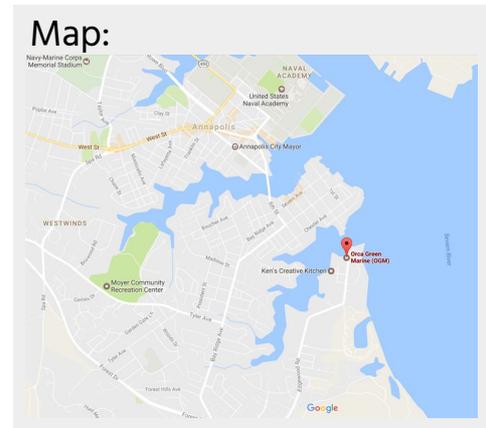


Appendix - Company Profiles



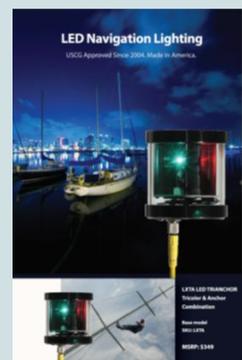
Overview (from OGM's product catalog):

Orca Green Marine (OGM) builds energy-efficient products from the ground up that will withstand the test of time and the harshest open ocean environment. The company aims to have a positive environmental impact, was founded in Austin, TX, and is currently located in Annapolis, MD. Their first products were field tested by the Navy Seals, circumnavigators and offshore racers, and they focus on customer feedback to continuously improve all products.



Quick Facts:

- Year Founded: 2002
- Company Type: Private
- Employees : 0-10
- Annual Sales: *Information not available*
- Number of Establishments: 1
- Key People: Meghan Matthews



Products/ Services & Markets

OGM's products feature classic designs to fit a variety of vessels and uses. They had the first USCG-approved LED navigation light, in 2004.

Prospects:

The company continues to innovate and is the founder of Silicon Bays, an ecosystem of universities, government, and industry that is striving to bring green tech and clean tech to the maritime industry.

Additional Info:

In addition to their LED navigation lighting, the company has also launched several portable solar and energy-harvesting products.



7040 Bembe Beach Road, Ste. 1., Annapolis, MD 21403 (1-443-699-6348) www.orcagreenmarine.com

Interviews:

We met Meghan at the Annapolis Sailboat Show and had an enlightening conversation with her that helped guide the direction of our project.

Meghan, who has a background in technology, has launched Silicon Bays, of universities, government, and industry that is striving to bring green tech and clean tech to the maritime industry.

When we asked why she has located the company in Annapolis, she said there were many reasons, including:

1. Location near the water helps her be near her customers.
2. Location in the “Sailing Capital of the World,” and in between Maine and Florida, also allows her to be near her customers.
3. Proximity to the Naval Academy and Norfolk is also helpful.
4. “It’s a good place to innovate while keeping in mind the ocean that we all love. Annapolis and Maryland are very cognisant of environmental sustainability and Chesapeake preservation.”

We also discussed what aspects of an innovation district, incubator, or makerspace would be helpful for OGM:

1. 3-D printers, milling machines, electronic testing equipment, pressure tanks, certification testing.
2. The testing equipment would be especially helpful.
3. Just one light going through Coast Guard and other certification testing can be very expensive, and can prevent small businesses from competing as easily as larger companies.
 - a. “We would see a lot more innovation happening if we had that level playing field.”

Meghan also emphasized how important a strong local labor pool is to small businesses, and that infrastructure (education, government, banking) needs to be there too.

When we discussed where innovation in the maritime industry is going, Meghan said that while there is always a traditional spirit in the maritime industry, technology in the field is going in the direction of: conservation, data collecting, and communicating the health of the oceans.

1. “We’ll start seeing big data more.”
2. “There’s so much we don’t know about our oceans.” And there is so much energy in our oceans.
3. Technology → Learning → Communicating.

Highlights:

“It’s a good place to innovate while keeping in mind the ocean that we all love. Annapolis and Maryland are very cognisant of environmental sustainability and Chesapeake preservation.”

When we discussed where innovation in the maritime industry is going, Meghan said that while there is always a traditional spirit in the maritime industry, technology in the field is going in the direction of: conservation, data collecting, and communicating the health of the oceans.

Details of the Interview:

Date:

10.10.16

Person interviewed:

Meghan Matthews, Founder

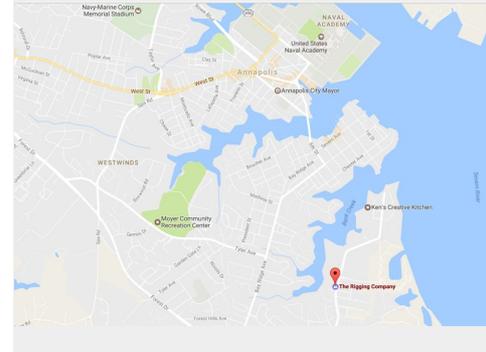
Interviewed By:

Joe Christo and Raynell Cooper

Overview (from The Rigging Company's website):

The Rigging Company, LLP was founded on the idea of offering customers the best quality service for the most competitive price available. Maintaining the ideals that each job should attain safety and functionality through simplicity, is the company mantra. Offering better than internet pricing to all of its customers, The Rigging Company wants to provide people with a quality of products and services that they have come to expect in the non-marine industry.

Map:



Quick Facts:

- Year Founded: 2011
- Company Type: Private
- Employees : 0-10
- Annual Sales: *Information not available*
- Number of Establishments: 1
- Key People: Sean Simmons and Jimmie Cockerill



Products/ Services & Markets

The company offers a full line of rigging products and services, including but not limited to: Complete spar packages as well as individual booms, spreaders, masts, and poles; Rigging related custom part fabrication and welding; Foresail furler service and installation.

Prospects:

While The Rigging Company is a small company offering a niche service, it is a service that continues to be in demand in Annapolis and throughout the Chesapeake Bay. Further, the company has a good reputation and a loyal customer base throughout the region.

Additional Info:

In addition to providing information about the company and its services, the company's website also serves as an educational resource about rigging techniques and rigging products.



7416 Edgewood Rd. Bldg. 7402 Ste. 1, Annapolis, MD 21403 (1-443-847-1004) www.theriggingco.com

Interviews:

We met Brad and Aaron at the Annapolis Sailboat Show, and they both offered us helpful insight into the maritime industry, especially the sailing side of the industry.

Brad expressed that a lot of rigging companies go out of business because it's a tough job, but that one of the reasons they are surviving is because they "sell like mad." He expressed that is especially important in the rigging business because you can't create demand, you need to capture it. He also noted that you "can't sell more than you can install."

In discussing the industry as a whole, he said that "As the middle class shrinks, sailing does too." And in a shrinking industry, he acknowledged that The Rigging Company can't directly compete with Defender and the other big guys - but they create an advantage by being more personal. Brad met Jimmy, the owner, through sailing.

Brad said that the members of the company all love sailing, and said that "The difference between sailboating and powerboating is a bunch of courage."

Brad also discussed the types of boats that are in Annapolis: it's not a deepwater harbor, so the boats tend to be smaller, with most being in the 30'-45' range, and 65' being huge (for Annapolis).

His colleague Aaron then joined and expressed that "A lot of people use the Chesapeake Bay as a proving ground and a training ground." He said that you can jump around, fix, prep, and get onto the Intracoastal Waterway.

In speaking about the parallels between sailing and entrepreneurship, Aaron and Brad expressed that in both environments, you have to think on your feet because a lot of times when things go wrong in sailing you've just got to figure it out.



Highlights:

In discussing the industry as a whole, he said that "As the middle class shrinks, sailing does too." And in a shrinking industry, he acknowledged that The Rigging Company can't directly compete with Defender and the other big guys - but they create an advantage by being more personal.

Brad said that the members of the company all love sailing, and said that "The difference between sailboating and powerboating is a bunch of courage."

Details of the Interview:

Date:

10.10.16

Person interviewed:

Brad Clark, Office Manager and
Aaron Moeller, Rigging Tech

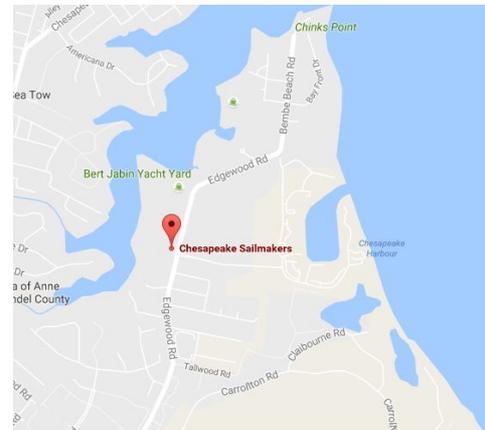
Interviewed By:

Joe Christo and Raynell Cooper

7416 Edgewood Rd. Bldg. 7402 Ste. 1, Annapolis, MD 21403 (1-443-847-1004) www.theriggingco.com

Overview:

Chesapeake Sailmakers is a small, boutique sailmaker that has created a niche market with the Club Racing, Coastal Cruising, Offshore and Bluewater sailing communities by providing highly customized products designed specifically to their needs. They support many regattas, events, sailing clubs and cruising rallies by offering educational seminars, individual on board consulting, and sail repair and service.



Quick Facts:

- Year Founded: 2003
- Company Type: Private
- Employees : 6
- Annual Sales: \$ 800,000
- Number of Establishments: 1
- Key People: Chuck O'Malley, Founder and Loft Manager



Products/ Services & Markets

The company produces durable blue water sails, as well as competition-proven racing sails by being well versed in all aspects of computer aided design, modern methods of sail construction and having an understanding of material applications.

Prospects:

Initially, the company both repaired and built new sails locally eventually realizing that to serve clients better there was a need to make changes. Moving forward the company has focused minimally on new sail construction. Instead, they have formed a strategic alliance with major offshore production sailmakers.

Additional Info:

The company has produced the EZ Main System as an innovative, simple, functional and cost effective solution for mainsail raising and lowering. After years of fine tuning, the concept was refined, making mains easier and safer to use.

Recognitions:

The World Cruising Club USA approached Chesapeake Sailmakers to build a new mainsail for a boat, which called for strength and durability, for an offshore mainsail capable of world cruising. Chesapeake Sailmakers traveled to St Thomas to complete a thorough measurement of the boat as well as an analysis of the rig set-up and tuning, offering some recommendations. This enabled them to build a better sail as well as offer insights and suggestions to improve the boat and get the most performance out of the new sail.

7366 Edgewood Road, Annapolis, Maryland 21403 (410-263-4840) www.chesapeake-sailmakers.com



Overview:

The Cover Loft is a full service custom canvas shop. It is the oldest of its kind in Annapolis and offers custom design and fabrication. The company has been in business for over 35 years manufacturing cushions, dodgers, biminis, sail covers, enclosures, repairs, and more.



Quick Facts:

- Year Founded: 1984
- Company Type: Private
- Employees : approx. 4
- Annual Sales: \$428,000
- Number of Establishments: 1
- Key People: Sean Lawlor, Owner



Products/ Services & Markets

The Cover Loft services many marinas in the Annapolis area, as well as locations at private homes and community docks. They generally travel within a one-hour area of Annapolis, including parts of the Eastern Shore and Baltimore. They offer special consideration for local transients that are traveling through the area and can even meet you at your boat if necessary.

Additional Info:

The Cover Loft also offers custom products including marine and non-marine items like awnings, firewood covers, grill covers, hot tub covers, kayak covers, log carriers, table covers, Surf Bike® covers, canvas bags, wine bags, enclosures for outdoor bars, Gore-tex® material applications, or anything else you might need covered.

Recognitions:

Cover Loft has outfitted covers for renowned musicians including the Rolling Stones and Bryan Adams. They have also designed prototypes for government projects and individual patent ideas.

412 Fourth Street, Annapolis, MD 21403 (410-268-0010) www.coverloft.com



Overview:

Starting as a small business in 1946, Lewmar has established itself as a global leader in the maritime industry for its design, manufacturing, and distribution of innovative, high-quality maritime equipment. Lewmar has won the prestigious DAME Design Award multiple times for its products, and three Queen’s Awards. While based in the United Kingdom, it has dealers in all seven continents, as well as an online store.

Quick Facts:

- Year Founded: 1946
- Company Type: Private
- Employees : 441
- Annual Sales: \$7.5 Million
- Dealers worldwide
- Key People: Peter Tierney, Chairman and CEO



Products/ Services & Markets

Lewmar is a worldwide distributor of maritime equipment for sailboats and powerboats, including hardware, winches, hydraulics, windlasses, anchors, thrusters, steering systems, hatches and portlights. The company also designs, manufactures and sells rigging fittings and hydraulic systems, including hydraulic cylinders, shackles, composite fiber rigging, wire rigging, mast fittings, rod rigging systems, rigging terminals/turnbuckles, hydraulic panels, and guardrails/lifelines. Lewmar distributes its products to boat builders and the retail sectors through a network of agents and distributors.

Prospects: Lewmar has expanded from the maritime industry to supplying a range of products for the wind energy industry, gondola production companies and for use in multiple vehicle applications.

Additional Info: The company was formerly known as Clyde Marine Plc and changed its name to Lewmar Marine plc in August 2007.

Recognitions:

- 2015 DAME Design Special Mention
- 2013 DAME Design Nominee
- 2006 DAME Design Award
- 1993 DAME Design Award
- 1980 Queen's Awards for Enterprise
- 1975 Queen's Awards for Enterprise
- 1972 Queen's Awards for Enterprise

Southmoor Lane, Havant, Hampshire, PO9 1JJ, United Kingdom | +44 (0) 23 9247 1841 | www.lewmar.com



Overview:

Sea Tow is a franchise-based marine assistance organization headquartered in Southold, New York. It was founded by Captain Joseph Frohnhoefer after the U.S Coast Guard stopped responding to non-emergency calls. Since then the organization has grown into a network of nearly 100 locations across the United States with additional offices in Europe and the Caribbean. The network consists of a team of captains, crew and support staff that are standing by, 24/7, to serve both Sea Tow members and other boaters.



Quick Facts:

- Year Founded: 1983
- Company Type: Private
- Employees (Locally): 1-4
- Annual Sales (Locally): <\$500,000
- Number of Establishments: >121
- Key People: Captain Joseph Frohnhoefer III, CEO
Dave DuVal, Store Owner



Products/ Services & Markets

Sea Tow members have access to nearly unlimited towing benefits should they break down on the water. The operators will also bring fuel to vessels that have run out, or give them a jump if the batteries have died. Also, while Sea Tow is a proponent of having a working VHF radio on board your boat for emergencies, for non-emergency assistance from Sea Tow members can also use the the Sea Tow App. The bulk of Sea Tow members are recreational boaters who are covered aboard any boat that they rent or charter.

Additional Info:

Sea Tow also offers boater Education classes through the US Power Squadron and the Coast Guard Auxiliary and maintains a nationwide network of OSHA-trained and certified personnel who respond to spills of all scales.

Recognitions:

The company received a Marine Marketers of America Award for its Designated Skipper Campaign in the category of "Best Event Marketing or Sales Promotion" at the Miami International Boat Show. The award recognized the awareness-raising efforts to promote the "Designated Skipper Program," which encourages boaters to designate a sober skipper whenever alcoholic beverages are being consumed onboard.

901 Monroe St, Annapolis, Maryland 21403 | (410-267-7650) | www.seatow.com



Gen-Air-Ator[®]
Custom Generator Compressor Combinations



Recognitions:

Patented ultra compact line of marine and industrial generator sets

Overview:

Next Generation got its start over 20 years ago when the company began manufacturing its patented ultra compact line of marine and industrial generator sets. Today, Next Gen provides a wide variety of innovative and customized power solutions for both marine and industrial markets. The company is known for creating custom power packages and combination units to meet its customers' unique needs.

Quick Facts:

- Year Founded: ~1996
- Company Type: Private
- Employees : 1-9
- Annual Sales: \$1-4.9 Million
- Number of Establishments: 1

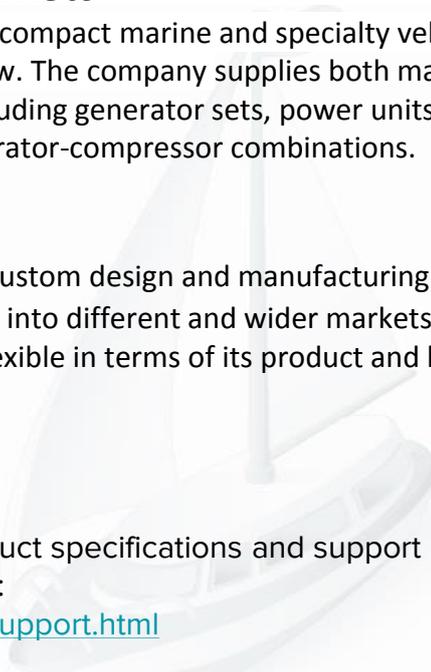
Products/ Services & Markets

Next Generation manufactures ultra compact marine and specialty vehicle diesel generator sets from 3.5 to 8 Kw. The company supplies both marine and industrial markets with products including generator sets, power units and compressors, as well as unique generator-compressor combinations.

Prospects: Next Generation's custom design and manufacturing process has enabled the company to expand into different and wider markets, which makes the company versatile and flexible in terms of its product and business viability.

Additional Info:

Next Generation also makes product specifications and support available directly on their website:
www.nextgenerationpower.com/support.html



Overview:

Nordhavn Pacific Asian Enterprises (PAE) was started by two friends in 1978 as a small business dealing primarily in yacht brokerage and the importation. Having become familiar with yacht design, the company ventured out into design and manufacturing in the 1980s with its unique trawler-styled vessel, and has since sold more than 500 of vessels, including larger 52-75 feet long vessels and motorsailers. Their boats are renowned for their structural strength and ability to cross oceans. Nordhavn's founders have made their vessels famous by proving their capability through several long ocean passages.



Quick Facts:

- Year Founded: 1978
- Company Type: Private
- Employees : 90
- Annual Sales: \$1-4.9 Million
- Number of Establishments: 1
- Key People: Dan Streech (President), Jim Leishman (Vice President and Chief Designer)



Products/ Services & Markets

Nordhavn designs, manufactures, and markets a line of ocean-going trawler-styled motor vessels, ranging from 40 to 120 feet (37 m) in length. On average, the motor vessels] travel at slow speeds - typically 7 to 10 knots (13 to 19 km/h) - but can cover long ocean passages.

