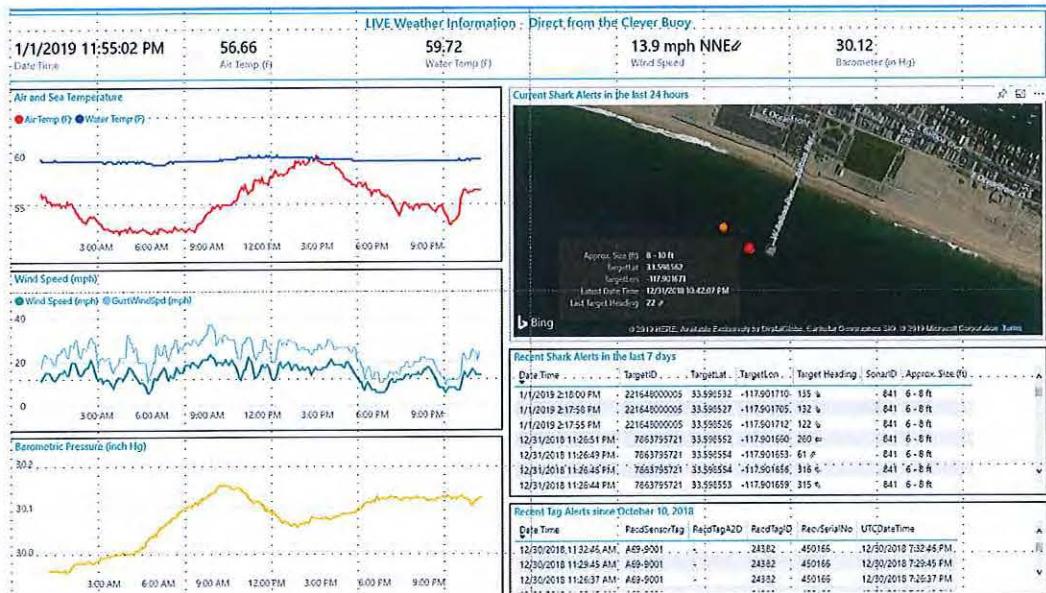
## Mobile Application

All critical environmental information and alerts are available on a dedicated mobile application and can be integrated with current emergency service operations.



## Environmental Data and Information

A wide range of additional environmental and research information and data can be integrated through desktop dashboards customizable to each location.





SMART MARINE SYSTEMS

## Clever Buoy

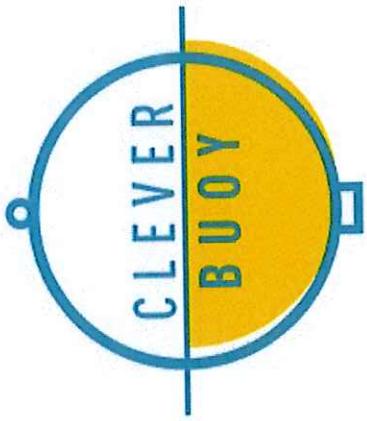
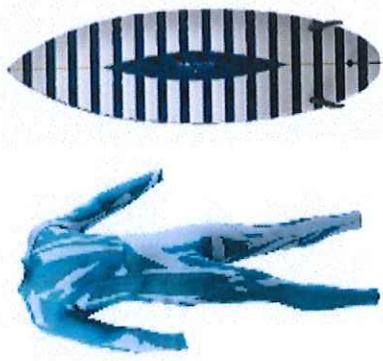
Real-Time Marine Monitoring Solution



# The Company

Smart Marine Systems Ltd (ASX:SM8)

*"scientifically developed, non-invasive, marine technologies"*



SEABINPROJECT.COM

## SAMS™

Shark Attack Mitigation Systems Visual Technology which is applied to wetsuits and water sport products to disrupt sharks visual systems

## Clever Buoy™

Automated marine monitoring and alert system using real time sensor technology to autonomously monitor near shore marine environments and send alerts to shore for immediate action

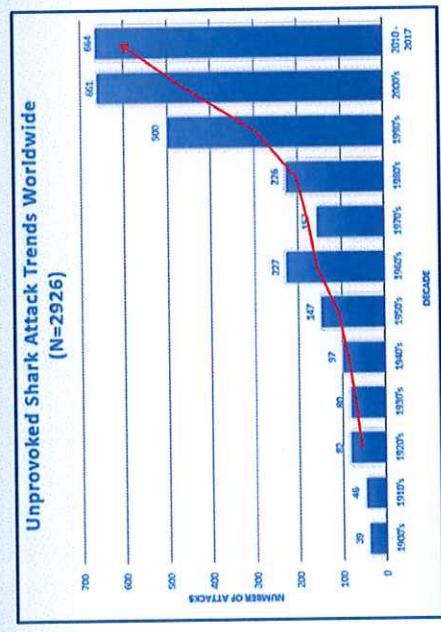
## Seabin

The revolutionary ocean plastics cleaning device that catches floating rubbish, oil, fuel and detergents and makes oceans cleaner