Prospects: Nordhavn's market continues to grow as brand recognition increases and the company expands into different boat models. The company's most recent model to gain attention is the large luxury cruiser, Nordhavn 120.

Additional Info:

Nordhavn is also known for maintaining robust and active communication with consumers and the wider boating community. They maintain updated blogs, discussion boards, videos, photo galleries, and social media accounts.

Recognitions:

Smallest production powered vessel to circumnavigate the world, from November 3, 2001 - June 30, 2002, covering more than 24,000 miles (39,000 km) over some 170 days at sea.

2010 Motor Boat of the Year: Nordhavn 47

2010 Trawler Fest People's Choice: Nordhavn 55 & 64

2010 MotorBoating Best of the Year Dream Makers award

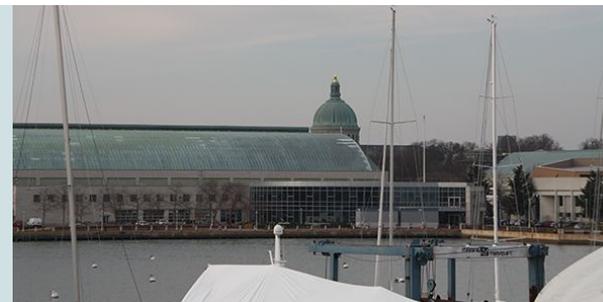
Overview:

Viking Systems is a solutions provider of conventional and specialized structural design, analysis, and verification of ships and offshore assets to ensure the highest quality structures while reducing the cost of construction and maintenance. The Viking team is comprised of experienced mechanical engineers, naval architects, marine engineers, civil engineers, software developers and business professionals.



Quick Facts:

- Year Founded: 2000
- Company Type: Private
- Employees : 13
- Annual Sales: \$3,252,538
- Number of Establishments: 5
- Key People: Lars Henriksen, President



Products/ Services & Markets

The Viking Annapolis office provides Design, Hydrodynamics, Initial Scantling Evaluation, Dynamic Load Assessment, Spectral Fatigue Analysis, Fracture, and Collision Analysis engineering services. Annapolis is also Viking's primary technology center. This office executes work on all types of projects, including structural design and analysis of conversions and new builds. Clients include; Oil and Gas companies, EPCI Contractors, Shipyards and owner/operators of vessels of all maritime industries, including US Navy, US Coast Guard and Military SeaLift Command.

Prospects:

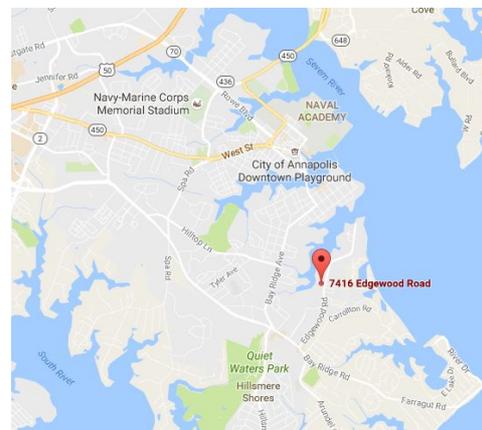
Viking Systems uses state-of-the-art modelling software, SAGA. All engineers are engaged in the use and demand for new features of SAGA, driving the development of the program by frequent communication and exchange of ideas to continue to expand the program and to ensure consistent quality oriented solutions.



Yacht Haven Building, 326 First Street, Suite 36 Annapolis, Maryland 21403 (410-263-1908) | www.viking-systems.net

Overview:

Kato Marine is a small Annapolis based firm that specializes in finely finished, high quality stainless and aluminum custom fabrications for the marine world. They design, or customize and engineer products in house. Due to their Flow water-jet cutter with a dynamic head, they are able to provide cutting service for parts up to 6 x 12 FT.



Quick Facts:

- Year Founded: 1988
- Company Type: private; produces in house
- Employees : 10 to 19
- Annual Revenue Estimate: \$5 to 10 million
- Number of Establishments: 1
- Key People: Terrie Olver, Keith Olver, Len Corasaniti

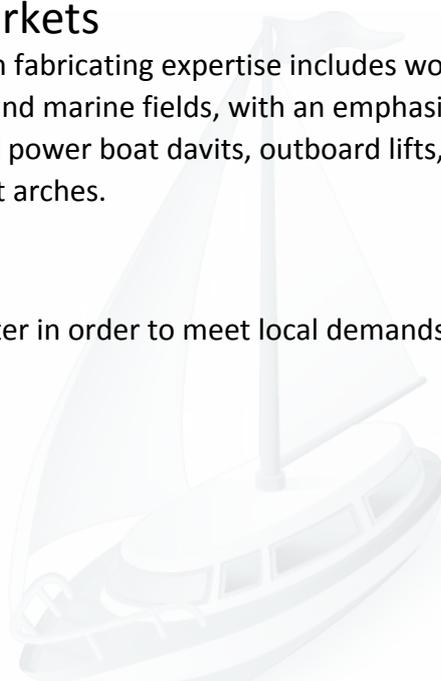


Products/ Services & Markets

Their stainless and aluminum custom fabricating expertise includes work in the architectural, residential, industrial and marine fields, with an emphasize on the latter. Marine products: sailboat and power boat davits, outboard lifts, poles and mounts for instruments, sailboat arches.

Prospects:

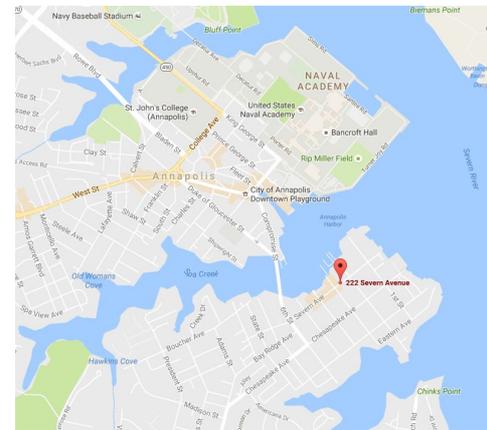
Kato recently added a water-jet cutter in order to meet local demands.



7416 Edgewood Road, Annapolis, Maryland 21403 (410-269-1218) <http://www.katomarine.com>

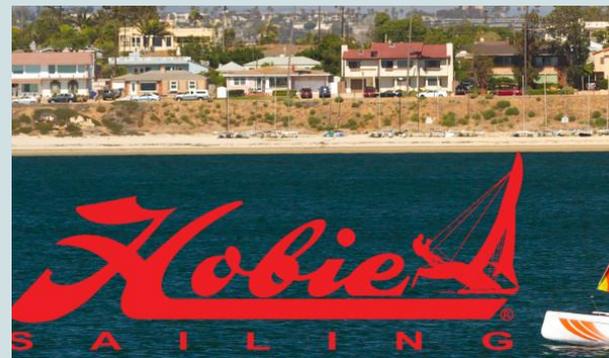
Overview:

Backyard Boats is a small recreational boating firm in Annapolis. It specializes in the retail of Hobie products that range from Stand Up Paddle Boards (SUPs) to boats, and parts and accessories, to second hand boats.



Quick Facts:

- In business since over 30 years
- Company Type: Private retailer (Hobie products)
- Employees: 1 to 4
- Annual Revenue Estimate: \$500,000 to \$1 million
- Number of Establishments: 3 (2 in MD, 1 in VA)
- Key People: Annapolis Sales Team: Dan



Products/ Services & Markets

Their main focus is on boat retail. They carry a full line of both new and pre-owned boats from dinghies and canoes to 60 foot yachts - sail and power, as well as stand up paddle boats. They also offer to take boats on consignment.



Prospects:

Hobie developed innovative MirageDrive pedal that can be used for small boats and SUPs, which has caught the Naval Academy's engineers' attention. The biggest challenge in Annapolis is the lack of supply of a skilled workforce.

222 Severn Avenue, Annapolis, Maryland 21403 (410-263-2900) <http://www.backyardboats.com>

Interview results:

Local advantages:

Annapolis's advantage are its reputation as the sailing capital, and a good, wealthy boating customer base who keep their boats in the midst of financial crisis. This good customer base that attracts firms, and a lot of talent for repair and maintenance. Another advantage is the Marine Trades Association job internship program that provides apprentices. They have had good experiences with the program, but still see the provision of a skilled, lasting labor force as a big challenge.

Local challenges:

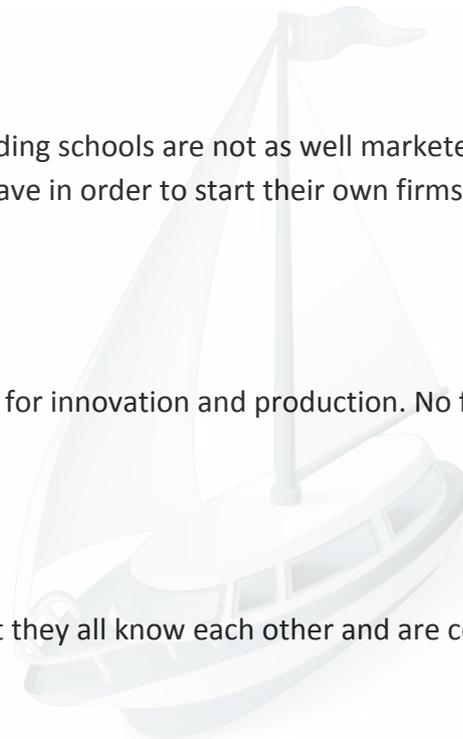
Availability of skilled labor, which is a nationwide problem. Trading schools are not as well marketed and desirable as higher educational institutions. Many people learn skills and leave in order to start their own firms where cost of living and doing business is cheaper.

Production/ Innovation:

No production in house. They rely on the Hobie manufacturers for innovation and production. No feedback loop of innovative ideas from dealer to manufacturer.

Existing local network:

Not really a collaborative/brainstorming/business network, but they all know each other and are connected through friendships.



Highlights:

Importance of improving the supply of skilled labor force.

Details of the Interview:

Date: 10/08/2016 at the Annapolis Sailboat Show

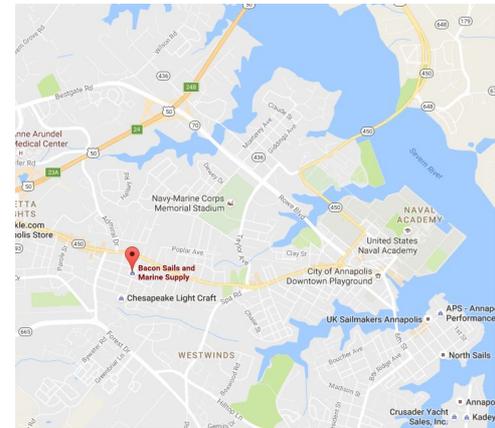
Person interviewed:
Dan,
Owner

Interviewed By:
Elisabeth Walker



Overview:

Annapolis boating supply store that started in MA, and moved to MD because of the existing sailing industry cluster. They sell a wide variety of smaller boating supplies, and make custom sails and spinnakers.



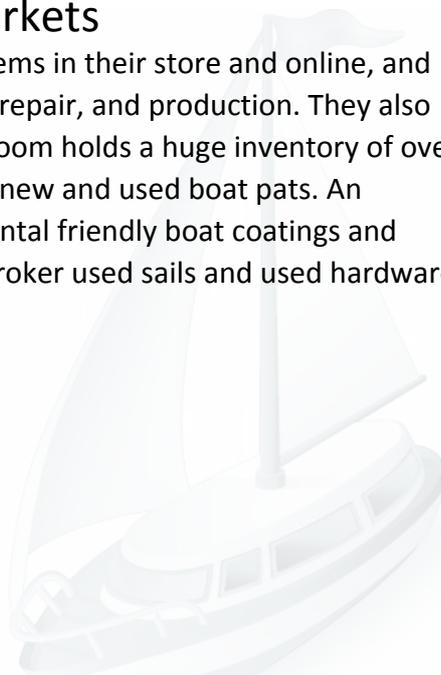
Quick Facts:

- Year Founded: 1959
- Company Type: Private retailer
- Number of Establishments: 1
- Key People: Gary Chwazik, General Manager



Products/ Services & Markets

They sell a wide variety of boating items in their store and online, and specialize in sail and spinnaker care, repair, and production. They also offer second-hand sails. Their showroom holds a huge inventory of over 10,000 sails, and a large selection of new and used boat parts. An interesting product is the environmental friendly boat coatings and paints selection. They also offer to broker used sails and used hardware.



116 Legion Ave, Annapolis, Maryland 21401 (410-263-4880) <http://baconsails.com/>



Interview results:

Local advantages:

- Good customer base: Annapolis is a one-stop shop for boat owners

Local challenges:

- High cost of living and making business

Production/ Innovation:

- Solar products

Existing local network:



Highlights:

Details of the Interview:

Date: 10/08/2016 at the Annapolis Sailboat Show

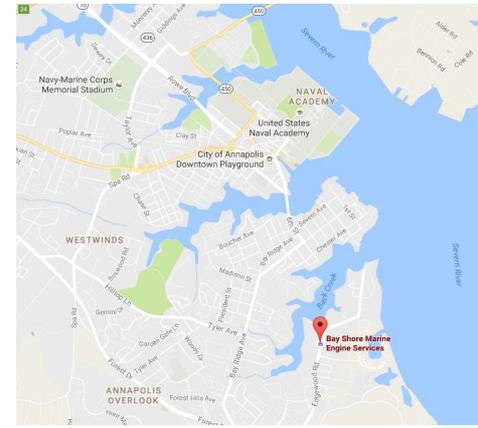
Person interviewed:
Gary Chwazik,
General manager

Interviewed By:
Elisabeth Walker

116 Legion Ave, Annapolis, Maryland 21401 (410-263-4880) <http://baconsails.com/>

Overview:

Bay Shore Marine (BSM) is a growing Annapolis boating repair and service store that specializes in the sale and replacement of boat engines. They offer on-site repair, and maintenance services. Their “technicians are trained to keep up with the latest marine technologies” (bayshoremarineengines.com). Their service area expands from Maryland, Delaware, Virginia, to the Coastlines including northern areas.



Quick Facts:

- In business since over 20 years
- Company Type: Private retailer
- Employees: 5 to 9
- Annual Revenue Estimate: \$10 to 20 million
- Number of Establishments: 1
- Key People: Jeff Leitch



Products/ Services & Markets

Marine engine sales and service, repairs and replacements, engine and generator sales, and parts sales. They carry a variety of engines and generators for both power and sail boats.

Prospects:

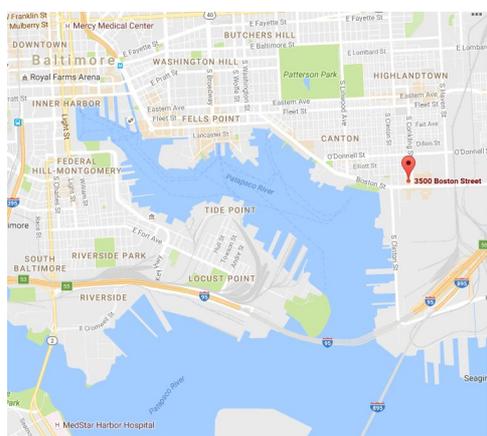
Over the last few years BSM has expanded its team to provide customers with an expert group of technicians, and a service team.



7344 Edgewood Rd, Annapolis, Maryland 21403 (410- 263-8370) <http://bayshoremarineengines.com>

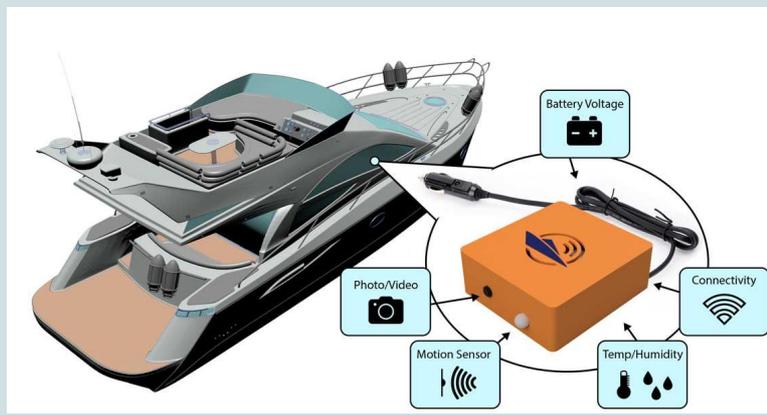
Overview:

Boat Aware is an innovative startup based in Baltimore that launched their first product Remote Monitor (ReMo) in September 2016. The development team is comprised of experts in boating, database systems, app development, and engineering.



Quick Facts:

- Year started: 2016
- Company Type: Crowd funded start up
- Number of Establishments: 1
- Key People: David Butz, founder.



Products/ Services & Markets

The Boat Aware remote monitor (REMO) allows boat owners through a smart phone app to check on the temperature, humidity, boat battery life, motion, and barometric pressure of their boat. It sends alert messages regarding if anything irregular occurs. The remote monitor does not require installation, it only needs to be plugged into a 12 volt power source. The app can be downloaded from the firm's homepage.



3500 Boston Street, Suite 502, Baltimore, MD 21224 (410-218-6131) <http://www.boataware.com>

Interview results:

1. Was there a local community or industry need for your business that helped you get started?

Initially, the business was started working in hydroponics. This market did not excite either Adam (co-founder) or I. We really reflected on what needs there are for similar sensor needs (camera /temp /etc). We interviewed local boat owners, and having a boat myself- looked at the marine industry. A quick glance told me there was an emerging market for Internet-of-Things products in the marine industry.

2. What is the climate of your local maritime industry (local trends, industry grows or shrinks)?

Our research has led us to understand the local maritime industry is a small market with small growth opportunities. However the IoT (Internet of Things) market is expected to triple in 10 years. We feel this explosive growth will carry over from cars/homes to luxury items (RVs/Boats) soon.

3. Do you receive a lot of support from local government to help your business succeed?

No. We self-funded our entire operation.

4. What connection have you made within your area (national or global connections, if so – how have they affected your business growth)?

We have reached out to several marine businesses, and are continuing this process. To date, we have not found the appropriate connections to help business growth.

5. What trends do you see coming up in the maritime industry (Innovation, Technology, Environmental)?

From my software engineering perspective, I believe the maritime industry will eventually standardize around a communication platform - this would mean your depth finder / GPS plotter / battery monitor would all speak the same language. This should help foster greater innovation as devices should be able to talk to each other and inform each other.

6. How do you spread the word into newer generations and expanding your audience?

We use Facebook , Pinterest and Twitter to communicate product updates and keep our followers apprised of our progress. We also use MailChimp to keep track of interested persons.

7. What would make you want to locate your business elsewhere (land price, proximity to competitors, incentives, etc)?

If there was financial incentives to move our business from Baltimore, MD elsewhere- we would definitely consider this. There is also a makerspace in the city. Baltimore is more affordable than Annapolis, both in terms of cost of living and of running a business, than Annapolis.

Highlights:

Internet of Things is an emerging opportunity;

Need for affordable space in Annapolis to stay competitive.

Details of the Interview:

Date: 10/08/2016 at the Annapolis Sailboat Show & follow up survey via email

Person interviewed:

David Butz ,
Founder and president

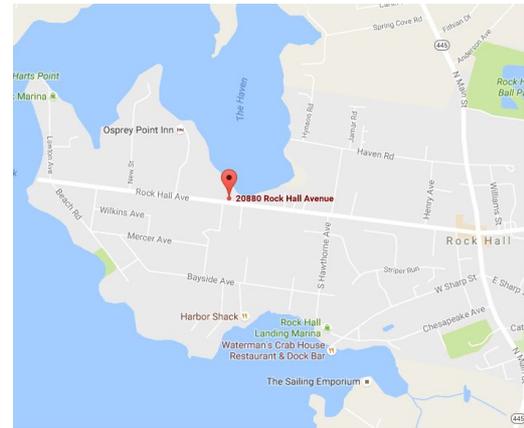
Interviewed By:

Elisabeth Walker

3500 Boston Street, Suite 502, Baltimore, MD 21224 (410-218-6131) <http://www.boataware.com>

Overview:

Haven Harbour Marina (HHM) is a full service marina in Rock Hall on the Eastern Shore, MD, that offers boating, accommodations, and yacht repair services.



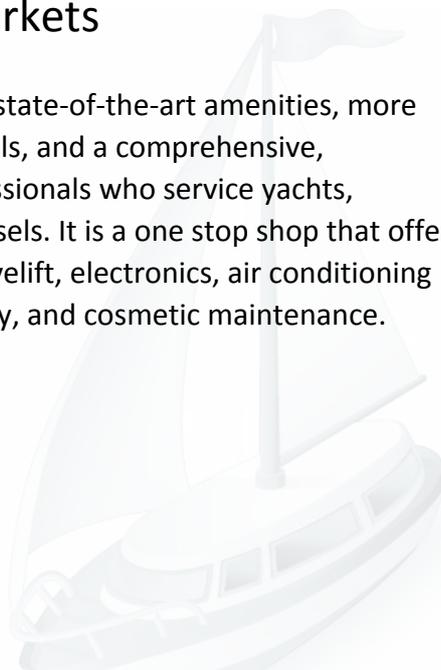
Quick Facts:

- Company Type: A privately held company
- Employees: 20 to 49
- Annual Revenue Estimate: \$5 to 10 million
- Number of Establishments: 1
- Key People: Jonathan Jones, Manager; Mark Bryden, COO (interviewed at Boat Show)



Products/ Services & Markets

The marina, boatyard and inn, offer state-of-the-art amenities, more than 200 floating and fixed slip rentals, and a comprehensive, experienced team of in-house professionals who service yachts, powerboats, sailboats and other vessels. It is a one stop shop that offers services such as boat handling & travelift, electronics, air conditioning and refrigeration, carpentry & joinery, and cosmetic maintenance.



20880 Rock Hall Ave | Rock Hall, MD 21661 (800-506-6697) <http://www.havenharbour.com/>

Interview results:

Local advantages:

- The Eastern Shore is more affordable than Annapolis.
- The Votech programs that provide apprentices to the marine industry. HHM has participated and was very pleased.

Local challenges:

1. Skilled labor supply: the industry does not attract young people because it is mostly seasonal work, with a lot of dirty and hard work, and a low level of income. Once people have learned a critical amount of skills, they often leave because cost of living in the area is high, and they make more if they start their own firm somewhere else. HHM has had some of their technicians for a long time.
2. Lack of educational opportunities: the area needs more training opportunities. The Chesapeake College tried some programs out, but HHM is not aware of their activities/success.

Production/ Innovation:

They don't innovate or build anything, but their recommendation for innovative products or services are catamarans. They get increasingly popular in the Caribbean, but no local marina is equipped for their service. Someone should specialize in them.

Existing local network:

They do not have connections to Annapolis, because there was no need to collaborate on anything.



Highlights:

Need for local training and education supply

Details of the Interview:

Date: 10/08/2016 at the Annapolis Sailboat Show

Person interviewed:
Mark Bryden,
Chief Operating Officer
Greg Tetrick,
Rigging Specialist

Interviewed By:
Elisabeth Walker

Appendix - Literature Reviews

Literature Review for URSP708
*National Economic Development in the Maritime Industry and
Education in the Maritime Industry*
Joe Christo, Anusree Nair, and Brittany Rolf
09/29/16

Section I

National Maritime Industry - Intro and “Who Does What?”

The U.S. maritime industry sector is vast, comprised of multiple subsectors with diverse economic impacts. This scale and diversity have led various organizations to define the sector and value it in different ways, framing it through the lens of trade, transportation, recreation, etc..

However, to begin to understand how the national maritime industry operates, understanding the administrative infrastructure of our coasts, waterways, and trade, is helpful. In short, and in very broad terms:

- **The International Maritime Organization (IMO)** is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships (<http://www.imo.org/en/Pages/Default.aspx>)
- **The U.S. Coast Guard (USCG)** works towards protecting the country’s maritime interests and ensuring safety at sea (<https://www.uscg.mil/>)
 - **The US Coast Guard’s (USCG) National Maritime Center (NMC)** issues credentials to fully qualified mariners in the most effective and efficient manner possible in order to assure a safe, secure, economically efficient and environmentally sound Marine Transportation System (<https://www.uscg.mil/nmc/>).
- **The U.S. Environmental Protection Agency (EPA)** works towards protecting human health and the environment (<https://www3.epa.gov/>)
- **The U.S. Customs and Border Protection (USCBP)** works towards preventing illegal entry of people into the country (<https://www.cbp.gov/>)
- **The U.S. Department of Transportation (DOT) Maritime Administration (MARAD)** works towards developing and maintaining an adequate, well-balanced United States merchant marine, and ensuring that the country has adequate shipbuilding and repair services, efficient ports, effective inter-modal water and land transportation systems, and reserve shipping capacity for use in time of national emergency (<https://www.marad.dot.gov/>)
- **The U.S. Department of Commerce’s (DOC) National Oceanic and Atmospheric Administration (NOAA)** works towards providing environmental intelligence to coastal areas (<http://www.noaa.gov/>)

- **The U.S. Department of Commerce’s (DOC) International Trade Administration (ITA)** works towards fostering economic growth and prosperity through global trade. (<http://www.trade.gov/>)
- **The U.S. Department of Commerce’s (DOC) Economic Development Administration (EDA)** works towards fostering regional economic development efforts (<https://www.eda.gov/>)
- **The U.S. Small Business Administration (SBA)** works towards aiding, counseling, assisting and protecting the interests of small businesses, to preserve free competitive enterprise and to maintain and strengthen the overall economy (<https://www.sba.gov/>)
- **The Federal Maritime Commission (FMC)** works towards regulating U.S. maritime commerce (<http://www.fmc.gov/>)
- **Port Authorities:** At the state, regional, and local level - Port Authorities throughout the US operate (and sometimes own) ports.
 - From *Seaport Authorities in the US and Canada*: “ To observers from abroad, even experienced port specialists, the seaport system of the United States might seem at first glance to be anything but a system. In other countries, port systems are typically small by comparison and commonly subject to direct control by national authority. The situation in the United States differs in several crucial respects. First is simply the size of the industry itself--183 commercial deepdraft ports dispersed along the U.S. Atlantic, Gulf, Pacific and Great Lake coasts. Included in that number, too, are the seaports of Alaska, Guam, Hawaii, Puerto Rico, Saipan and the U.S. Virgin Islands. Here, unlike many countries, there is no national port authority. Rather authority is diffused throughout all three levels of government-federal, state and local. That stems from the federal character of the U.S. Constitution, which reserves certain powers for the national government and others strictly for the states”
 - In Maryland, the mission statement of the Maryland Department of Transportation Port Administration is “to stimulate the flow of waterborne commerce through the ports in the State of Maryland in a manner that provides economic benefit to the citizens of the state.” (<http://www.mpa.maryland.gov/>)
- **The Marine Transportation System (MTS)**, according to MARAD, “consists of waterways, ports, and inter-modal land-side connections that allow the various modes of transportation to move people and goods to, from, and on the water,” and includes the following:
 - 25,000 miles of navigable channels
 - 238 locks at 192 locations
 - Great Lakes and St. Lawrence Seaway
 - Over 3,700 marine terminals
 - Numerous recreational marinas
 - Over 174,000 miles of rail connecting all 48 contiguous States, as well as Canada and Mexico
 - Over 45,000 miles of interstate highway, supported by over 115,000 miles of other roadways
 - Over 1,400 designated inter-modal connections”

- **The Committee on the Marine Transportation System (CMTS)** works towards ensuring the development and implementation of national MTS policies that are consistent with national needs and to report to the President its views and recommendations for improving the MTS (<http://www.cmts.gov/>)

Beyond the administrative infrastructure, many academic, trade, and environmental organizations are doing important work to strengthen the industry as well, including:

- The American Maritime Partnership (AMP) is focused on ensuring that America's domestic maritime industry and the Jones Act remain a key component of our nation's economic and homeland security. (<https://www.americanmaritimepartnership.com/>)
- American Association of Port Authorities (AAPA) is the unified voice of the seaport industry in the Americas, representing more than 130 public port authorities in the U.S., Canada, the Caribbean and Latin America. (<http://www.aapa-ports.org/>)
- The Maritime Industry Knowledge Center, operated by the Maritime Industry Foundation, aims to enrich human knowledge and understanding of the vital roles of maritime industries and commercial shipping in the economic, social, political and cultural life of the global environment. (<http://www.maritimeinfo.org/>)
- The National Working Waterfront Network (NWWN) is a nationwide network of businesses, industry associations, nonprofits, local governments and communities, state and federal agencies, universities, Sea Grant programs, and individuals dedicated to supporting, preserving, and enhancing our nation's working waterfronts and waterways. Participation in the NWWN is open to all individuals and organizations involved in working waterfront issues at the federal, state, and local level. Our mission is to increase the capacity of coastal communities and stakeholders to make informed decisions, balance diverse uses, ensure access, and plan for the future of their working waterfronts and waterways. (<http://www.wateraccessus.com/>)
- The Center for the Blue Economy (CBE) provides research, education, and data for valuing our oceans and coasts. Through this work, we demonstrate the importance of ocean and coastal resources for regional economies, and help improve policy and business decisions in this era of accelerating climate change impacts. Below are the basic components of our structure and work. (<http://centerfortheblueeconomy.org/>)
- The National Ocean Economics Program (NOEP) provides a full range of the most current policy-relevant economic and demographic information available on changes and trends along the U.S. coast, Great Lakes, and coastal waters. (<http://www.oceaneconomics.org/>)
- The International Council of Marine Industry Associations (ICOMIA) seeks to bring together in one global organisation all the national boating federations and other bodies involved in the recreational marine industry, and to represent them at international level. (<http://www.icomia.com/>)
- Locally, the Marine Trades Association of Maryland (MTAM), founded in 1972, is comprised of nearly 400 marine related businesses, and is dedicated to promoting the recreational marine industry and the preservation of the waterways on which our businesses rely. (<http://www.mtam.org/>)

With this structure in mind, the NOAA's Sea Grant program is a valuable resource that analyzes, impacts, and influences the maritime industry. Sea Grant's mission is to provide integrated research, communication, education, extension and legal programs to coastal communities that lead to the responsible use of the nation's ocean, coastal and Great Lakes resources through informed personal, policy and management decisions.

(<http://seagrant.noaa.gov/WhatWeDo.aspx>)

Sea Grant operates locally at the University of Maryland, and plays an important role in the network of organizations working to preserve and restore the Chesapeake Bay and Maryland's coastal waters. [They] serve as a bridge between scientific expertise and the needs of people who manage, conserve, enjoy, and make their living from the Chesapeake Bay, America's largest and most productive estuary. (<http://www.mdsg.umd.edu/>)

Lastly, there are several trade publications that cover the industry, including *The Maritime Executive*, *The Journal of Commerce*, *World Maritime News*, *GCaptain*, and *Marine Link* broadly, and *Boating Industry*, *Boating World*, *Boating Magazine*, *Seapower Magazine*, *Scuttlebutt Sailing News*, and *Yachting World* on the recreational side.

National Maritime Industry - Size, Issues, and Trends

According to IMO, "We live in a global society which is supported by a global economy – and that economy simply could not function if it were not for ships and the shipping industry. Shipping is truly the lynchpin of the global economy: without shipping, intercontinental trade, the bulk transport of raw materials and the import/export of affordable food and manufactured goods would simply not be possible."

The Maritime Industry Knowledge Center also notes that "roughly 90% of world trade is carried by the international shipping industry. There are over 50,000 merchant ships trading internationally, transporting every kind of cargo. The world fleet is registered in over 150 nations, and manned by over a million seafarers of virtually every nationality."

Of all the resources cited above, one of the most comprehensive and compelling overviews of the maritime industry was a report produced by the National Working Waterfront Network (NWWN) in 2013 titled *Economic Analysis of Working Waterfronts in the United States*. According to that report:

- "Waterfront communities in the United States, whether rural or urban, recreational or industrialized, have been subject to economic, technological, ecological, and demographic changes that challenge their continued existence or development. The purpose of this study is to document the current status, contribution to regional economies, and future prospects of U.S. coastal communities in order help promote their long-term economic prosperity. A review of the relevant literature on economic valuation of waterfront and ocean-related economic activities found that previous studies usually evaluated only one particular economic sector or specific region. The present study

attempts to provide a comprehensive evaluation of all ocean-related economic activity for all coastal regions of the United States.”

- “A commonly accepted definition of ocean-related economic activity was adopted for this analysis based on specific industry sectors (NAICS codes) developed under the National Ocean Economics Program. This classification scheme includes six major industry groups: marine construction, marine living resources (fishing, aquaculture, seafood processing), offshore minerals (oil and gas production, sand and gravel mining), ship and boat building/repair, coastal tourism/recreation (boat dealers, marinas, waterfront hotels, restaurants, tours, marine parks, etc.), and marine transportation (ports, shipping, warehousing, passenger transportation). Data on economic activity in these sectors were compiled for the period 1990-2010, including information on employment, wages and value added or contribution to Gross Domestic Product (GDP) . In addition, data were gathered on specific high profile industries such as commercial fishing, port shipping, and passenger cruise ships.”
- “Coastal regions of the U.S. were defined for this analysis to include counties within 50 miles of the coastline or counties located in coastal zones as established by the Coastal Zone Management Act. ”

Statistical highlights from the *Economic Analysis of Working Waterfronts in the United States* report include:

- “In 2009, all coastal regions of the U.S. had over 130,000 ocean-related business establishments, with 2.398 million fulltime and part-time employees, who received \$84.25 billion in wages and benefits, and produced \$217.87 billion in Gross Domestic Product. Nationally, ocean-related wages averaged around \$35,127 per job annually. The western Gulf of Mexico region led the nation in ocean-related GDP (\$83.47 billion) and wages (\$19.93 billion) primarily due to its off-shore minerals sectors, while the North Atlantic region was home to the largest ocean-related employment (439,633 jobs) and number of establishments (30,955) due primarily to tourism and recreation.”
- “In terms of its relative importance to the overall economy, ocean-related sectors in all coastal regions of the U.S. represented 3.37 percent of total GDP and 4.81 percent of total employment. The states with the largest share of ocean-related activity were Alaska (18%), Texas (18%) and Louisiana (17.2%), primarily due to the presence of large offshore oil and gas production. In a second tier of states, including Alabama, Hawaii, South Carolina, Maine, and Georgia, ocean-related activities represented between four and eight percent of GDP, reflecting mainly tourism and recreation as the dominant ocean industries. The states with the highest share of total employment (more than 12 percent) in ocean-related industries in coastal counties include Hawaii, South Carolina, and Alaska. A second tier of states with between 8 and 12 percent ocean sector jobs includes Louisiana, North Carolina, Maine, Georgia, Mississippi, South Carolina and Alabama. More than half of ocean-related jobs in these states came from the relatively labor-intensive tourism and recreation industries. In some individual coastal counties, especially in the western Gulf of Mexico region and Alaska, ocean-related sectors represented over 50 percent of total GDP and employment, although some of these counties were relatively small, with total GDP of less than \$1 billion.”

The United States Department of Transportation also produced a concise overview of the industry in 2014 titled *Maritime Trade and Transportation* by the numbers that isolated the recreational component of the industry a little more clearly:

- “Recreational Boats Recreational boating contributed \$30.4 billion to the economy in 2010-12. The number of registered recreational boats steadily increased between 1990 and 2000. However, the number has remained flat at just above 12 million boats since 2000. In 2010, Florida reported the largest number of recreational boat registrations. The remaining top five states included Minnesota, Michigan, California, and Wisconsin.¹³ The lower levels of recreational boat registrations and sales in recent years may be the result of the economic recession and high fuel costs. Although recreational boat sales declined between 2006 and 2009, recreational boat participation has grown to its highest level since 2000. In 2010, an estimated 32.4 percent of the adult population participated in recreational boating, a 14 percent increase over the previous year. 14 Recreational boating also supports the economy in the form of boats and marine engines traded. In 2010, the U.S. exported over 100 thousand recreational boats, and imported 265 thousand boats.¹⁵”

Lastly, the in March 2013, Connecticut Sea Grant produced a great report on that state’s maritime industry titled *Valuing the Coast: Economic Impacts of Connecticut’s Maritime Industry*, that could serve as a model for a similar study in Maryland. In addition to state-specific statistics, the report gave some good industry overview as well:

- “Because maritime industries purchase goods and services from other industries and hire local labor, its economic impact cascades throughout the state’s economy. Maritime industries include such activities as fisheries, aquaculture, shipping, marinas, and tourism. Using direct sales of coastal industries, this study estimates the total economic impact of maritime industries through the use of an economic model of the Connecticut economy. This input-output model will capture the scope of coastal industries, their linkages to the rest of the state economy, and translate direct sales into statewide output and jobs to account for maritime industries purchase of goods and services from other industries.” (<http://seagrant.uconn.edu/publications/value.pdf>)

An issue facing the industry is how environmentally friendly shipping actually is, which is a frequent topic of debate. While the IMO states that “Shipping – which transports about 90% of global trade – is, statistically, the least environmentally damaging mode of transport, when its productive value is taken into consideration,” environmentalists often call for stricter standards, and say that accurate measurement of the global shipping footprint is needed.