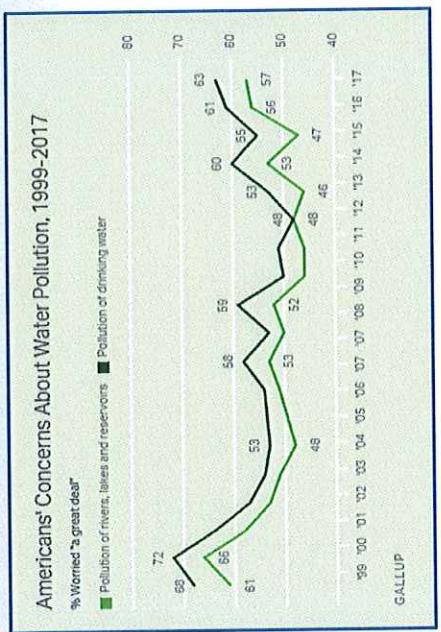


# Increasing Public Concerns

## 1. Beach Safety



## 2. Water Quality



## 3. Maritime Surveillance



1. Growing concern for  
shark attacks that impact  
coastal communities in  
social and economic ways.

2. Accurate real-time  
marine data and cleanup  
solutions are critical to the  
marine environment.

3. Surveillance for Public  
and Private marine  
property is emerging as a  
more urgent problem.



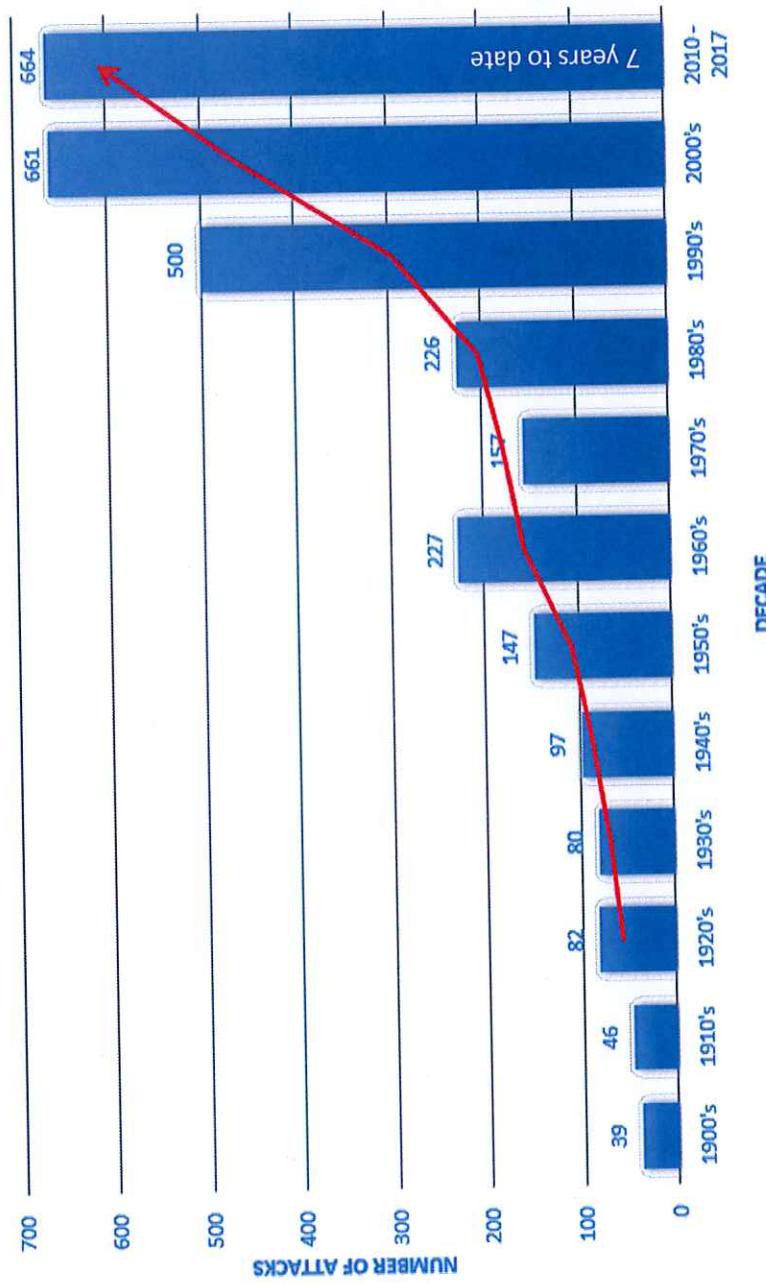
# Clever Buoy – Solutions Platform

- Industrial buoys rated to Category 5 storms with on-board **Solar Panels and Lithium Batteries**
- Autonomous 24/7 marine monitoring and alert system
- Real-time sensor technologies to monitor near shore marine environments.
- On-board data processing and communications solutions transmitting data to the cloud
- Custom Apps and dashboards
- display data for end users



# 1. Public Safety – Shark Attacks

**Unprovoked Shark Attack Trends Worldwide  
(N=2926)**



The global incidence of shark attacks is small, but rising with 2015 the worst year recorded with 98 unprovoked attacks.

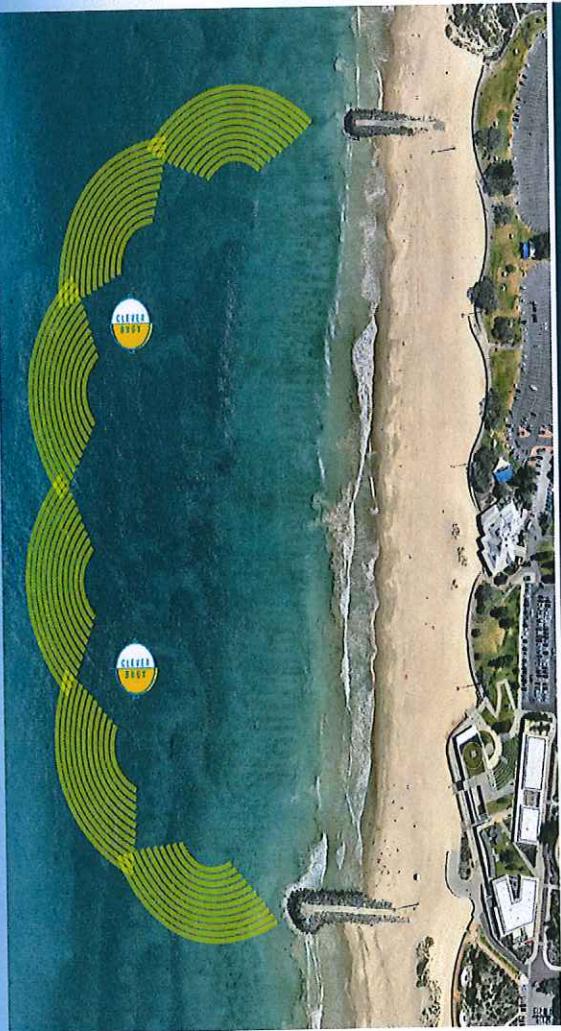
The impact on coastal communities is profound, far-reaching and commercially devastating.

Ineffective mitigation strategies are often employed to allay fears and give the appearance of action.