(<http://www.nytimes.com/2015/12/08/science/carbon-emissions-shipping-container-ships.html>)

Another interesting issue facing the industry, both at the commerce and recreational level, is corrosion - a 2014 study by NACE cites that corrosion issues cost the industry \$50-80 billion every year. (<https://www.nace.org/Corrosion-Central/Industries/Maritime-Industry/>)

Trends in the industry were covered in a *Trade Only Today* article from 2015, which produced an outlook on the industry that featured first-hand insight from industry leaders.

(<http://www.tradeonlytoday.com/features/industry-news/misc-news/outlook-2016/>) Similarly, *Boating Industry* magazine also offers business owners an interesting “best ideas” white paper every year. In 2016, it featured ideas such as operations, marketing, and services.

(<http://boatingindustry.com/e-white-papers/>)

Economic Development - What Makes a City Good for Business and for Maritime Business

Northeastern University’s Center for Urban and Regional Policy has conducted several reports on economic development business location decisions, which offer good insights for what makes a city good for businesses in general, and for maritime business. The first analysis, from Barry Bluestone, concludes that “the highest correlates to economic growth are the availability of sites for development, economic development marketing, and the timeliness of municipal approvals for development projects. These results provide some indication of the extent to which these cities and others might influence their own economic futures.”

(<http://www.northeastern.edu/dukakiscenter/what-makes-working-cities-work-federal-reserve-bank-of-boston/>):

The second report from Northeastern University, titled “*Can We Seal the Deal? : An Examination of Uncertainty in the Development Process*”, concludes that “Studies of firm location decisions suggest that an organization’s desire to reduce the uncertainty associated with operating in a new or unfamiliar location plays a role in determining where it will choose to locate. To date, however, little attention has been paid to the experience of uncertainty in the preoperational phase (i.e., during the development process). When the development process in a given municipality is rife with ambiguity or unpredictability, it may deter firms from moving there, even if the location is attractive on the basis of its long-term operating economics. This study draws on in-depth interviews to explore how real estate professionals experience uncertainty while navigating the development process. The findings reveal that real estate professionals’ conceptualizations of uncertainty reflect five related, but distinct, themes: municipal support, community opposition, process, cost, and feasibility.”

(<http://edq.sagepub.com/content/24/1/87.refs>)

While several sources suggest that the factors that make a city good for businesses, also make it good for maritime business (as long as the city is along the coast), the City of Gloucester, MA, laid out some strategies in 2012 that could potentially serve as good models. The city’s report, titled *The New Maritime Port Economy - Gloucester, Massachusetts*, suggests:

- “For this economic transition to occur, for Gloucester to emulate the broader Massachusetts economy in its shift towards innovation and production, while retaining its local maritime character and the fishing industry at its base, there are two primary strategies the City must pursue.”
- “First, a purposeful strategy of engagement with the marine research community is necessary. Across the State, new and existing high tech companies have clustered around research institutions, essentially marking such institutions as essential infrastructure for the development of science and high tech clusters like the Marine Science and

Technology cluster discussed at the Summit. Gloucester Harbor is a gateway to the ocean and ocean access is a necessity for these marine research institutions. Where the City can play a role is in learning about the needs of these institutions and connecting them to the resources already available in Gloucester. Ultimately, the goal should be a campus presence for these institutions on Gloucester Harbor.”

- “Second, there must be greater flexibility and predictability in the harbor area regulations, the Designated Port Area regulations in particular. These regulations represent one of the biggest obstacles in a transition towards many innovation-oriented Maritime industries. Designed to protect and preserve marine industrial land, the regulations fail to recognize that many marine industrial uses cannot be accommodated in an urban waterfront like Gloucester’s, as they require larger areas of land and do not necessarily need the continuous water access of a harbor front property. Fish processing in Gloucester has demonstrated this fact as these facilities have moved inland. In persisting to favor marine industrial uses over other marine-related uses, the regulations frustrate the community’s objectives in utilizing its waterfront land, one of the City’s prime assets, for future economic development that would be compatible with the continued presence of the fishing industry, take advantage of local skill sets, and further efforts to transition into the innovation and production based economy described and endorsed at the Summit.”

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Section II

Maritime Recreation In North America

The post WW11 period saw a subtle and significant change in the leisure and leisure time pursuits in North America. Since then maritime recreation in North America has become very diverse and also have witnessed a significant growth in the number of persons participating. Being America's largest employer, travel and tourism have one of every ten Americans employed in the field. 85% of the tourist-related revenue is received in the coastal cities of U.S (American Shore & Beach Preservation Association).“Some of the many recreational activities attracting large numbers of visitors to the marine environment include scuba-diving, fishing, snorkeling, reef-walking, cruising, marine wildlife viewing, boating and sea-kayaking. Although some forms of marine tourism, such as marine wildlife viewing, may be viewed as lower impacting or alternative forms of tourism, others such as cruising continue to be a major force in modern tourism in attracting the masses”(Altobelli et al, 2008).

Recreational Boating Industry in North America:

Mass production of small dinghies in the 1950's revolutionized water sports participation. The market was led by the United States with factory produced boats built from glass-reinforced plastic(GRP) and also affordable runabouts propelled by outboard and inboard engines by manufacturers such as Chris Craft, Owens, and Trojan. Recreational boating since then has turned into a social activity and family sport with 87.3 million Americans cruising, sailing, fishing, water skiing,camping, wildlife watching or just exploring the waters in the previous year as per the National Marine Manufacturers Association, 2014 Recreational Boating Survey report.

According to the report the recreational boating in Unites States has an annual economic value of \$121.5 billion. As reported by the states to USCG around 12,182,157 boats were totally registered. Outboard boats, inboard boats, sterndrive boats, personal watercrafts and sailing boats are the different types of boats in use. Of the 15.8 million boats on the water 49.7% were outboard boats and remains to be the most popular for 18th consecutive year. 94.9% of powerboats sold in U.S were made in U.S.A. Recreational boating and its related industries had 963,818 jobs and 34833 businesses. 97% of the U.S. boat manufacturers are family owned and operated small businesses. All these figures signifies the scale of this activity and its impacts on the national economy. It's not just new boats Americans are buying, there were an estimated 940,500 pre-owned boats (powerboats, personal watercraft, and sailboats) sold in 2014. Boating is primarily a middle-class lifestyle as 71.5% of American boat owners have a household income less than \$100,000.

The North American seacoasts with their boundless economic opportunities and better quality of life are increasingly viewed as preferred places to live, work, play and retire. According to NOAA in 2008, 157 million of the population in the United States lives in counties adjacent to the four coastal regions, the Atlantic (Northeast and Southeast), the Gulf of Mexico, the Pacific region and the Great lakes.

Northeast: The northeast region extends from Northern Maine south to the tidewaters of Virginia (180 Counties)

Southeast: Extends from northern Outer Banks of North Carolina to the southern tip of Florida (103 Counties)

Gulf of Mexico: Extends from Florida Key Westwards to the southern tip of Texas (144 Counties)

Pacific: Includes the coastlines of California, Oregon, Washington, Alaska and the entire state of Hawaii (88 Counties)

Great lakes: Extends from north easternmost counties in the New York westward toward Minnesota along Lake Ontario, Lake Huron, Lake Erie, Lake Michigan, and Lake Superior. (158 Counties)

Kristen et al, 2008, As per the report done on 'Population trends along the coastal United States : 1980-2008' for NOAA.

These coastal areas with oceans, lakes, rivers and bays with beautiful waterways and marina services has made boating a popular recreational activity among the Americans.

According to 2014 NMMA annual sales data, the top 10 boating states in the U.S. based on the number of registered boats were:

1. Florida
2. Minnesota
3. Michigan
4. California
5. Wisconsin
6. Texas
7. South Carolina
8. Ohio
9. New York
10. North Carolina

States with the highest share of total employment in ocean-related activities in their coastal counties (more than half of ocean-related jobs were in tourism and recreation):

Hawaii, South Carolina, Alaska (>12%),

Alabama, Georgia, Louisiana, Maine, Mississippi, North Carolina (>8%)

(Alan et al, 13, Economic Analysis of the Working Waterfront in the USA)

“Boaters count on being able to get to the water (access), being able to enjoy the water and related wildlife (natural resources- clean coastal waters that sustain an abundance of fish and wildlife), and having the time and desire to pursue boating for recreation (opportunity). These three elements constitute the base of possibilities for recreational boating”- Ryck Lydecker and Margaret Podlich, Boat Owners Association of the United States.

Annapolis the 'Sailing Capital of the United States', located on the shores of the Chesapeake Bay the largest estuary in the United States is a well preserved historic waterfront town. From its earliest history until 1920's, Annapolis was mostly a commercial port, and since the local businesses developed marinas to accommodate pleasure crafts and also with the new roads connecting Annapolis to Baltimore and Washington, the focus of this historic port shifted from work to recreation and as major maritime

location for one stop repair and marine docking. With the annual U.S sailboat and power boat shows it has been hosting since 1970's, millions of visitors visit the historic city of Annapolis. Along with the varied recreational and tourist experience provided by the estuarine environment, Annapolis still continues to be one of the highly preferred sailing cities in the United States with its accessibility and abundantly available natural resources and opportunities. Annapolis is also a major market center for the supply of recreational boats in the East Coast.

Based on comparing the Water transportation cluster of major coastal cities with that of Annapolis, with respect to Location Quotient, employment in Boat Building and Repairing, Marine Transportation Services and Water Passenger Transportation, and also the traded versus local economy, few cities did seem comparable to Annapolis. Gloucester, MA, Marblehead, MA, Providence, RI, Portland, ME, Kennebunkport, ME, Charleston, SC, Duluth, MI, and Cleveland, OH seemed comparable. The comparable ones are in the Atlantic and the Great lakes region. All of them have marine transportation services as the major employment sector within the water transport cluster. All of them also have a similar traded/ local economy. All these cities can be identified as tourist oriented sailing / boating cities as well. A more detailed research, into the climate, geography and other aspects of these cities will be interesting to pursue.

Comparing Water Transportation Cluster						
City, State	County	Location Quotient	Boat Building and Repairing	Marine Transportation Services	Water Passenger Transportation	Traded/ Local
Annapolis, MD	Anne Arundel	0.43	70	154	10	33/67
Newyork, NY	Bronx	0.11	10	20	0	15/85
Newyork, NY	Newyork		10	520	245	46/54
Newyork, NY	Queens	0.11	360	90	10	26/74
Newyork, NY	Richmond	20.38	175	1803	10	14/86
Stamford, CT	Farfield	0.35	10	380	10	39/61
Boston, MA	Suffolk	0.31	235	216	70	41/59
Gloucester, MA	Essex	0.36	82	130	10	31/69
Marblehead, MA	Essex	0.36	82	130	10	31/69
Marion, MA	Plymouth	0.31	35	40	0	23/77
Brooklin, MA	Hancock	11.24	493	30	20	45/55
Newport, RI	Newport	6.72	505	40	20	35/65
Providence, RI	Providence	0.24	10	140	10	34/64
Portsmouth, NH	Rockingham	0.13	20	20	0	31/69
Castine, ME	Hancock	11.24	493	30	20	35/65
Camden, ME	Knox	8.1	235	20	10	26/74
Portland, ME	Cumberland	0.65	175	60	10	32/68
Kennebunport, ME	York	0.23	281	529	0	31/69
Charleston, SC	Charleston	6.8	810	2260	10	32/68
Jacksonville, FL	Duval	4.72	1816	2885	70	34/66
Miami, FL	Miami Dade	5.67	4348	7520	457	33/67
Tampa, FL	Hillsborough	1.54	810	1375	0	35/65
Pensacola, FL	Escambia	1.13	60	100	0	19/81
Galveston, TX	Galveston	10.09	495	1179	60	28/72
Corpus christi, TX	Nueces	1.9	185	325	20	27/73
San Diego, CA	San Diego	2.78	8037	457	10	36/64
Seattle, WA	King	3.19	1900	7699	1438	44/56
Milwaukee, WI	Milwaukee	0.04	0	30	0	37/63
Greenbay, WI	Brown	2.41	1125	20	0	45/55
Duluth, MI	Saint Louis	1.61	10	275	0	28/72
Mackinac Island, MI	Mackinac	2.97	10	10	0	28/72
Chicago, IL	Cook	0.08	70	435	0	37/63
Cleveland, Ohio	Cuyahoga	0.19	60	275	0	36/46

Source: U.S. Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

According to a recent article published in an online portal for sailing news, the changing demographics of the American population is a concern for the boating industry. As per the data from the US census bureau, the population of millennials are estimated to outnumber the baby-boomers in few years. The aging population of baby boomers is a concern since “The white baby boomer has been the core consumer of the boating industry for decades, buying millions of boats, engines and accessories”. In

order to grow the industry, it is important to reach out to the diverse younger Hispanic, Asian and African buyers. (Graph Source : <http://boatingindustry.com/top-stories/2015/04/01/next-is-now/> Sept 29 2016)

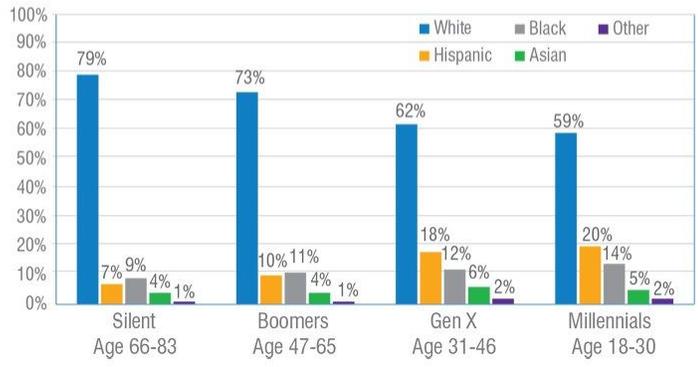
The access to travel and entertainment due to technology is one of the greatest challenges of the boating industry. We are living in a world with constant distractions and when a few years ago, to experience the thrill involved in sailing, one would have to be on a real sailboat in the ocean, in today's world, where the line between virtual and reality is getting thinner, we have millions of players spending days and nights playing virtual sailing games on their computers.

Fishing remains the most popular among all boating activities.

Most of the recreational boating activities have a multi use nature and consumers engage in different activities. A boater alone can be associated to passive activities like viewing the water and nearby shore as well as other active ones like water skiing, tubing, fishing etc. Resolving user conflicts remains important, especially considering the various uses of coastal areas for recreation. With due prioritization given in overcoming such challenges and growing participation, recreational boating industry in America can remain to be an important economic driver.

YOUNGER POPULATION GROWING MORE DIVERSE

- Race and ethnicity are becoming more multicultural with each passing generation.
- Keeping traditionally mainstream pastimes, like boating and fishing, thriving means embracing this growing diversity.



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Section III

Boat-Building and Marine Technology Education - Background

Schools and other educational places are where the seed for innovation is planted. Discussion of theory and techniques between teachers and students creates the opportunity for new ideas to take root. This holds true for the marine industry. According to *BoatUS Magazine's* "The Boat Lovers' Guide to Marine Trade Schools," educational programs not only support persons starting a new career, but they also help improve quality thresholds for "standards-based work across the field." As boatyard and other marine employers look for ways to carry their businesses into the future, they are likely to seek new employees who have completed educational programs that have better prepared them for success and reduced the likelihood of trial-and-error from simply learning on-the-job.

As the City of Annapolis seeks ways to bolster and sustain its maritime zones and economy, it should leverage its substantial social capital—knowledge from professional experts and boating enthusiasts—to create educational opportunities that attract younger and older adults seeking new careers in boat-building and marine technology. To this end, we have compiled a list of education centers from across the nation; the purpose of compiling this information is to show where marine technology and boat-building education exists, and what these types of programs look like. With this information, the City of Annapolis may potentially begin to build mutually supportive relationships with education centers whose graduates would benefit from future innovative opportunities in Annapolis' maritime zones.

List of Education Centers

Table 1 in Appendix A features a list of schools and education centers that offer boat-building, marine systems technology, and related courses. Most programs are one- or two-year degrees or certifications offered by community colleges, accredited certification programs, or trade schools. Note that the focus here is on programs providing recreational/commercial boat-design or building education, rather than four-year naval architecture or marine engineering programs at larger universities/research institutions. The latter programs tend to steer graduates to naval or industrial ship-building and transportation, which is not the type of maritime culture that Annapolis seeks to promote through this project.

The list was aggregated from BoatDesign.net and BoatUS's 2010-2011 *Boat Lovers' Guide to Marine Trade Schools*; individual program information was taken directly from each school's website.

Analysis

As shown in Table 1, several of the education centers are for-profit boat-building/repair organizations that offer boat-building and related classes/workshops to adults and families. These shorter-term courses are largely intended to teach small craft-building skills for individuals' boating hobbies. For example, Chesapeake Light Craft, which is based in Annapolis, offers boat kits and classes for interested hobbyists.

Most of the education centers in Table 1 provide a more traditional route for students who intend to study boat-building/restoration and marine systems, offering longer-term certification and degree programs. Potential jobs for graduates depend on the program, but are likely to be found in boatyard operations, boat design and manufacturing, boat repair and restoration, and similar fields.

In terms of academic curricula, BoatUS's 2010-2011 *Boat Lovers' Guide to Marine Trade Schools* notes that marine educational programs typically prepare students for one or both marine sectors: manufacturing or service. The marine service sector is more likely to retain jobs than the manufacturing sector through economic downturns, so educational programs that promote trouble-shooting and problem-solving may be more valuable or sustainable for students. Regardless of the type of education, all of the programs described below emphasized the importance of hands-on learning experiences and collaboration among students and industry professionals.

Education and Innovation Resources for the City of Annapolis

Notably, many schools listed here are accredited by the American Boat & Yacht Council (ABYC), an Annapolis-based "non-profit member organization that develops voluntary safety standards for the design, construction, maintenance and repair of recreational boats"; 90 percent of boats nationwide adhere to these standards. Through its Marine League of Schools, ABYC also provides assistance in curricula development and instructor training/certification for member colleges. For Marine League member colleges, the latest technology and ABYC standards are taught through lessons in marine electrical, plumbing, fuel and water tankage, pumps, propane and natural gas, fire protection, steering, and trouble-shooting.

To attract young adults to careers in the marine industry, the Marine Trades Association of Maryland, composed of local and regional marine businesses and stakeholders, offers a Pre-Apprenticeship Program. The program entails introductory training, a paid internship,

workplace mentors, worker training grants, and other resources for participants. The Association also The Marine Trades Association of Maryland is located in Annapolis.

Several boat-building schools provide opportunities for students to learn technical skills while engaging in real-world historic restoration. IYRS School of Technology and Trades in Rhode Island, and the Center for Wooden Boats in Seattle, Washington have partnerships within their respective communities that allow students and other non-credit course participants to actively contribute to local maritime heritage via historic boat restoration projects. Grants for the preservation of ships and maritime education are available through the National Park Service's National Maritime Heritage Grants Program.

Table 1: Marine-Related Schools and Educational Programs

School	Location	Programs Offered	Notes
Landing School	Arundel, Maine	<ul style="list-style-type: none"> ● Associate degrees in Marine Industry Technology, including yacht design, wooden boat-building, composite boat-building, and marine systems ● Partnership with Southern New Hampshire University for Bachelor of Science in Technical Management 	<ul style="list-style-type: none"> ● Alumni manage national companies in Maine, such as Sabre Yachts, French and Webb, Hinckley, and Back Cove Yachts
Westlawn Institute of Marine Technology	Bath, Maine	<ul style="list-style-type: none"> ● Distance study for Yacht & Boat Design Course as well as Professional Diploma in Yacht Design ● Discovery Boat-building program at Maine Maritime museum for school-age children 	<ul style="list-style-type: none"> ● Graduates "prominent in boat-building industry" ● Course graduates find "careers as professional yacht and small-craft designers with production boat-building companies, design firms, and as self-employed yacht designers in private practice"

The WoodenBoat School	Brooklin, Maine	<ul style="list-style-type: none"> • Shorter-term courses/workshops for high school and college students, as well as adults and families 	
Philadelphia Wooden Boat Factory	Philadelphia, Pennsylvania	<ul style="list-style-type: none"> • Offers apprenticeships to youth (ages 14-21) in boat-building and sail making; participants work with PWBF boat-builders 	
Arques School of Traditional Boatbuilding	Sausalito, California	<ul style="list-style-type: none"> • Months-long courses for high school students • In-depth courses for boat design for adults • Apprenticeship program 	
Spaulding Marine Center	Sausalito, California	<ul style="list-style-type: none"> • Education of traditional and contemporary marine skills; youth and adult programs 	
Chesapeake Light Craft	Annapolis, Maryland	<ul style="list-style-type: none"> • Offers boat kits and classes for individual small craft-making 	
IYRS (International Yacht Restoration) School of Technology and Trades	Newport, Rhode Island	<ul style="list-style-type: none"> • Two-year program for Boat-Building & Restoration • Other programs: Composites Technology, Marine Systems (6-month, career-focused program with 1-month internship) 	<ul style="list-style-type: none"> • Rutherford Boat Works and Coronet Restoration Partners undertaking historic restoration of Coronet boat on campus • CRP hires interns from IYRS each year, also hires graduates

			<ul style="list-style-type: none"> ● Prospective students drawn to Restoration Hall, where students work on summer projects ● Graduate stories: grads have founded North Country Boatworks; many go to Maine; another purchased Redd's Pond Boatworks in Massachusetts ● Students may stay in Newport to finish projects after graduating ● IYRS very connected to "the Rhode Island network of boats, boat yards, and boat owners" ● One graduate drawn to IYRS because wanted in-depth training rather than risk on-the-job training
<p>The Center for Wooden Boats</p>	<p>Seattle, Washington and Camano Island, Washington</p>	<ul style="list-style-type: none"> ● Programs for adults, families, and youth ● Adult sailing, adult woodworking, maritime skills; short-term courses for hobbies 	<ul style="list-style-type: none"> ● Marketed as "hands-on history" ● Fund-raising for the Wagner Education Center-- additional classroom and exhibit spaces, including Bill Garden Boatshop to build and maintain boats and showcase traditional maritime skills

<p>Cape Fear Community College: Boat Building School</p>	<p>Wilmington, North Carolina</p>	<ul style="list-style-type: none"> • Three-semester programs for Boat Service & Manufacturing and Wooden Boat-Building 	<ul style="list-style-type: none"> • Students get jobs at Beneteau and Jarrett Bay Boatworks
<p>Northwest School of Wooden Boatbuilding</p>	<p>Port Hadlock, Washington</p>	<ul style="list-style-type: none"> • Associate of Occupational studies plus 9-month diploma in Traditional Large Craft, Traditional Small Craft, or Contemporary Wooden Boatbuilding • Offers workshops up to several months long on boat design, diesel engines, carving, marlinspike, sail-making, and rigging 	<ul style="list-style-type: none"> • Alumni hired at Haven Boatworks, LLC; Northwest Maritime Center; Port Townsend Shipwright's Co-op; Un-Cruise Adventures; Spindrift Ocean Rowing • Prothero Method written about in WoodenBoat Magazine • Boat School leaders meet with "15 maritime industry representatives each year to review boatbuilding skills and projects required for graduation. Through this regular industry collaboration the School helps ensure the solid vocational basis of its educational programs. • Post-graduate careers include: boat yards, maritime museums, educational programs, boat design, architectural design, engineering,

			<p>charter services, tall-ship programs, wooden boat repair and restoration, yacht construction and yacht interiors, wooden boat-building, boat surveying and appraising, boat-building coaching and cabinetry</p> <ul style="list-style-type: none"> • From 2007- 2014, 81 percent of graduates with a Large Craft diploma found employment; 77 percent percent of graduates with a Small Craft diploma found employment
MacNaughton Group Yacht Design School	Eastport, Maine	<ul style="list-style-type: none"> • Distance learning for a diploma in Naval Architecture with a Specialty in Yacht & Small Craft Design 	
Skagit Valley College	Mount Vernon, Washington	<ul style="list-style-type: none"> • Certificate or degree in Marine Maintenance Technology (serves as core for ATA degree) • Composites certificate program 	<ul style="list-style-type: none"> • Northwest Center of Excellence for Marine Manufacturing & Technology is located at this school; serves as "statewide liaisons to business, industry, labor and education for the purpose of creating a highly

			skilled and readily available workforce"
New England Institute of Technology	East Greenwich, Rhode Island	<ul style="list-style-type: none"> • Associate degree in Marine Technology; also, the Advanced Marine Technology program • "Faculty members in Marine Technology are factory-certified by ABYC, Volvo and Mercury Marine. The Marine Technology Department is the New England training site for Volvo Penta Marine with advanced training available for qualified students. Students completing the Marine Technology program may also qualify to become certified Volvo Penta Technicians" 	<ul style="list-style-type: none"> • "Develop hands-on skills in the installation, service, and repair of mechanical, electrical, electronic, and hydraulic systems used by both recreational and commercial vessels. Prepare for entry-level positions in boatyard operations, vessel manufacturing, engine repair, marine electronics installation..." • Career possibilities include Marine Mechanic, Outboard Engine Technician, Marine Systems Installer
Great Lakes Building School	Cedarville, Michigan	<ul style="list-style-type: none"> • Two-year Career Boat Building program; includes coursework in advanced composite wooden boat-building, marine systems, and yacht interiors • Students complete projects on historical boat restoration • One-year Comprehensive Boat Building program 	

		<ul style="list-style-type: none"> • Also offers summer workshops for building Chesapeake Light Craft boat kits 	
Carteret Community College	Morehead City, North Carolina	<ul style="list-style-type: none"> • Degree and certificate in Boat Manufacture and Service: Composite Boat Manufacturing • "Course work includes reading and interpreting marine blueprints, manuals, and other documents common to the industry; lofting; constructing forms and mold-making; application of concepts and techniques in composite, and fiberglass; marine woodworking; interior finishing; and marine mechanical, electrical, and plumbing systems. " 	<ul style="list-style-type: none"> • "Graduates may find employment with boat/yacht manufacturers, service yards, dealerships doing commissioning work, and companies doing custom boat building."; also find work as Fiberglass Laminators and Fabricators
Chattanooga State Technical Community College	Chattanooga, Tennessee	<ul style="list-style-type: none"> • One-year diploma in Motorcycle and Marine Services 	<ul style="list-style-type: none"> • "Accreditor Rate: The job placement rate for students who completed this program is 80%" • Tennessee College of Applied Technology, which is a division of Chattanooga State, has partnered with

			<p>the Blount Partnership to work with schools and manufacturers to create more qualified, skilled employees for Marine and Advanced Engineering Systems Technology Regional Occupations</p>
EHOVE Adult Career Center	Milan, Ohio	<ul style="list-style-type: none"> • Marine Trades program • Certification in Mercury Marine Trades Fundamentals 	<ul style="list-style-type: none"> • Potential careers include Marine Mechanic, Yacht Maintenance, Fiberglass Tech, Engine Mechanic
Florida Keys Community College	Key West, Florida	<ul style="list-style-type: none"> • Associate's degree in Marine Engineering, Management & Seamanship • Vocational certificate in Marine Propulsion 	<ul style="list-style-type: none"> • Skills taught include maintaining and repairing mechanical, electrical, hydraulic and pneumatic systems used in recreational and commercial craft • Potential careers include Charter Boat Captain, Marine Technician, Marine Fabricator, Marine Electrician, Boat Builder, or Project Planner
George Stone Technical Center	Pensacola, Florida	<ul style="list-style-type: none"> • Marine Service Technology program trains students in electrical systems, drive systems, fuel systems, 	<ul style="list-style-type: none"> • Graduates benefit from technical experience with diagnostic modules and training tools, which

		power transfer systems, ignition systems, cooling systems, lubrication systems, drive systems and boat and trailer rigging	is attractive to potential employers
Hennepin Technical College	Brooklyn Park, Minnesota	<ul style="list-style-type: none"> • Diploma for Marine, Motorsport, and Outdoor Power Equipment Technician • Certificate for Outboard Technician 	
Broward College	Miami, Florida	<ul style="list-style-type: none"> • Two-year Associate's degree in Marine Engineering Management • Curricula includes ABYC marine certifications 	<ul style="list-style-type: none"> • Prepares students for careers in large yacht maintenance, repair, and retrofit industries
Honolulu Community College	Honolulu, Hawaii	<ul style="list-style-type: none"> • Two-year Associate's degree in Small Vessel Fabrication & Repair • Student projects include "real world" repair, service, and construction; hands-on instruction in composite boat construction and repair, marine woodworking and joinery, and others 	
Kodiak College	Kodiak, Alaska	<ul style="list-style-type: none"> • Courses for professional mariners seeking USCG licensing • Classroom Training courses 	

Suncoast Technical College	Sarasota, Florida	<ul style="list-style-type: none"> • 18-month program in Marine Service Technologies 	<ul style="list-style-type: none"> • Students prepare for employment as marine engine or outboard motor mechanics
Fort Meyers Technical College	Fort Meyers, Florida	<ul style="list-style-type: none"> • One-year program in Marine Service Technologies 	<ul style="list-style-type: none"> • Students prepare for a career in servicing 2-stroke, 4-stroke, inboard, and outboard power plants
Anolis School of Seamanship	Annapolis, Maryland	<ul style="list-style-type: none"> • Offers short-term classes and workshops in basic boating, diesel, outboard, electrical, navigation, safety, weather, and cruising 	

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History of maritime industry

The maritime industry has been central to the identity of Annapolis since the early 1700s. Its location and access to the Chesapeake Bay enabled the city to serve as a principal port of entry for North America and major center of the Atlantic slave trade.¹ As competition arose from Baltimore and other eastern shore ports, the maritime industry branched out into other trades such as seafood, boatbuilding, and sailmaking. Today, Annapolis is a center for recreational boating and boatbuilding, holding approximately 24 percent of boatbuilding businesses in the State of Maryland as of 2013.²

In 1986, an aggressive maritime zoning strategy was employed to preserve and grow maritime businesses along the Annapolis waterfront. The 1986 *Maritime Zoning and Economic Strategy* established four exclusive maritime districts, and enacted strict zoning regulations that limited land uses to those that directly or closely support the maritime industry. A revision of the zoning code was selected instead of other approaches, because it provided the city government the most direct means for quickly and effectively addressing land use issues, such as rising land values and competing land uses. Analysis of the two maritime districts zoned at the time showed a significant percent of land area (17%) available for development, that if not protected, would be highly vulnerable to competing land uses and redevelopment.³ The regulatory approach employed facilitated a legal and economic buffering of maritime land uses through the restriction and discouragement of nonconforming development.

This strategy enabled Annapolis to preserve maritime land uses and stabilize land values in the newly established maritime districts, and likely contributed to the industry reaching its peak in the late 1980s. However, since then, the industry has experienced repeated cycles of decline, marked especially by wider economic trends.⁴ A combination of high real estate prices and property taxes, strict environmental regulations, and increased competition from other maritime communities has challenged the position of Annapolis' maritime industry. As a response, the city has conducted multiple industry economic surveys to assess the condition of the maritime industry and the effects of public policy designed to support maritime businesses.

From the first survey in 1992 to the last survey in 2013, the maritime industry has steadily declined overall in terms of business incomes, wages, and workforce capacity, but not significantly enough to concern the maritime businesses surveyed. Local perceptions of the industry remain largely positive despite dips in median annual gross business income and rates of full-time employment.⁵ The majority of respondents in the 2013 survey reported better current business conditions when compared with years past, and only 8.3 percent of respondents reporting worse business conditions.⁶ Furthermore, maritime businesses expressed their continued faith and investment in Annapolis' maritime industry by their increased rates of property and business ownership, as well as their high participation (83% of 2013 survey respondents) in professional maritime organizations.

In spite of this positive outlook, the economic reality is changing, and as stated in the original 1986 strategy, the "effectiveness of zoning is absolutely dependent upon the relevance of the zones" to this reality.⁷ It may be time to direct the city's strong identification with and investment in the maritime industry toward a review and update of current maritime zoning regulations and strategy. In order to sustain a healthy and viable maritime industry, the city may need to look beyond its regulatory

approach to ways in which to incentivize and adapt maritime businesses for the changing market needs and interests ahead.

Annapolis Maritime Industry Economic Surveys: A Closer Look

The City of Annapolis has regularly produced and published maritime business surveys to gauge the health and wellbeing of the seafaring community in the city that bills itself as the “Sailing Capital of the World.” The 2013 edition of the report attempts to take the pulse of the industry in the city and contextualize it within national trends.

The most insightful section of the report is the results of the survey itself. A 20-question survey was distributed to business owners in the maritime industry in the City of Annapolis and its immediate surroundings. Its results were compared to previous surveys to highlight trends in the industry. They received 68 responses from a total of 242 businesses, which is a lower success rate than previous years. This calls the rigor of the data into question, especially when looking at employment numbers, which attempt to extrapolate the data from the survey to the entire maritime industry. 90% of businesses who responded were in Annapolis’ Maritime Zone.

The most common business, according to the survey, is yacht broker/dealer. 12 respondents self-identified in that category. Other categories with high numbers in the 2013 survey include the marina publications and marine electrical. Business sectors within the maritime industry that saw the most growth between 2008 and 2013 included the marine publication and the sailing/boat instruction sectors. Either of those industries could serve as a good nexus for future development.

The biggest takeaway from the survey is that the health of the maritime industry in Maryland’s capital is deteriorating in the long-term, but has made gains since the recession. Employment numbers between 2002 and 2008 show a serious decline in jobs. Estimates from 2008 show that anywhere from 125 to 482 fewer people were employed by the maritime industry in Annapolis. Using the averages of the estimates, employment in the maritime industry in Annapolis went down by about 17.7% between 2002 and 2008. However, from 2008 to 2013, jobs ticked up. There were between 1,651 and 2,904 people employed in the industry in 2013, up about 800 from 2008. The percentage of full-time workers, however, decreased, unlike in the previous gap between surveys. So while total employment is up, much of that is believed to have shifted to part-time. Some of this may have to do with the seasonality, which the survey showed greatly affected businesses. Work was slowest in January and February.

One part of the survey asked about workforce availability. Most firms didn’t express difficulty in recruiting talent, but boat repair companies lamented the long training time required for their industry.

For the 1992 survey, just 2.4% of customers from survey respondents were international. That ticked up in 2002 to 4.2%⁸. But in 2008, 14.9% of all customers to Annapolis maritime businesses were based abroad⁹. This number declined heavily however in 2013, in part because the recession had not affected international markets as strongly as domestic markets in 2008. Still, the high numbers show that the city’s businesses are able to compete with multinational corporations not just locally or regionally, but even on the global stage.

The climate in Annapolis for maritime businesses was strong enough to attract businesses to relocate to the area. 15.9% of businesses in the 2013 survey were 0-5 years old, showing some growth in the industry. Many businesses are also more than 30 years old, showing strength in longevity.

This survey, like the previous three iterations of the survey, asked businessowners about the state of the business community. They were asked how they thought conditions were compared to one year ago. A record number of businesses -- 16.7% -- though business conditions were “considerable better” than the previous year. However, 2013 was the first year business owners were asked about what they thought the business environment was compared to two and five years previously. A startling 57% of respondents said that things were “considerably worse” in 2013 than five years previously.

One other result from the survey was that businesses noted that the activity they would like the most from the Annapolis Economic Development Corporation was networking. Networking will likely be an important part of the final product of this class, so it is encouraging to see that businesses would like to see that in the city.

Land Use Planning: *Annapolis Comprehensive Plan*

Annapolis has long utilized land use planning and zoning as tools for promoting and preserving the city’s unique and historic maritime character. The city’s land use plans and studies up to present day have outlined visions and policies to guide the use of these tools for this purpose, and subsequent zoning codes have prescribed the physical layout and implementation of such visions.

The *Annapolis Comprehensive Plan* was developed and adopted October 5, 2009 and includes some plans as to how the City of Annapolis plans on handling the maritime industry. As of the *2009 Comprehensive Plan*⁹, a majority of the land is for residential uses, the second highest use is in roadways, and only three percent of city land is vacant. Maritime land use represents only one percent of land use.