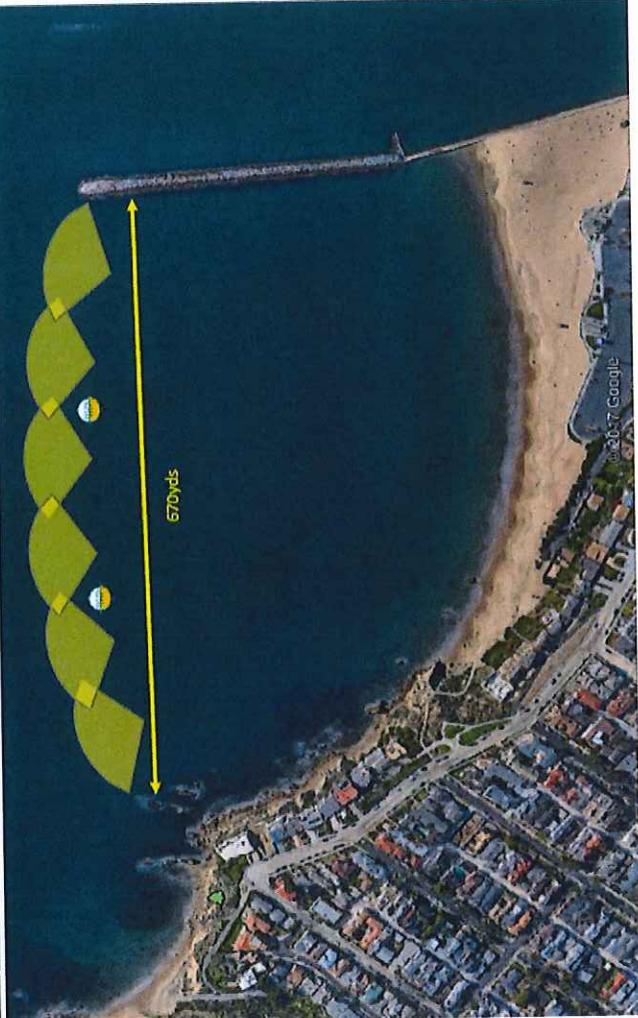


# The Solution

## Clever Buoy - the virtual Shark Net



**City Beach  
Installation  
Perth, Western  
Australia**



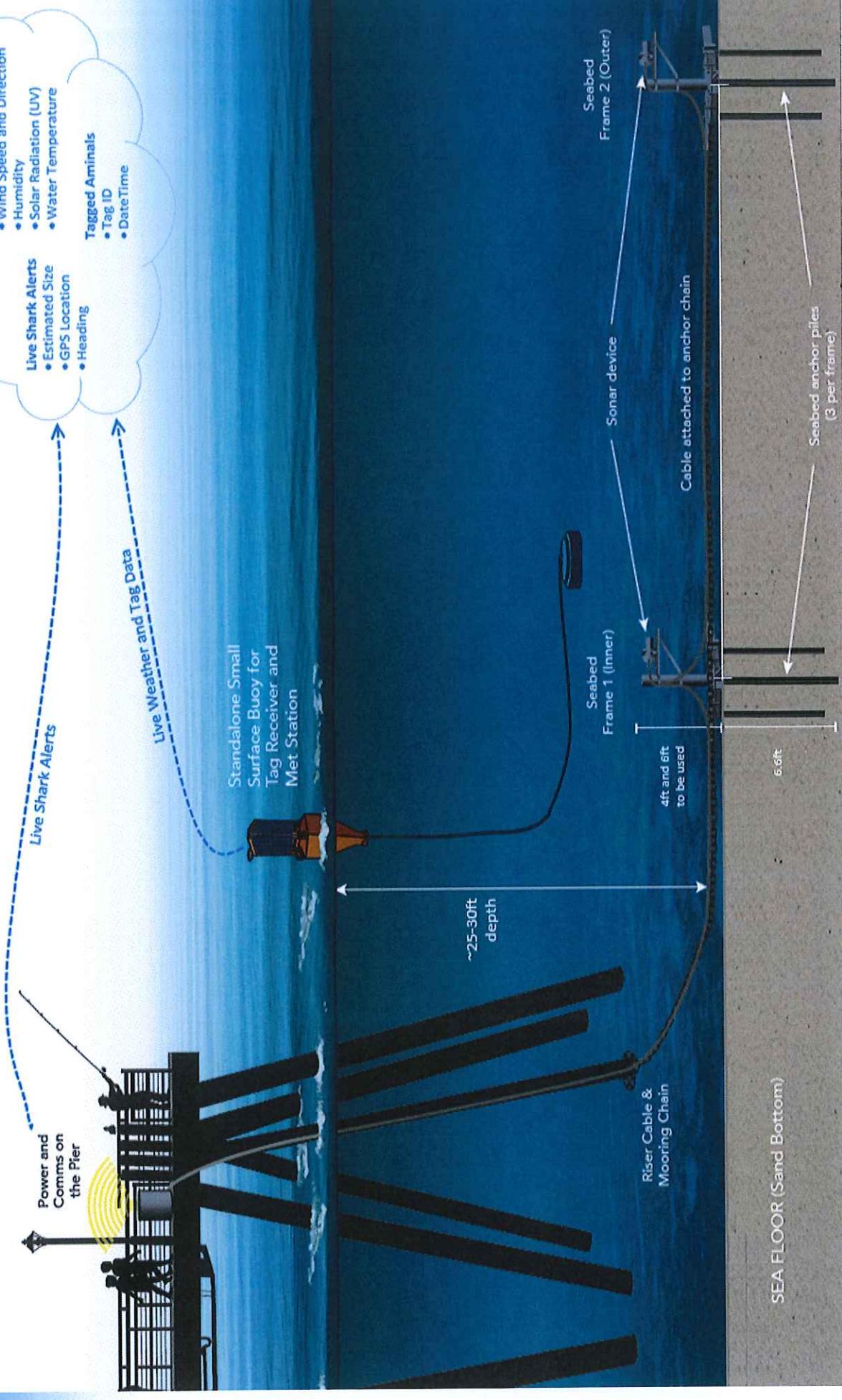
**Corona Del  
Mar Design  
California,  
USA**