Figure 1 - 2008 Land Use Table from the *2009 Annapolis Comprehensive Plan*

Land Use Classification	Acres	% of Total Land
Commercial	346	8%
Industrial	108	2%
Institutional	306	7%
Maritime	64	1%
Mixed Use	20	0%
Recreation & Open Space	326	7%
Residential	2549	56%

Vacant	139	3%
Roadways	696	15%

In policies 6, 7, and 10 there are detailed plans as to how the City wants to keep the maritime industry a part of the charm and character of the city by maximizing public access, including pedestrian and bicycle presence in planning, accommodating for diverse boat types and sizes, and increasing public transportation accessible areas. Though there are stringent bylaws on what can and cannot be built on or near the waterfront the comprehensive plan also details conducting an assessment of city regulations in order to promote viability and sustainability of the maritime industry.

Despite the small percentage of land in maritime uses, the appropriate use of waterfront properties is cited as a specific purpose of the Zoning Code and policy 7 of the Comprehensive plan outlines five recommended actions to “ensure the Maritime Industry’s sustained health and viability”. However, the *2009 Comprehensive Plan* falls short of recommending specific land use plans and economic development policies for the maritime districts. Recommended updates to the *2013 Maritime Industry Economic Survey* and *2003 Draft Waterways and Harbor Plan* have also not been completed yet.

Instead, the Land Use Plan proposed in the *2009 Comprehensive Plan* centers on urban population growth and has identified three opportunity areas for absorbing anticipated growth. While it is critical that the city forecast and plan for such growth, it is also key that population growth not only be managed in terms of residential and commercial accommodation, but also in its relationship to and impact on existing industries. Given the maritime industry’s relatively small land use footprint, the industry may be particularly vulnerable to changes in population and land uses. Current and future land use plans will need to be reevaluated in the context of the maritime industry and wider economic conditions in order to ensure the industry’s well-being and continued role in Annapolitan culture and identity.

Land Use Planning: *Zoning Code*

The *2004 Zoning Code* organized the city into five zoning districts: Residence, Commercial and Industrial, Office and Mixed Use, Waterfront Maritime, and Overlay:

1. Residence districts are made up of general and single-family residences, as well as areas marked for revitalization, and residence and neighborhood conservation.
2. Commercial and Industrial districts are composed of general, convenience and “community” shopping, areas marked for business revitalization, conservation, and corridor enhancement, light industrial and uses, as well as professional mixed office parks.
3. Office and Mixed Use districts include professional office, professional mixed office, mixed uses, and special conservation professional uses.
4. Waterfront Maritime districts are the four maritime districts designated in the *1986 Maritime Zoning and Economic Strategy*: Waterfront Maritime Conservation, Waterfront Mixed Maritime, Waterfront Maritime Industrial, and Waterfront Maritime Eastport.

- 5. Overlay districts represent spaces identified as critical, historic, or of specific "Office and Commercial Design".⁸

Figure 1 - General Land Use Map

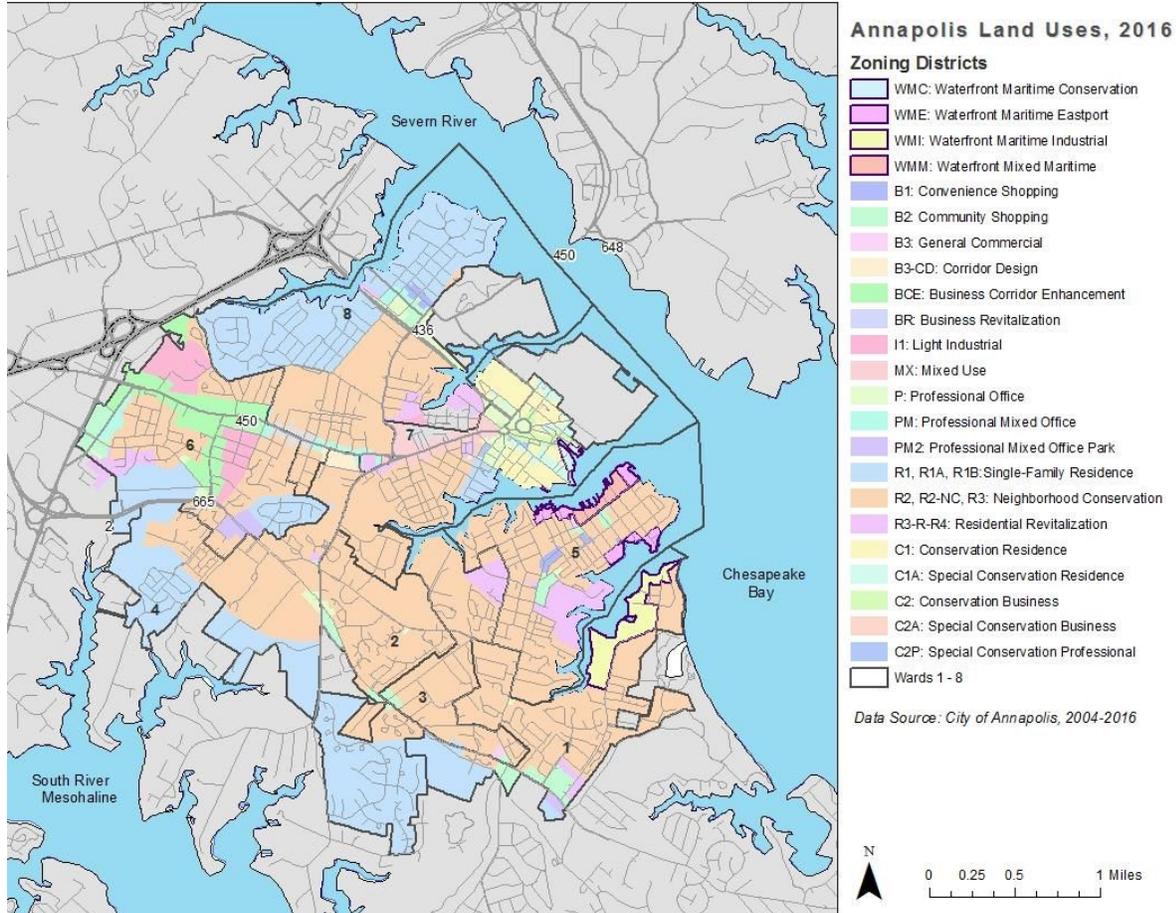
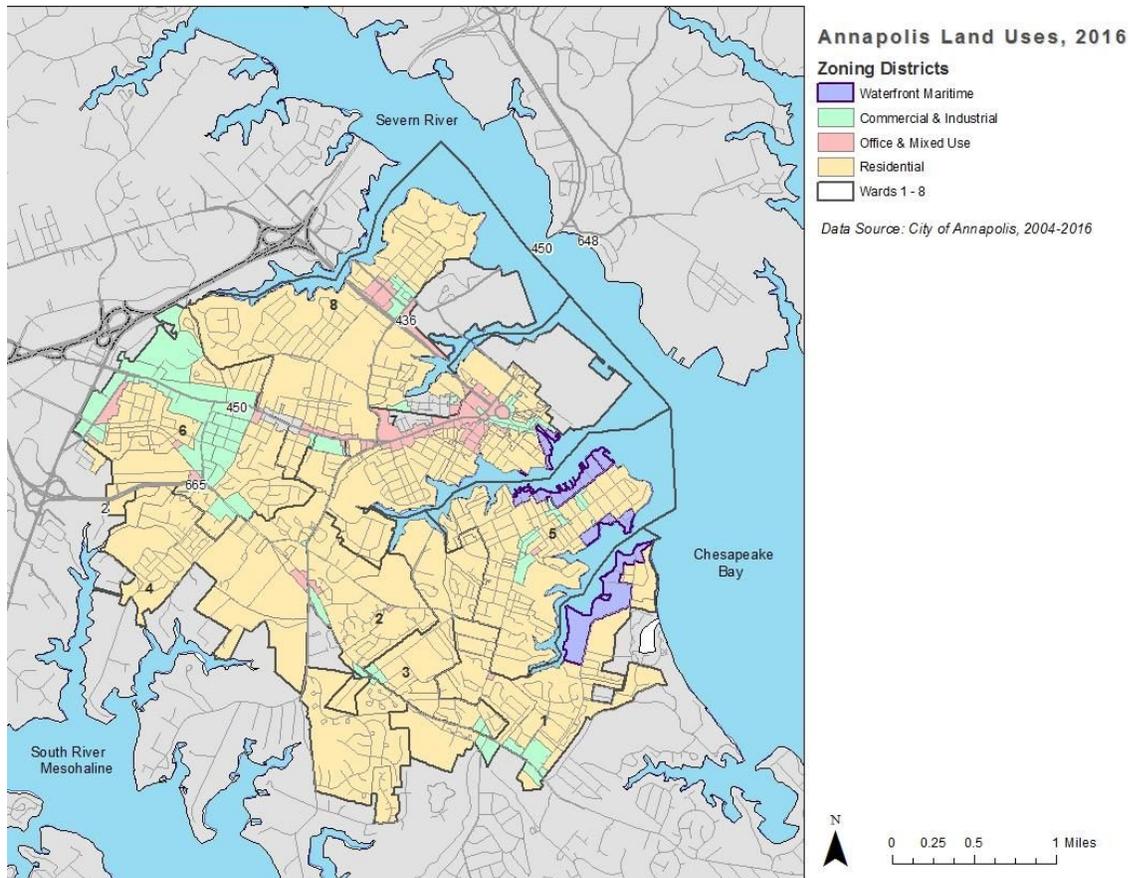


Figure 3 - Map of Primary Land Use Categories



Maritime Districts

Some maritime districts of Annapolis are Waterfront Maritime Conservation (WMC), Waterfront Maritime Industrial (WMI), Waterfront Mixed Maritime (WMM), and Waterfront Maritime Eastport (WME). Each district has different requirements and restrictions on what can and cannot be built in the area.

Figure 4 - Four Maritime Districts from 2013 Maritime Industry Economic Survey



Under Title 21: Planning and Zoning in the Annapolis Code of Ordinances there is no building or tract of land to be dedicated to any other use than those listed in Subsection A with the exception of uses lawfully established before or on the date of the zoning code adoption. There are some community design uniformity codes such as an established front yard, which can be found in the code ordinances. This will limit the diversity of housing and business structures that can be established. Within WMC, multiple maritime uses, including restaurants and retail sales, may exist on the same lot at the same time as long as the maritime function of that lot comprises a minimum of 40% of the gross floor area on the lot. The number of docks slips piers and other facilities at which boats are berthed may not be reduced with a change in use except reconfiguring to accommodate larger vessels. Within the WMM district, structures for the rack storage of boats are permitted within the 100 ft maritime use provided they are no taller than 8 ft and do not use motorized lifts. In cases where parking is provided within or beneath a structure all exterior views of the structure shall resemble a working facade in order to keep with the aesthetics of the neighborhood. Housing in the area is regulated to mostly single family attached and detached with some two family attached homes. These structures may be expanded for residential use but must meet the requirements of the R2-NC Single Family Residence Neighborhood Conservation District. For WMI district non-water dependent building structures or parking is permitted within the one hundred foot maritime use setback if it includes a site plan incorporating building structures set back 100 feet for at least 50% of the lot width. The total gross open area contiguous to the waterfront and continuous on the site must remain equal in square footage to 100 times the lineal shoreline frontage of the zoning lot. In the WME no multidweling structures of five units or less will lawfully exists unless established before August 1987. After August 1987 mutildweling structures are considered nonconforming, but bed and breakfast inns are acceptable

under R2-NC. Restrictions under WMI also include restaurants, laundrettes, and general maritime office and research, which might limit what can be suggested for improvements.

The office of the Harbormaster is in charge of the safe and enjoyable use of navigable city waters included parts of Severn Back Creek, Sp Creek, and Weems Creek. The office managed private and public moorings, multiple slips, and miles of shoreline. Facilities provided by the Harbormaster's Office include public restrooms, public showers, self-service laundry facilities, and rental moorings.

The Maritime Advisory Board consists of seven members who represent the maritime industry for the City of Annapolis. They provide expert and informed analysis of facts related to the maritime industry and pleasure boating to the city council or agencies and to provide advice to the city concerning the administration of the maritime industry. Under the Annapolis Code of Ordinances (15.16.030) the Port Warden will not approve any application for a license or permit involving the placement, erection, or construction of structures in the water beyond the harborlines for temporary or permanent use. Construction may be approved in developable waters. The Annapolis Code of Ordinances also details that no rebuild, modification, construction, or enlargement of a structure can be made without permit from the Port Warden. This includes repairs or rebuilds to a structure permanently installed in the waterways. Prior to filling out an application for a building permit a sketch setting forth a concept plan of the proposed improvements must be submitted (15.20.010 and 15.20.020).

Environmental and Sustainability Considerations

According to the Maryland State DFIRM Outreach on flood risk, a large portion of Main Street, Annapolis and adjacent marina are under a 100- and 500-year floodplain All of the marinas that surround Annapolis are within 100-year floodplains but most disturbing is that a large portion of the historic commercial district is covered by the 500-year floodplain. The community flood risk is assessed by FEMA Flood Insurance Study, which takes into consideration river flow, storm tides, rainfall, and other coastal storm surges. This information is created for Flood Insurance Rate Maps by the National Flood Insurance (NFIP) for floodplain management and insurance purposes. These maps can help determine what areas of Annapolis need the most attention when it comes to preparing for flood mitigation and sea level rise.

Based on research by Whitney, Bailey, Cox, & Magnani LLC and maps by the Maryland Department of Planning the Historic Annapolis District is looking at 5-10 feet inundation of sea level rise. Large parts of Eastport are also within 5-10 feet inundation. According to the "Flood Mitigation Strategies for the City of Annapolis" study current flooding at City Dock is caused by high tides and storm surges. Storm drains in the district start to back up when the water elevation reaches almost two feet. Because of the structure of the storm drains and the fact that they have not been updated in decades causes flooding to happen often. The study shows that from January 1 to September 30 2010 high tides were recorded between 3.5 and -1.85 feet. There are many structural and nonstructural recommendations throughout the report. Some structural recommendations include new seawalls, pumping stations, and portable cofferdams. Nonstructural recommendations include elevation, reconstruction, and relocation. These recommendations were made personally to the City of Annapolis with consideration to what they are in the position to handle.

The City has gotten together city officials, business owners, and residents in community meetings to discuss the situation the city is in and the decisions that have to be made for the future of the city with the impending sea level rise. From local articles it seems that the issue has been received well by the public and businesses but there has not been any evidence of actions taken or action plans being put into place. Inclement weather and sea level rise is not only a hazard that the city faces but also the US Naval Academy that is located on the Annapolis Shoreline. The US Naval Academy is “situated within an East Coast sea level rise hot spot” being in an area that is predicted for 10 feet inundation. The USNA’s current flood mitigation includes door dams but there is a lot that needs to be done in order to catch up with proper preparedness for the predicted sea level rise. When the approval is given by Congress and the Department of Defense a plan will be developed by the Army Corps of Engineers. This could pose an opportunity for collaboration between the City and the USNA for floodwater mitigation since it would benefit everyone in the area.

Demographics

Comparing Annapolis to national averages from a demographic perspective can be very informative about the makeup of the city. 66.2% of Annapolitans are between 18 and 65, a full 3.2 percentage points ahead of the national average as of the 2010 Census, meaning there is a much larger potential workforce than in other American cities. The city’s naval roots are apparent in its veteran population, with about 10% of those not currently serving in the military over the age of 18 holding veteran status in the armed forces. According to the 2014 American Community Survey, slightly more than half of these veterans served in either the Persian Gulf War or the Wars in Iraq and Afghanistan. If one presumes that most of the 3,000+ veterans in Annapolis are naval, this is a subset of people that can be an important resource. 9.1% of firms in Annapolis are owned by veterans, which is on par with the national average.

Over 45% of Annapolis residents have a bachelor’s degree, which is well above state and national averages. The amount of knowledge in the city can definitely be leveraged to assist the maritime industry, but it also means it may be more difficult to find low-skill workers, who usually would not have a bachelor’s degree.

Business data also shines a spotlight on Annapolis’ competitiveness. The most striking statistic is the amount of retail spending per capita. The 2012 Economic Census says the city of Annapolis had \$39,050 in retail sales per capita. This is nearly three times higher than the national average. This may be related to the median household income being over \$20,000 higher than the national average.

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Innovation Economy

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URSP 708: Community Planning Studio
The University of Maryland – College Park
Fall Term, 2016



PALS - Partnership for Action Learning in Sustainability
An initiative of the National Center for Smart Growth

Gerrit Knaap, NCSG Executive Director
Uri Avin, PALS Director

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Open Innovation Economy

Introduction: Open Innovation

Innovation is the new pink. It has become a popular marketing term, and is used within many different contexts. Based on the literature review, we define innovation as a highly collaborative, often multidisciplinary and multi-directional process in which new or improved ideas are transformed into new products, services, organizations, and processes (Wessner, 2013). This “create[s] new market demand or cutting-edge solutions to economic, social and environmental challenges” (Katz and Wagner, 2014, p. 2) that can result from research, applied sciences, or the manufacturing process itself.

Technological advancements have fostered this sense of innovation, and thereby enabling a wave of change in the workplace. The new innovation economy “represents a radical departure from traditional economic development”. (Katz and Wagner, 2014, p.1). There has been a big shift away from the secret, disconnected, silos meant to sequester knowledge, to a dynamic, “open innovation” ecosystem that strongly emphasizes and depends on collaboration, networking, and sharing of equipment, skills and knowledge.

As a result, maker spaces, co-working spaces, incubators, and accelerators have begun to proliferate nationwide, giving rise to innovation districts and innovation clusters. This report will define these terms; provide an ingredient list for each of their success, as well as detailed case studies of successful models that could be potentially replicated. Due to the relative young age of the innovation economy – Silicon Valley started to popularize entrepreneurial clustering in the 1950s, which evolved into the open innovation concept in the early 2000s - it remains a local movement and has still yet to be researched extensively (wikipedia, Innovation, n.d).