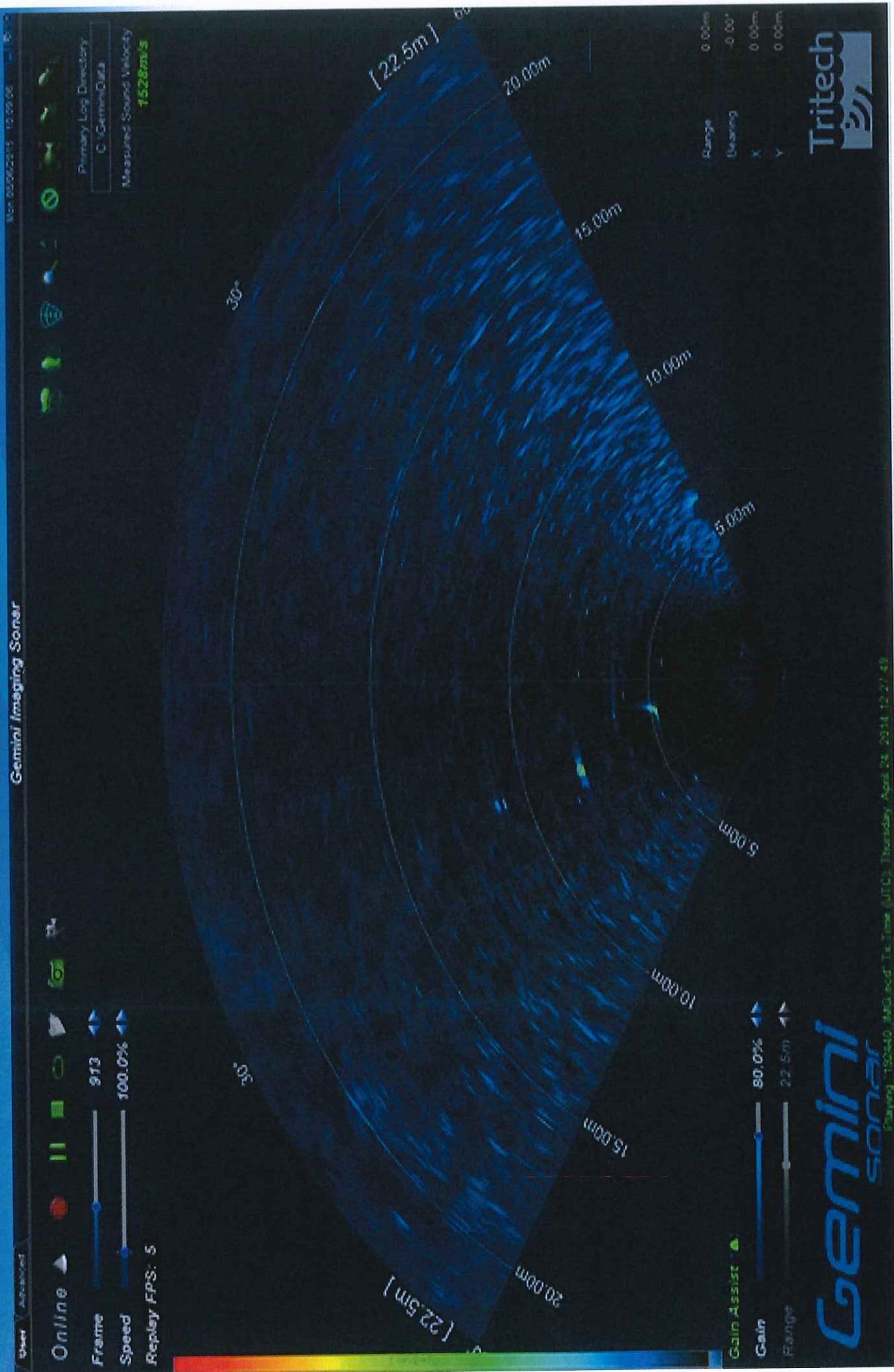
# Clever Buoy – Equipment

## Clever Buoy Technology – Surface to Seabed Diagram

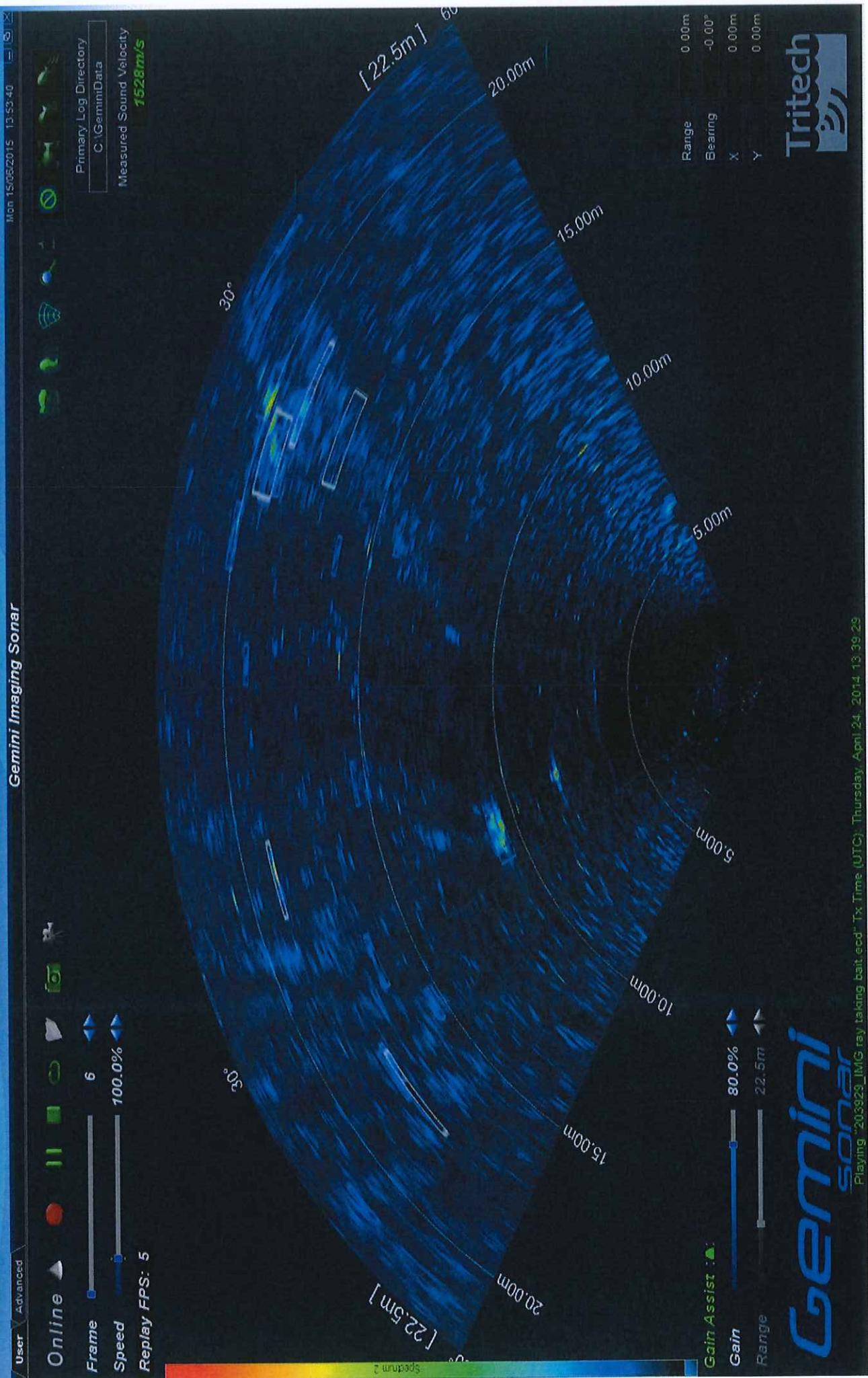
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# Clever Buoy – Shark Detection