Regional Innovation Clusters (RIC) and Districts

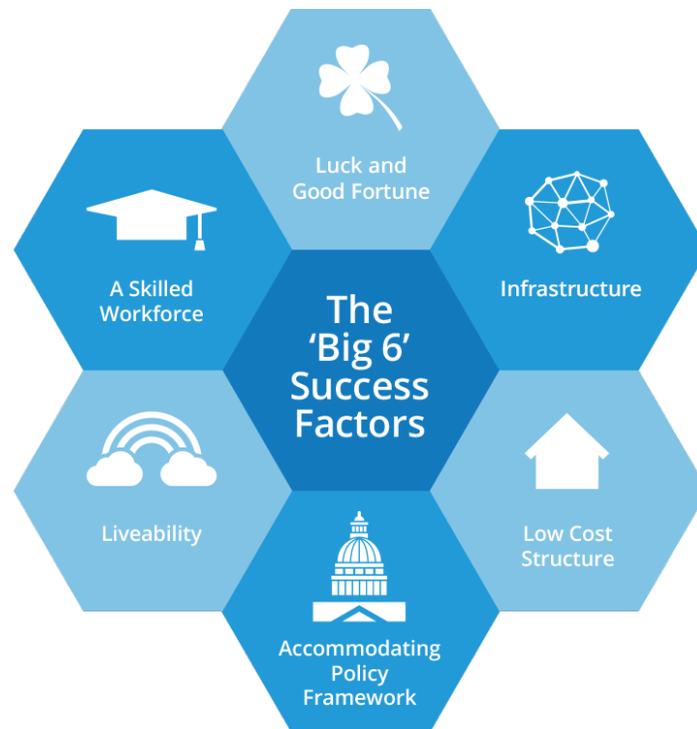
Regional innovation clusters and local innovation districts are not a novel phenomenon. They are rather a renaming and an evolution of the original form of U.S. manufacturing industries. The new version is more diverse, more collaborative, research focused, and – in the case of RICs- geographically bigger. Even though RICs differ from innovation districts in their geographical expansions, and both clusters and districts differ amongst each other due to locally unique features, there are several key characteristics that successful RICs and innovation districts have in common:

They are geographically distinguishable concentrations of public-private partnerships comprised of small to large companies, specialized suppliers, service providers, research institutions, and industry anchor institutions from related sectors that connect with start-ups, incubators, and accelerators (Katz and Wagner, 2014). These network components are united by a common, specific industry focus. Consequently the network members have a common need for a cluster specific skilled workforce, infrastructure and technology. (Wessner, 2012 and 2013; SBA, n.d). They are marked by a high level of interaction and interconnection among their researchers, entrepreneurs, and workers, which is expressed in “sharing of facilities and exchange of knowledge and expertise and by contributing effectively to technology transfer, networking and information dissemination among the undertakings in the cluster.” (InnoviSCOP,n.d). These characteristics allow for unusual collaborations and an innovative environment that nurtures entrepreneurship, and therefore results in higher levels of economic growth and competitiveness, and drives innovation and job creation (Wessner, 2013; AIA, 2013; SBA, n.d). Furthermore, both RICs and innovation districts provide a strong foundation for the commercialization of ideas, due to the collaboration of inventors and builders (Katz and Wagner, 2014). Due to their organic, place specific nature, they are often referred to as innovation ecosystems” that are, in a nutshell “a synergistic relationship between people, firms, and place (...) that facilitate idea generation and accelerates commercialization” (Katz and Wagner, 2014, p.10).

Ingredients for Success

Even though the literature listed the key components for clusters and districts separately, I combined those that matched, and list unique aspects in a separate paragraph under the respective headers. As already mentioned, RICs and innovation districts are by nature very diverse. Nevertheless the current theory emphasizes common core principles that, if calibrated according to the unique, local situation, have guaranteed the cluster’s or district’s long-term success.

Katz and Wagner group the key characteristics for success into three groups of assets: economic, physical, and networking (2014). The Economist Intelligence Unit Limited further subcategorizes these three groups into six key ingredients (2015), which are broadened according to related topics from the literature:



Graphic 1: The Economist Intelligence Unit’s big six success factor for successful Innovation Clusters; Source: Retrieved Sept.29, 2016 from <http://destinationinnovation.economist.com/part-1/>

- Skills and knowledge: local competencies; exchange of tacit or implicit knowledge, which requires close, personal interactions between the inventors, developers and the builders; knowledge spill overs.
- Accommodating policy frameworks: primarily through local governments that support the skill building process through transforming local educational institutions into “skill feeders”, that invest in local infrastructures, and secondarily through financial incentives through fiscal and taxation policies that foster entrepreneurship.
- Infrastructure: The local or regional infrastructure must foster collaboration, connectivity and mobility. This pertains to the educational system, the provision of equipment and facilities that are too expensive for small businesses, and the supply of modern technology.
- Low costs (especially in the early stages): Cost of living, and taxation.
- Livability: safety, stability, an attractive urban realm, good public amenities, culture, entertainment, schools, hospitals.
- Local luck, whether geography (proximity to key markets), natural benefits, and social processes.

In addition to these key ingredients, other authors added the following:

- Supportive local leaders, or “innovation enablers” or “innovation intermediaries” work are part of a collaborative leadership network, and who bridge the gap between research and production, connect public and private entities, help in pooling public and private funding resources.

- Positive local attitude about exploring ideas and risk-taking.
- Early stage and sustained long term funding through private-public funds.
- Private-public partnerships.
- The presence of small companies engaged in research, and a willingness to be permeable.
- A vision for growth, with actionable short, mid- and long term guidance that takes economic, physical and social aspects into account.
- Branding to both create a visual identity and to market the cluster or district.

(Wessner and Wolff, 2012; Wessner, 2013; Colgan, Clark, Lawton, and Damici, 2008; Chatterji, Glaeser, Kerr, 2013; © The Economist Intelligence Unit Limited 2015; Katz and Wagner, 2014)

Regional Innovation Clusters (RIC)

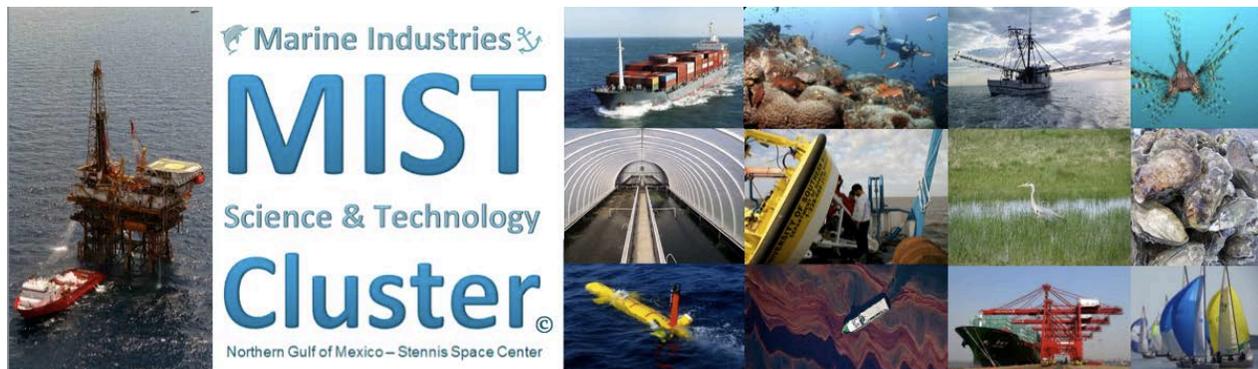
Clusters

Clusters are not defined by their outputs (products or services), but by cluster specific skillsets and knowledge base that reside and are developed within the region. An important characteristic is that clusters evolve from within- based on local skills, research, geographic advantages or challenges- , rather than being forcefully created from outside. The authors of the report *Maine’s Technology Sectors and Clusters* emphasize four correlated core elements that define a cluster: “Knowledge/skills/innovation - Networks/Knowledge Spillovers - Entrepreneurship - Production/Distribution” (Colgan, Clark, Lawton, and Damici, 2008, p.2).

Case Studies

I chose the two following case studies because they exemplify the core characteristics of and ingredients for successful clusters, they vary in size and age, and are related to maritime industries. They can therefore provide interesting ideas for Annapolis and Maryland.

Case Study I: Marine Industries Science & Technology Cluster (MIST)



Graphic 2: Marine Industries Science & Technology Cluster; Source: MIST presentation, retrieved Sept.15, 2016 from <http://www.mistcluster.org/past-events.html>

In 2014 the Marine Industries Science & Technology Cluster (MIST) was established under the leadership of University of Southern Mississippi (USM) and its partners Louisiana State University (LSU), Mississippi Enterprise for Technology (MSET) and Innovate Mississippi, as well as numerous network members. Its diverse network members - that range from large to small business, federal to local agencies, academic institutions, and nonprofits - develop and implement “applied technologies for operating in, working around, and monitoring the marine and coastal environments.” (MIST ppt, 2016). The cluster supports “other related marine industries which include commercial & recreational fishing, shipbuilding, defense, aqua-mariculture, off shore oil & gas, Port & Harbor Operations, Shipping, Environmental Restoration & Recovery” (U.S Cluster Mapping, n.d) It extends over four states: Louisiana (LQ under Water Transportation Cluster (including the subclusters: Water Passenger Transportation, Marine Transportation Services, Boat Building and Repairing) for the State Level: 7.9), Mississippi (LQ: 9.2 - highest in U.S), Alabama (LQ: 2), and Florida (LQ: 2.1). The cluster is funded in part by a U.S. Small Business Administration (SBA) Regional Innovation Cluster contract (Base year plus 4 option years), and other public and private funds. Members have to apply, but the membership is free.

MIST’s stated primary focus is on the development and promotion of the cluster’s small business (SB) members (MIST, n.d). The cluster assists SB development and promotion through Direct Services and Linking Services. Direct Services are provided by the cluster partners/ Institutional members, which are comprised of 14 federal and state government agencies, 12 academic institutions, 10 associations, and 6 financial institutions. Direct Services entail: Business training and counseling/consulting, Mentoring, Technology Transfer counseling, Commercialization of R&D Results, SBIR/STTR Engagement, Supporting Facility Clearance and holding personal clearances, Export readiness counseling/consulting, and Support to underserved communities. Linking Services are provided by network members that encompass 70+ small businesses, and 8 large business cluster members (see all members on Graphic 2). They entail: Customer base with federal agencies, Networks and partnerships, Showcase and demonstration opportunities, Regional market development, Assist in ascertaining federal agency technology development requirements and priorities, matching; and/or operationalizing cluster technology and capabilities to best meet these needs, and Facilitate opportunities for accessing new resources and markets (MIST ppt, 2016).

of entrepreneurship in the boat building industry, and a substantial critical mass of commercially successful firms. The fifth step was to identify clusters of economic activities, followed by the identification of their current and future economic importance that revealed how successful knowledge had been and could be translated into commercial or service products. The last two steps analyzed existing policies and funding opportunities (Colgan, Clark, Lawton, Damici, 2008).



Graphic 4: Maine’s technology sectors, retrieved Sept.15, 2016 from the presentation Cluster Initiative Program: <http://slideplayer.com/slide/6424870/>

After a successful identification of unique local strengths, a clear definition of an action plan, and the application of several federal and state funds, Maine’s Composite & Advanced Materials Cluster took shape. A \$15 million workforce grant enabled the state to create the North Star Alliance, a group of leaders who connected the expertise of local craftsmen with new technologies being developed in University of Maine’s laboratories. With an additional support of a Workforce Innovation in Regional Economic Development (WIRED) grant, the group re-trained 1,800 workers in Maine to build boats using advanced technologies and materials. The group also also approached local community and vocational schools, in order to encourage the use of the state’s newly built training center for composite technologies (Wessner, 2012).

The Composite & Advanced Materials Cluster evolved from locally unique skills, and the sharing and development of tacit knowledge. It has evolved and flourished due to a strong evidence of boat building entrepreneurs who were able to adapt to new market conditions (TechMaine, n.d),

numerous private-public partnerships, and academic and research collaborations, all supported by a group of innovation enablers and strong political support. The cluster's success and progress can be measured by the fact that nowadays Maine boats have Asian customers, several other composite related sub clusters have formed in the area, and that the state acknowledges clusters as a base for economic development which has resulted in a state fund that promotes cluster development (Wessner, 2012). Furthermore, there is a support network of research and vocational training opportunities that connect academic and research institutions, and enables knowledge spill overs.

The cluster is comprised of four sub clusters, which intersect with other state clusters. One of the four clusters is specialized Boatbuilding and Related Industries Cluster, which is led by the private firm Hodgdon Yachts, and collaborates with The Maine Advanced Technology & Engineering Center (MATEC), located on the Southern Maine Community College (SMCC) Midcoast Campus. It houses the SMCC's Composite Science and Manufacturing program, SMCC's pre- engineering program, the University of Maine's Brunswick engineering program, and the Composites Engineering Research Laboratory (CERL). CERL is a partnership between SMCC and the Maine Composites Alliance, and provides students and workers with cutting-edge precision analytical instruments (TechMaine, n.d).

Innovation Districts

The term innovation district was officially coined by Barcelona's @22 in 2000 (see case study below). According to Katz and Wagner (2014) they are "the ultimate mash up of entrepreneurs and educational institutions, start-ups and schools, mixed-use development and medical innovations, bike-sharing and bankable investments—all connected by transit, powered by clean energy, wired for digital technology, and fueled by caffeine." (Katz and Wagner, 2014, p.2) In short, Innovation Districts are, ideally, RICs in small scale. They usually stay within neighborhood districts or city limits, and are characterized by a compact, walkable, transit accessible, and "well-designed, amenity-rich" mixed-use urban environments (Katz and Wagner, 2014). Due to their smaller scale, they have a stronger emphasize on the correlation between the innovation process and the public realm.

Katz and Wagner (2014) categorize them by three general models:

- "anchor plus" model: evolves in downtowns and mid-towns of central cities around anchor institutions - mostly educational and research facilities- , and is surrounded by a network of related firms, spin off companies, and entrepreneurs who translate innovative ideas and findings into marketable products.
- "re-imagined urban areas" model: is often near or along historic waterfronts where industrial or warehouse areas are transformed into dense, mixed use neighborhoods. Often the change is powered by "by transit access, a historic building stock, and their proximity to downtowns in high rent cities" in addition to research institutions and anchor companies.(Katz and Wagner, 2014, p. 3). "Many of these areas draw from the experiences of 22@Barcelona, a

self-proclaimed innovation district that involved the complete re-make of an older industrial area in the city core. “ p.3 Good example is Boston’s innovation district.

- “urbanized science park” are traditionally isolated suburban areas, mostly science parks, that are transformed into new mixed use urban cores. Prime example is North Carolina’s Research Triangle Park

Ingredients for Success

According to the uniquely different characteristics mentioned above, I am expanding the previous ingredients list accordingly:

- One repeated key item for success is well-designed, successful place making that draws people in, and enables them to run into each other. The Brookings Institution collaborated with Project for Public Spaces (PPS) (2016), and developed 8 Placemaking Principles for innovation Districts that can be found here (PPS, 2016). They capture physical branding (MIT calls it a “Narrative design” (Katz and Wagner, 2014, p.17) that gives people a distinct experience when they enter the district), mixed use, continuity (to evolve from existing strengths), sociability (design features, public amenities, and programs that bring people together), proximity (especially millennials- the main work force of the innovation economy – favor walkable, and bikeable cities), mobility (through the access of multiple transportation modes), flexibility (often cheap, temporary, tactile urbanism), and finally unity (the need for a clear leadership).
- Katz and Wagner (2014) encourage an intentional, inclusive development that takes adjacent low-income neighborhoods on board, in order to avoid future tensions.

Case Studies

I chose the two following case studies because of their originality, the amount of their references in the literature review, their proximity to water, and both fall under the category of “re-imagined urban areas”, which would be the category for an Annapolis Innovation District as well.

Case Study I: Barcelona's 22



Picture 1: Four of the five Core Industries in the Barcelona 22 cluster (Design is missing); Retrieved on September 15, 2016 from https://www.brookings.edu/wp-content/uploads/2016/07/06_barcelona_22_presentation.pdf

Many old and new innovation districts were and are inspired by Barcelona's 22@ Plan or 22@Barcelona (22). It was the first official, or at least self-proclaimed innovation district. 22 evolved from a completely refurbished, old industrial area between the city core and the waterfront called Poble Nou. The redevelopment was caused by the summer Olympic Games in 1992. In preparation for the celebrations, Barcelona built several capital projects that connected Poble Nou both to downtown, the waterfront, and the greater metropolitan area. What actually triggered the innovation district idea were discussions about the future of the Olympic village at the water. The result was the 22@ Plan, an Amended Metropolitan Master Plan, and a new urban planning ordinance that "allowed for a new land designation called 22@, which substituted the traditional industrial designation 22a." (22barcelona, n.d). The new ordinance allows a higher density, more public spaces, "and subsidized housing as long as the previous industrial activity is replaced by offices or other business services and equipment related to new technology and knowledge." (ibid.) In 2000 the Barcelona City Council created the municipal society 22 Arriba BCN, S.A.U to promote and manage the realization of 22.

22@Barcelona is building a new, compact 494-acre city, which fosters innovation by housing 10 universities, 12 RDI & technological centers, and numerous innovative companies that relate to one or several of the five "engines of transformations" industries: Media, Energy, Medical Technologies, ICT, and Design (22 BarcelonaPPT, 2016). It offers 4,614 dwellings, 4,000 new subsidized housing units, several public facilities (145,000 m² of land), public places (114,000 m²), and special services and programs – called 22@Plus- that support businesses and start-ups. The latter list includes: spaces and infrastructures, innovation and technology, clusters and market access, public and private financing, a skilled workforce supply, networking, and promotion. 22 has created over 100,000 new jobs, has seen a 105.5% growth of local companies, and it has welcomed about 4,500 new companies out of which roughly 50% are local start-ups and the other half are firms that moved from other locations- which is roughly an average of one new firm per day. It has

invested 180 billion euros in infrastructure, and has seen a strong increase in new workers and especially workers with a higher degree. 22 has a 22@Staying in company-program that connects the best students to local firms, and thereby attracts, retains and connects local and international talent.

A supportive city government that collaborated with local leaders, and a strong, forward-looking vision of growth drove the change. It saw the area as “a “new model of a compact city,” replete with innovation activities, green spaces, advanced industries, a strong industrial heritage, subsidized housing, a new mobility model, and revitalized public spaces.” (Katz and Wagner, 2014, p. 15) It clearly understood and communicated the district’s competitive advantages, brainstormed new opportunities through workshops and events, and re-imagined and changed the physical realm by removing barriers such as railroad tracks, and streets. Another factor was a strong marketing campaign that took the leadership team all over the world, and thereby gained international attention.