# Clever Buoy – Sting Ray



# Public Safety – Real Time Alerts

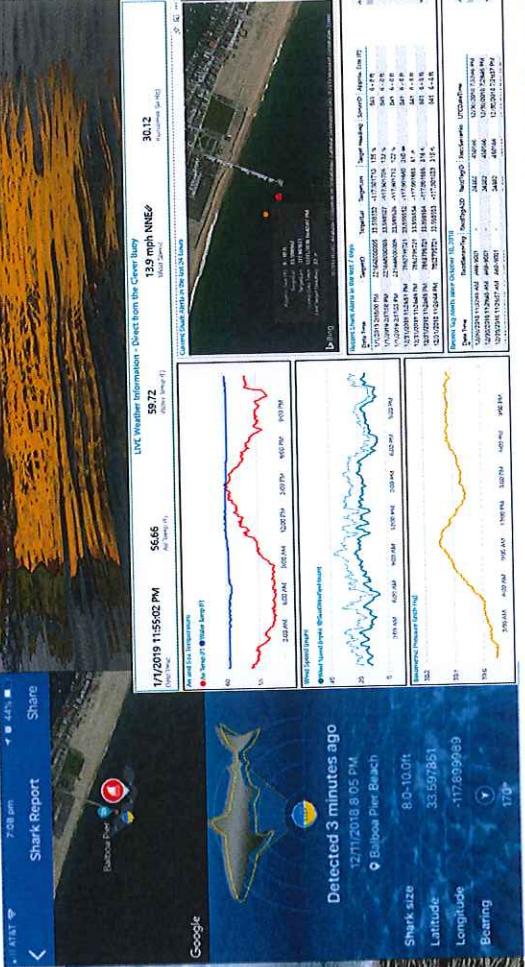
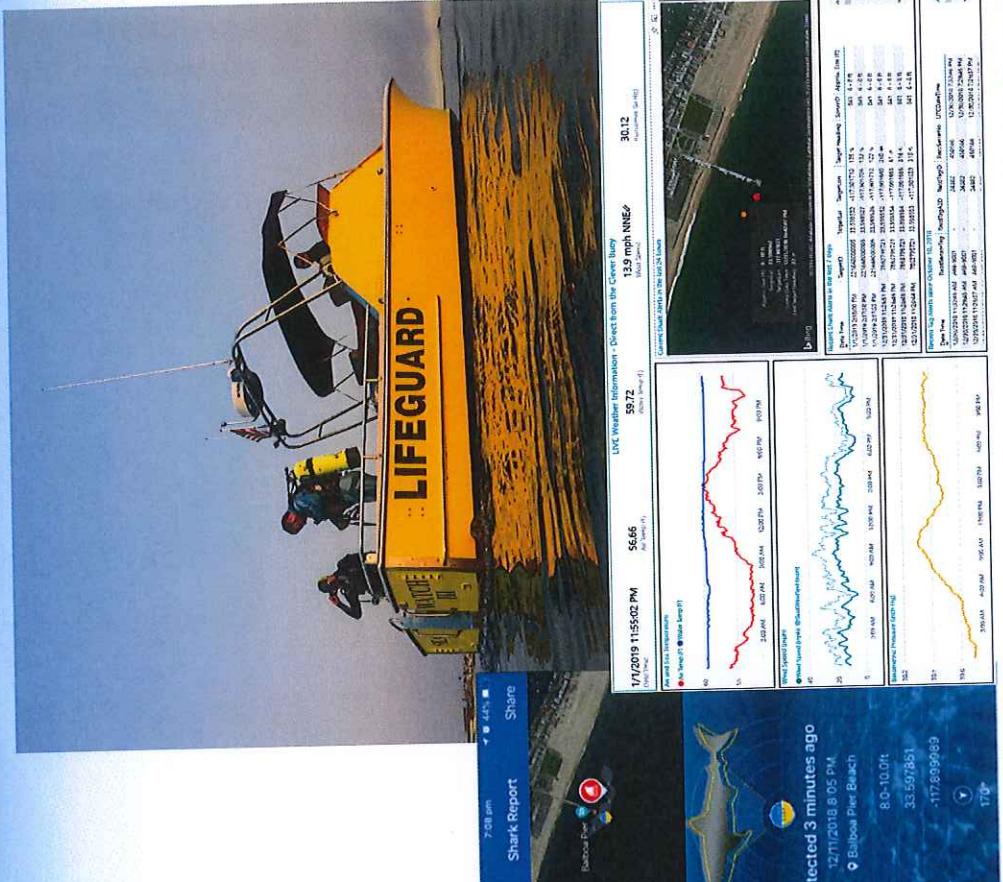
The collage consists of five screenshots from a mobile application:

- Top Left:** A red alert card with a large "X" in the top right corner. It displays the text "SHARK DETECTED" in white, a circular icon with a shark silhouette, and a red circular button with a white exclamation mark.
- Top Middle:** A screenshot showing a map of the Balboa Peninsula area. A red marker indicates the "Balboa Pier Beach" location. A red alert box on the right says "Shark detected" and "Leave the ocean and keep an eye on your kids." Below the map is a "Beach Report" section with weather information: \* 72°F, Max 74° Min 54°, Wind 18 mph Moderate Breeze E, Water temp 66 °F, Swell 1.3 ft, UV Index 0, and a timestamp of 12/11/2018 7:05 PM.
- Top Right:** Another screenshot of the same map and report. It includes a "Weather forecast" section with a blue icon and a "Beach activity" section with a red icon.
- Middle:** A screenshot showing a map of the same area. A red marker indicates "Balboa Pier Beach". A red alert box says "Shark detected" and "Leave the ocean and keep an eye on your kids.". Below the map is a "Beach Report" section with weather information: \* 72°F, Max 74° Min 54°, Wind 18 mph Moderate Breeze E, Water temp 66 °F, Swell 1.3 ft, UV Index 0, and a timestamp of 12/11/2018 7:08 pm.
- Bottom:** A screenshot showing a map of the same area. A red marker indicates "Balboa Pier Beach". A red alert box says "Shark detected" and "Leave the ocean and keep an eye on your kids.". Below the map is a "Beach Report" section with weather information: \* 72°F, Max 74° Min 54°, Wind 18 mph Moderate Breeze E, Water temp 66 °F, Swell 1.3 ft, UV Index 0, and a timestamp of 12/11/2018 7:09 pm.



# Lifeguard Integration

- The system integrates directly into existing Shark Sighting Action Plans and Shark Policy's.
- This allows lifeguards to directly respond to all alerts during their hours of operation.



# Public Safety – Real Time Dashboards

**LIVE Weather Information - Direct from the Clever Buoy**

1/1/2019 11:55:02 PM	56.66	59.72	30.12
Air Temp (F)	Water Temp (F)	Wind Speed	Barometer (in Hg)

**Air and Sea Temperature**

Date Time	Air Temp (F)	Water Temp (F)
1/1/2019 11:55:02 PM	56.66	59.72

**Wind Speed (mph)**

Date Time	Wind Speed (mph)	GustWindSpd (mph)
1/1/2019 11:55:02 PM	56.66	59.72

**Barometric Pressure (inch Hg)**

Date Time	Barometric Pressure (inch Hg)
1/1/2019 11:55:02 PM	30.1
1/2/2019 12:00:00 AM	30.2

**Current Shark Alerts in the last 24 hours**

Approx. Size (ft) 8 - 10 ft  
Target Lat: 33.598562  
Target Lon: -117.901671  
Latest Date Time: 12/31/2018 10:42:07 PM  
Last Target Heading: 22.7°

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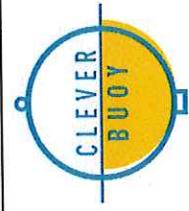
Bing

**Recent Shark Alerts in the last 7 days**

Date Time	TargetID	TargetLat	TargetLon	Target Heading	SonarID	Approx. Size (ft)
1/1/2019 2:18:00 PM	221148000005	33.598532	-117.901710	135.5°	S41	6 - 8 ft
1/1/2019 2:17:58 PM	221148000005	33.598527	-117.901705	132.5°	S41	6 - 8 ft
1/1/2019 2:17:55 PM	221148000005	33.598526	-117.901712	122.5°	S41	6 - 8 ft
12/31/2018 11:26:51 PM	7863795721	33.598532	-117.901660	260.0°	S41	6 - 8 ft
12/31/2018 11:26:49 PM	7863795721	33.598534	-117.901653	61.7°	S41	6 - 8 ft
12/31/2018 11:26:46 PM	7863795721	33.598534	-117.901656	316.8°	S41	6 - 8 ft
12/31/2018 11:26:44 PM	7863795721	33.598533	-117.901659	315.8°	S41	6 - 8 ft

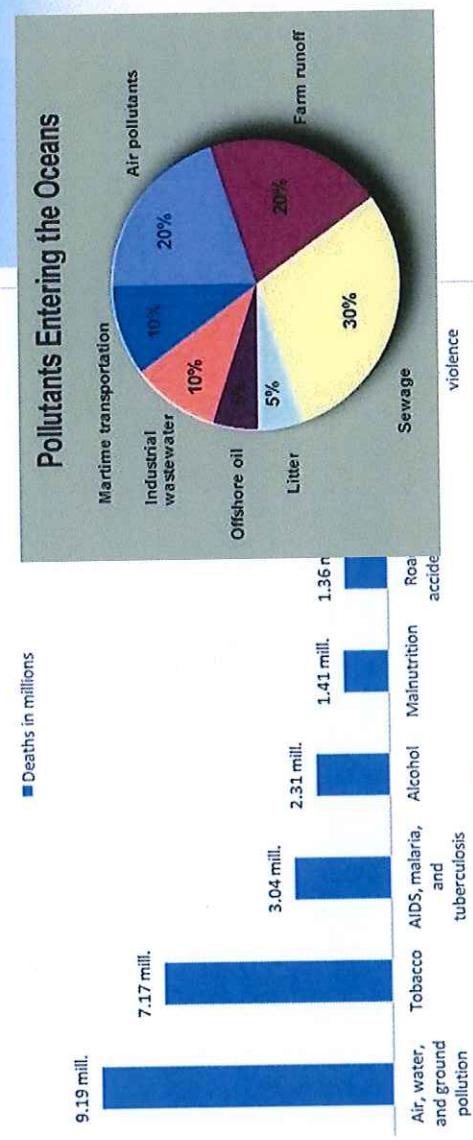
Recent Tag Alerts since October 10, 2018

Date Time	RecdSensorTag	RecdTagA2D	RecdTagID	RecdSerialNo	UTCDate/Time
12/30/2018 11:32:46 AM	A69-9001	-	24382	450166	12/30/2018 7:32:46 PM
12/30/2018 11:29:45 AM	A69-9001	-	24382	450166	12/30/2018 7:29:45 PM
12/30/2018 11:26:37 AM	A69-9001	-	24382	450166	12/30/2018 7:26:37 PM

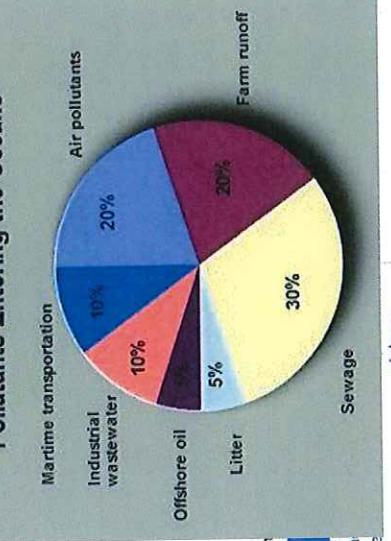


## 2. Water Quality — Public Concern & Infrastructure Crisis

Causes of Global Mortality in 2015

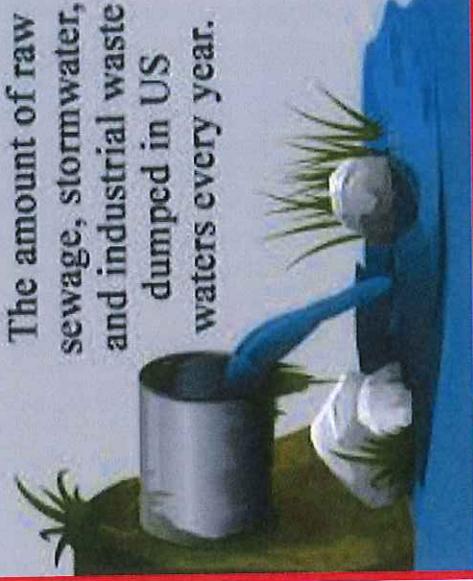


Pollutants Entering the Oceans

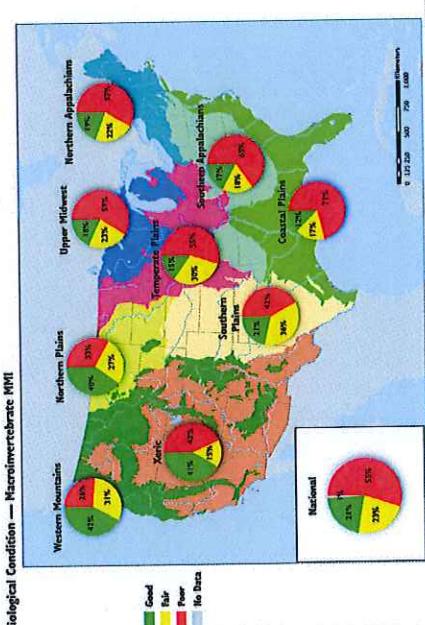
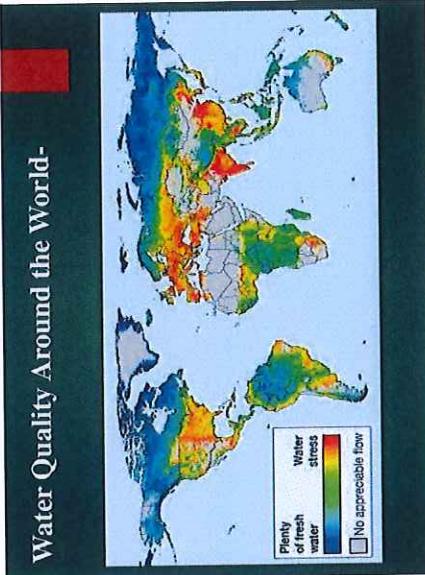


### 1.2 Trillion Gallons

The amount of raw sewage, stormwater, and industrial waste dumped in US waters every year.



Water Quality Around the World



THE LANCET, WITH DATA FROM THE BIOLOGICAL CONDITION — Macroinvertebrate MRI

320 Million US residents living with ageing infrastructure

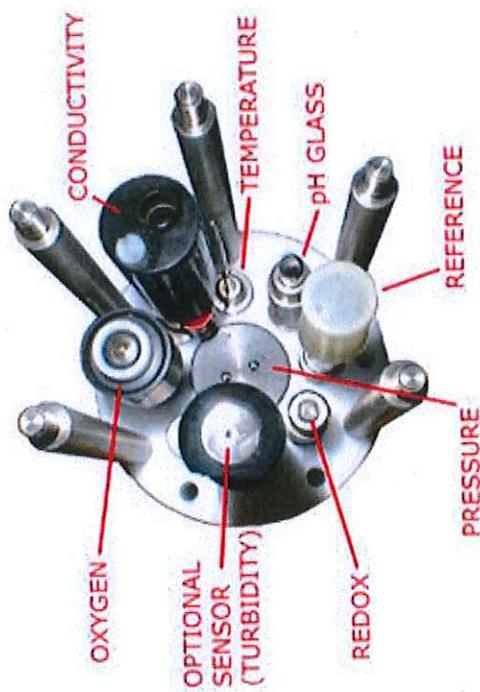


# Clever Buoy - Integrated Water Monitoring Sensors



## Water Quality Attributes

- CTD Profile (Conductivity, Temperature, Depth);
- Dissolved Oxygen;
- Light Attenuation;
- Chlorophyll-a;
- Hydrocarbon;
- Salinity;
- Turbidity and more



## Environmental Attributes

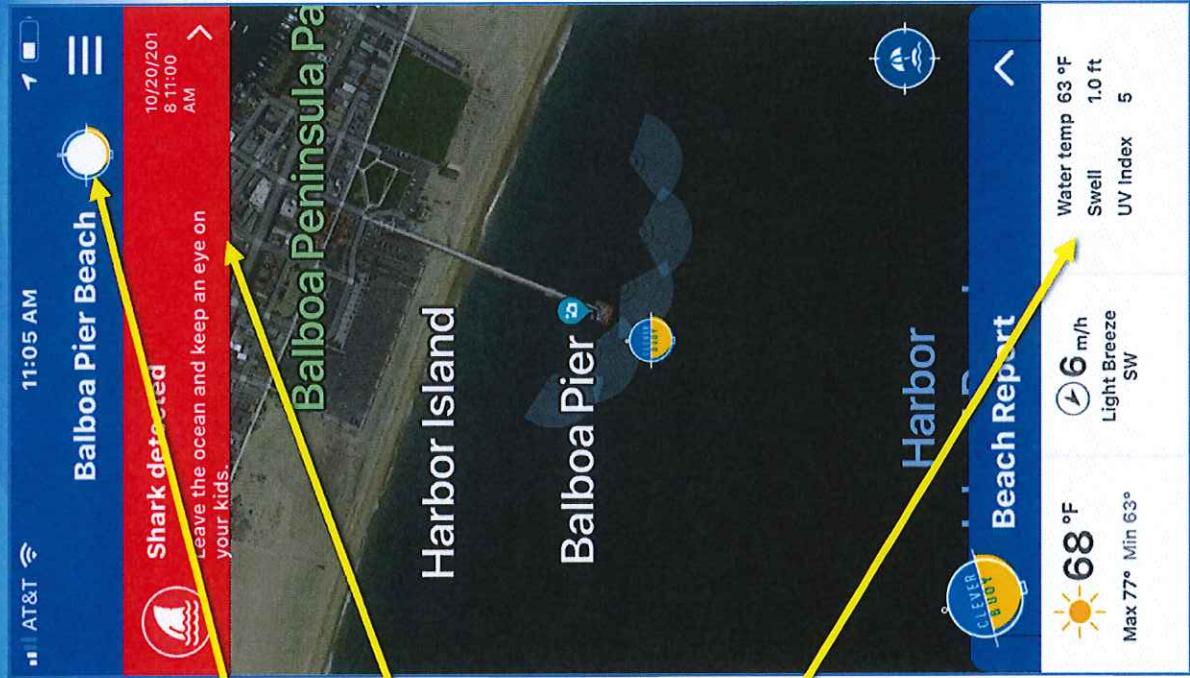
- Wave motion sensor
- Hydrophone
- Other sensors available



# Environmental Data – Real Time

Live Feed of a range of  
customisable Environmental  
Data

- Acoustic tag receiver for tagged sharks and fish
- Alerts for Sonar Detection of Sharks in CB zone
- Meteorology station; Water temp, barometric pressure, wind speed, air temp, UV Index plus..



Real time information transfer to Cloud and onto the Web or Mobile App



### 3. Maritime Surveillance & Security



### Homeland Security



**PORT of  
SAN DIEGO**



**Port of  
LONG BEACH**

*The Green Port*



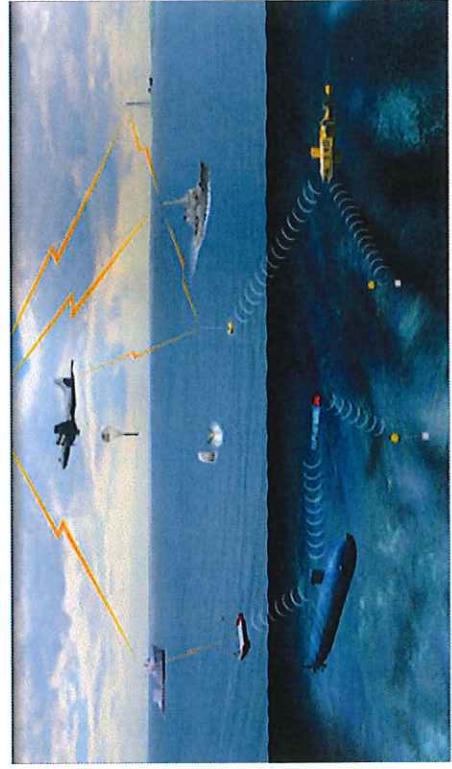
**Threats to Navy and Public Harbors  
and Private Infrastructure**



**sds**  
SMART MARINE SYSTEMS

# Clever Buoy - Marine Acoustic Systems

1. Long distance alerts to surface and underwater powered incursions from buoy based hydrophones
2. Expanded hydrophone array powered off Clever Buoy
3. AI software and alert database can be developed to recognize threats and generate alerts via Clever Buoy
4. 24/7 autonomous operation
5. Data delivered live to Apps, web pages and future devices
6. Date/Time, Hydrophone ID, Target ID, Target Position, Probability %, Target Velocity/GPS location data delivered live to Apps, web pages and future devices
7. Local Weather Data can be added to aid in future contact analysis



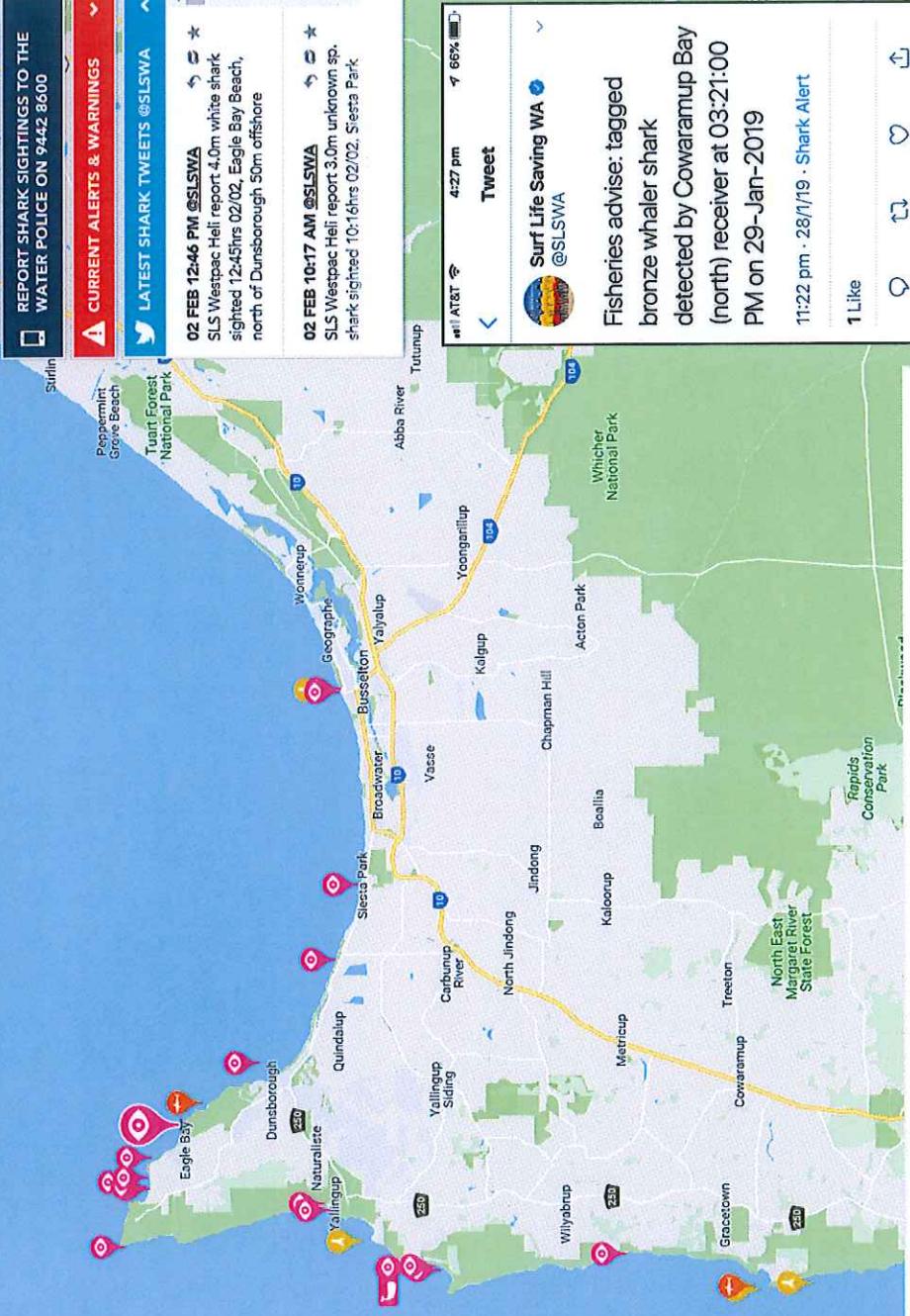
# Case Study – SmartShark WA



Search SharkSmart  
Search whole of W.A. Government

HOME SHARK ACTIVITY STRATEGY STAYING SAFE RESEARCH SPECIES NEWS AND ALERTS

SHARK ACTIVITY	
LAST 7 DAYS	



## EAGLE BAY BEACH, NORTH OF DUNSBOROUGH

1 unknown sp. shark sighting reported

1 white shark sighting reported

SLS Westpac Heli report 4.0m white shark sighted 12:45hrs 2/02, Eagle Bay Beach, north of Dunsborough 50m offshore.

SLS Westpac Heli report 2.8m unknown sp. shark sighted 15:20hrs 31/01, Eagle Bay Beach, north of Dunsborough 200m offshore sighted 200 m off the Eagle Bay boat ramp tracking West.

**REPORT SHARK SIGHTINGS TO THE WATER POLICE ON 9442 8600**

**A CURRENT ALERTS & WARNINGS**

**LATEST SHARK TWEETS @SLSWA**

**02 FEB 12:46 PM @SLSWA**  
SLS Westpac Heli report 4.0m white shark sighted 12:45hrs 2/02, Eagle Bay Beach, north of Dunsborough 50m offshore

**02 FEB 10:17 AM @SLSWA**  
SLS Westpac Heli report 3.0m unknown sp. shark sighted 10:16hrs 02/02, Siesta Park

**will AT&T 4:27 pm 7:66%**  
**Tweet**

**Surf Life Saving WA @SLSWA**  
Fisheries advise: tagged bronze whaler shark detected by Cowaramup Bay (north) receiver at 03:21:00 PM on 29-Jan-2019

1 Like

**11:22 pm · 28/1/19 · Shark Alert**

**Jallartagup Map data ©2019 Google Terms of Use**

# Integrated Solution – Clever Buoy

- **Automated marine monitoring system** that utilizes a range of sensors to collect and disseminate critical information to key maritime stakeholders.
- The Clever Buoy utilizes sonar detection to enable the establishment of a **protective perimeter** around a beach.
- **Autonomously identify large sharks** from other species and sends a warning signal to shore for human intervention response.
- **Customizable solutions** for various coastline configurations and public requirements.
- **AI Data Collection and Testing** in Sydney Aquarium, Abrolhos Islands (WA), Esperance (WA), Sydney Institute of Marine Science, Bondi Beach and Hawks Nest (NSW) and Newport Beach (USA).
- **Formally endorsed** by Australian Professional Ocean Lifeguard Association (APOLA) and Surfing WA.
- **Successful deployments** at **Bondi, Sydney** (2016) – multiple beach closures in 2 month period prior to installation and 33 sharks detected with no beach closures during 3 months deployment. **City Beach, Perth** (2016) with 27 threatening sharks detected over 3 month deployment and successful integration into Government Emergency Services notification network. **Newport Beach, California** in 2018 with 60 detections of threatening sharks over 100 days.
- Utilised by World Surf League at Championship Events in Australia and South Africa and various Triathlon, Ironman and Open Water Swimming Events.
- **Significant opportunity** for the **Cape Cod** community to install an integrated smart solution for the rising shark interactions and water monitoring utilizing the Clever Buoy technology to protect the public and the local economy.