Case Study II: Boston’s Innovation District/Seaport Innovation District



Graphic 5: Boston’s Innovation District Map; Source: Cities as a Lab: Designing the Innovation Economy, The American Institute of Architects.2013.

Boston’s Seaport Innovation District is a commonly referenced prime example of innovation districts in the U. S. Unfortunately I only found very little literature about Seaport Innovation District, and most of it was out of date. One article brought up the point that the term Innovation District seems to be fading away, without going into more detail about the reasons (Martin, 2016). I did the best with the available information, because due to the recognition and longevity of this case study, I did not want to give it up for another one with more available data.

Boston’s Seaport Innovation District also evolved from a collection of aging industrial buildings and parking lots that were separated from downtown by physical barriers. It was the first officially labeled innovation district in the United States, and, inspired by 22. However, the main difference is that it was not the result of a favorable capital investment campaign such as hosting

Olympic games, but by the bold initiative of Boston's Mayor Menino. He envisioned a transformation of 1,000 acres of vacant industry stock on the South Boston Waterfront into a innovative, creative, hip district that celebrated and fostered information age jobs, combined with clean tech, health care information technology and mobile media. The vision was built on three core principles and three key strategies: The core principles entailed: The Urban Lab that acknowledged risk taking in experimentation, as well as using the urban realm as part of the test and refinement process. Sustainable Leadership to maximize the development and to guarantee a sustainable development. Shared Innovation that emphasized an inclusive development that allowed all Bostonians who desired to participate, to do so. The key strategies called for the promotion of collaboration to foster innovative growth within the cluster, provision of public space and programming in order to create an attractive, urban realm that fostered encounters and collaboration- District Hall was an immediate realization-, and lastly, they called for the development of a 24-hour neighborhood (all principles and strategies from wikipedia, Innovation District, n.d). The vision was not only clear and strong enough to realize Menino's vision, but also to support the roughly \$15 billion Big Dig project that removed a major physical barrier- the busy I 93. This move reconnected the district to downtown, which was a much-needed change for a successful transformation.

Mayor Menino launched the innovation project in 2010, and only three years later it took shape. It's innovative live-work-play character and charming, historic buildings not only attracted developers, business owners and research leaders, but also artists. Menino asked developers to designate 10-15% of their permitted space for innovative use, which resulted in numerous makerspaces, co-working spaces, and accelerators (AIA, 2013). The district's website – which is in desperate need of an update- still advertises affordable office and start up space.

Since the launch, Seaport Innovation District has grown faster and younger than any other area in the city. One third of the districts population is between 21 and 34 (AIA, 2013). It counts over 200 new companies from small to large scale out of which 40% share offices, more than 4,000 jobs and another 2,500 lined up. According to The American Institute of Architects, of the jobs created "30% are at technology companies; 21% are in creative industries like design and advertising, and 16% come from green technology and life sciences." (AIA, 2013, p.20) From the currently 360,000 square feet developed office space (as of 2012), about 95% is occupied. 1.1-million square-foot headquarters for drug manufacturer Vertex Pharmaceuticals Inc., more office spaces, and hundreds of apartments have been added to the district (Webber Sadovi, 2012), and GE decided at the beginning of this year to take a seat in the district as well (Martin, 2016). Other players in the district are Fidelity Investments, Institute for Contemporary Art, high-end stores, breweries, restaurants (Szanişzlo, 2012), the world's largest startup company accelerator MassChallenge, and two other major accelerators, four co-working facilities (AIA, 2013), and Factory 63 that accommodates micro-housing units for district residents, along low priced office space for start ups (wikipedia, Innovation District, n.d).

These were two of many current examples of innovation districts. However, because the name is affiliated with success and novelty, the term is used more often than it should be. A follow up study by the Brookings Institution reveals that many projects use the name, without providing the needed conditions for the ecosystem to develop and flourish: there needs to be a minimum threshold of somewhat related innovation-oriented firms, start-ups, institutions, or existing industry clusters who are willing to cooperate and collaborate in order to innovate, and it needs to evolve from existing strengths. They need to evaluate their competitive advantage and cultivate it. It is not about a conundrum of service-sector activities that help each other out. Another important lesson is to not get stuck in the present anchors and opportunities, but to keep evolving and inventing. This includes reaching out to research institutions for future locations in the district. Another factor that the “copiers” underestimate is the importance of place, the need to foster an urban character that spurs connectivity, diversity, vibrancy, and density. And lastly - many projects ignore surrounding low-income neighborhoods (Katz, Wagner, Vey, 2015).

These findings exemplify the important nature of innovation clusters and districts. It is not a static formula, but a dynamic, evolving ecosystem that needs to be maintained and nourished to grow from its existing roots of local, tacit knowledge and other competitive advantages into new adaptations, and innovations.

Incubators

According to the National Business Incubation Association (2015), “business incubation is a business support process that accelerates the successful development of start-up and fledgling companies by providing entrepreneurs with an array of targeted resources and services.” Essentially, an incubator is a multi-tenant facility typically requiring specific qualifications for tenant entry, and a contractual agreement that the said tenant will graduate, leaving the incubator after a specified period of time. These incubator graduates, in turn have the potential to “create jobs, revitalize neighborhoods, commercialize new technologies, and strengthen local and national economies.” (NBIA, 2015). While providing management guidance, technical assistance and consulting tailored to young growing companies; an incubator’s main goal is to produce successful firms that will leave the program, both financially viable and freestanding. However, services are not limited to only technical guidance and assistance, as incubators usually provide clients access to appropriate, affordable rental space oftentimes with flexible leases, shared equipment, technology support and the financing necessary for the company’s sustenance and growth. That being said, “an incubator should be created only if a clear need, a sufficient market, and adequate resources to support the incubator have first been identified.” (A Resource Guide, 2006).

Ingredients for Success

Literature suggests that following are characteristics of successful business incubators:

- Targeting a Particular Industry Segment (e.g., manufacturing center for businesses within the maritime industry)- Such incubators have a unique edge and can differentiate themselves from others, increasing their chances of attracting quality companies from the targeted sector.
- Personalized Tenant Screening Process- Incubator staff should meet with potential tenants to gather basic information including, but not limited to, the nature of the product, its competitors and market potential, as well as the status of its funding. Learning this information in the early stages helps to avoid any surprises that may be the cause of the company's early failure.
- Networking Opportunities- The incubator must facilitate daily casual interactions between entrepreneurs in order to generate and sustain a positive social network.
- Design- The building design should therefore encourage such networking opportunities and social interaction with glass, open doors and shared hallways. "The space should provide flexibility to change configuration as tenants' needs change." (A Resource Guide, 2006).
- "Management by walking around" (A Resource Guide, 2006)- Incubator managers must pay close attention to their clients in order to both determine their needs and assess how successfully the services offered actually meet those needs.
- Established Graduation Policy- Milestones or checkpoints should be built into the lease agreement to ensure that tenants do not stay with the incubator indefinitely. Such a policy can retain flexibility based on the industry.
- Partnerships- Incubators should partner with entities with vested interests (for example, a university or an economic development organization) who can provide funding, mentorship and quality management.

Case Studies

Case Study I: TechShop

TechShop is a maker incubator, founded in 2006 by inventor Jim Newton. Its first workshop located in Menlo Park, San Francisco, CA was intended to provide shared access to over \$1 million worth of professional equipment, software and industrial machines for a wide range of independent manufacturing projects. Each facility offers laser cutters, plastics and electronics labs, a woodshop, a metalworking shop, and welding stations, just to name a few. The incubator also provides access to instructional classes and events. Members have open access to all of these facilities including large scale working space with huge worktables. Most importantly, paid members can create in a collaborative and creative environment with access to free coffee and popcorn alongside staff members who are available full time to help develop ideas and improve technical skills. (TechShop: Welcome).



Picture 2: A plane being assembled stands in the middle of TechShop Arlington, VA; Source: Retrived on September 29, 2016 from <http://www.makery.info/2015/09/15/on-a-jete-un-coup-doeil-au-chantier-du-futur-techshop-parisien/>

In addition to the membership fee paid by users, each TechShop location is funded and accounted for separately by acquiring funding from individual lenders. For example, the initial money for the San Jose location was acquired from individual lenders, making loans of \$25k or more to be paid back at 10% interest over five years. As a bonus, the lenders received a lifetime membership. Similarly, Bill Coughlin, CEO of Ford Global Technologies, a subsidiary of Ford Motor Company was heavily involved in bringing TechShop to Detroit. According to Ganksy (2012), Ford has since encouraged its employees to make use of the facility offering both current and past employees a 50% discount on TechShop Detroit membership. Additionally, three-month memberships are offered to employees who submit inventions that are considered deserving of patent consideration.

The TechShop user-base is typically creative innovators without sufficient manufacturing space whose projects range from a laser hair loss treatment device to an electric motorcycle. The TechShop franchise is part of America's sharing economy, where "instead of owning something they rarely use, people increasingly prefer to share with others at marginal cost" (AIA). As a result many of its members are makers who cannot afford to purchase expensive tools and are seeking affordable classes. The rise of 3D printers and microcontrollers for hardware manufacturing means that now equipment is cheap enough to share, yet still too expensive, bulky, and difficult to master at home. Paid members can therefore reserve and use TechShop's tools upon successful completion of its equipment-specific Safety and Basic Use (SBU) classes.

For a series of reasons, TechShop proves to be a successful incubator, particularly for hardware manufactures. By 2013 TechShop had attracted more than 4,000 members to its facilities in its six workshops at the time. The incubator has helped produce prototypes and early production lines for well known companies, including Square Inc., a credit-card processing service, and Type A Machines, which sells 3-D printers (Fowler, 2013). Furthermore, "the millennial generation is seeking

purpose and opportunities to associate and create with a community of like-minded people” (AIA), and TechShop has provided a facility for such opportunities.

Case Study II: PortTechLA

PortTechLA, located in downtown San Pedro, was founded in 2009 with the support of the City of Los Angeles, the Port of Los Angeles and the San Pedro and Wilmington chambers of commerce. It is a clean maritime technology center and business incubator focused on green technologies needed by the Ports of Los Angeles/Long Beach, their tenants and worldwide shipping industries. The incubator offers one-on-one mentoring, business development, and management and marketing consultation as well as connections to a network of public and private investors and government and private sector support services. PortTechLA also provides affordable office space for entrepreneurs and is credited with being an anchor of AltaSea, an urban marine science center for education, research and business innovation. Bringing manufacturing that will grow jobs in the harbor area and support a clean tech industry cluster is a top priority for the incubator.

With respect to funding, the Port of Los Angeles is a major sponsor for the incubator while others include academic institutions such as the California Institute of Technology; corporations such as Cavotec, an engineering firm and supplier of power controls systems in the maritime industry; and others including the Port of Long Beach. The incubator, has raised more than \$800,000 so far from foundation grants alongside a government earmark. PortTechLA’s current user-base includes makers of alternative fuels, vehicle pollution control systems, zero-emissions technology, software to maximize the use of resources, hazardous waste control technology and lighting innovators. PortTechLA is arguably the most successful incubator of its kind, tailored to the maritime industry. In 2010 the incubator launched its first Expo, a combination trade show and venture capital fair, which attracted more than 300 people. “The most recent 2016 Expo hosted 800+ innovators, investors, transportation professionals & change makers, 200 high school students - tomorrow’s entrepreneurs and STEM leaders, and 70+ entrepreneur exhibitions, demonstrations & displays.” (PortTechLA.org).

The following is a new initiative but may be worth replicating upon its continued growth and development.

Case Study III: New England Ocean Cluster

Thor Sigfusson, founder of the Iceland Ocean Cluster, and Patrick Arnold, Port Development/Transportation consultant, founded the New England Ocean Cluster in 2015. “Maine has a strong commercial fishing tradition, with over 150,000 tons of seafood landed in 2013, as well as a budding life sciences industry, containing more than 220 biotech and medical products companies and organizations.” (NEOC). Furthermore, there are also several nationally competitive research institutions and universities in the area. Using these resources and a context unique to the state, the New England Ocean Cluster will provide a space for entrepreneurs to connect with

companies in different marine related fields to develop their ideas and create value for the entire ocean cluster. The New England Ocean Cluster House will host an incubator hub for maritime focused companies where the intent is “greater efficiency, profitability, and a more transformative impact on the maritime industry as a whole.” (NEOC).

In September 2015 the state released a request for proposals for the marine jobs bond. The program required applicants to include a representative from each of the following areas: a marine-based research program at a private or public university, a commercial fishing or aquaculture interest, a community-based organization and a private-sector business. The bond was issued as a single award and had to be matched by at least \$7 million in private investment.

The intended users of the NEOC House are companies that draw on the ocean as a resource for their products, services, and ideas. It is a research and development facility for early-stage marine businesses and its tenants are expected to range from boat building to biotech companies.

As mentioned, key ingredients to a successful incubator are the networking opportunities it provides and its design. Considering these, the New England Ocean Cluster House may have some anticipated success. At the core of the initiative is the idea of intentional networking where the intent is to strengthen connections between people, businesses, and entrepreneurs to create a community of talented individuals committed to each other’s success. Furthermore, its design is based on the open and social nature of a coffee shop. Incorporating such a model facilitates a workplace where collaboration, joint strategic planning and knowledge sharing occur often and organically. Prior to launching the incubator had lined up eight companies interested in being tenants within what is envisioned to be initially a 30,000-square-foot incubator building on Portland's waterfront. Initial plans called for as many as 20 companies being located in the incubator.



Graphic 6: Conceptual representations of the New England Ocean Cluster House design; Source: Retrieved on September 27th, 2016 from <http://www.newenglandoceancluster.com/new-page-1/>

Accelerators

“Accelerators are programs that help entrepreneurs bring their technologies, ideas, or products into the marketplace and ideally lead them to develop viable businesses.” (Dempwolf et. al., 2014). Similar to incubators, accelerators work with startup businesses to provide a range of assistance and support services so that they can secure early-stage seed funding. However, despite their seemingly similar purposes, accelerators are quite different in that an accelerator is a fixed-term, cohort-based program requiring an application process that is open yet highly competitive. As mentioned, the startups are supported in cohorts or classes, which encourage peer support among the groups. For example, each team can seek assistance from the others and receive early feedback on their ideas. The accelerator typically invests \$18,000 to \$25,000 in each team of cofounders and takes, usually 4% to 8% equity in every investee. External investors generally fund these expenses. While some accelerators provide office space at their facilities, others encourage the teams to find their own places to work. The program ultimately ends with a public pitch event or demo day. “The number of new accelerators in the U.S. has grown significantly over the past five years. Worldwide, there are approximately 359 accelerators from 46 different countries – more than 250 of which are based in the U.S.” (Trends, 2013).

Ingredients for Success

According to *Innovation Accelerators: Defining Characteristics Among Startup Assistance Organizations* (2014), “to evaluate accelerator performance, especially as it compares to other similar entities, the evaluation design needs to consider program characteristics. Such characteristics are as follows:

- **Mentoring and Business Skills Training-** Mentors contribute to the education that enhances the human capital within the startups and because of their entrepreneurial expertise, they add overall value to the of the accelerator program. Such value is often in the form of marketing and awareness and thus they attract the most appropriate startups.
- **Program Length-** The length of the program differentiates accelerators from incubators in that an accelerator mirrors an intensive boot camp lasting only a few months. This means that iterations and product development are done rapidly and is “believed to create a sense of urgency that encourages intense work and rapid progress.” (Barrehag et. al., 2012).
- **Connections to Investors-** The main incentive for startups to take part in an accelerator program is the connection to a network of investors. In order to provide startups with this service, the accelerator must entice investors to be an active part of the network. Conversely, investors have an interest in presumptive future investment objects. In this way the investors are natural stakeholders to the accelerator.
- **Team-based startups rather than individuals-** “Most accelerators are of the opinion that running a startup during the period of the program would be too much work to handle for

just one person. Therefore it is very rare that an accelerator program accepts a single entrepreneur.” (Barrehag et. al., 2012).

- Technology-focused industries- Many accelerators emphasize that they invest predominantly in technology based start-ups, seeking out fledgling ventures that have new technology but only those that have established expertise and can to which they can add “value” to a concept. According to Hoffman et. al. (2012), “virtually all the accelerators companies studied state that they prefer technology based business concepts, while only occasionally accepting non-technology ideas.”

Case Studies

Case Study I: Highway 1

Brady Forrest and Liam Casey founded Highway 1 in June 2013. It is an accelerator that provides seed funding, offering investments of up to \$100,000 for 8% equity or \$50,000 for 5%. The accelerator was created to offer a collaborative, hands-on environment to help startups arrive at a prototype ready for manufacturing. Highway 1’s four-month program is an immersion into how to scale a hardware company, which includes product design and engineering support, access to a prototyping lab, a 10-day trip to Shenzhen, China, to learn about global manufacturing and supply chain management, as well as marketing and retail support. In week one of the course, a meeting is held with each of the startups about where they want to be by “Demo Day,” upon completion of the program. Conversations in those early meetings are often about discussing goals and the achievability of those goals. Once goals are established, the rest of the program is focused on supporting each startup’s product development. The company accepts about a dozen startups twice a year, once in the spring and once in the fall.



Photo 3: Highway 1 DemoDay; Source: Retrieved on September 29th, 2016 from <http://thinkapps.com/blog/post-launch/highway1-accelerator-hardware-startups/>

Funding for the accelerator is typically sourced from crowd funding with approximately \$11 million being raised thus far as part of crowd funding campaigns. With respect to the Highway 1 user-base, they tend to look for startup companies that are considerably far along in the process, perhaps even where there is already a working prototype, and the company can show that the product has value and is desirable to the public.

Despite the fact that many accelerator programs prefer to invest predominantly in technology-based start-ups, this hardware-manufacturing accelerator has seen significant success. So far it has accepted 67 companies from 12 different countries, which have gone on to raise more than \$100 million in venture and crowd funding. Hardware that has come out of Highway 1 has been featured in well-known magazines and on blogs such as TechCrunch and Engadget. Some better-known Highway 1 alums include; Drop, Navdy, Podo and Ringly.

Case Study II: Y-Combinator

Paul Graham, Jessica Livingston, Trevor Blackwell and Robert Tappan Morris founded Y-Combinator in Cambridge, Massachusetts in March 2005. Twice a year the accelerator invests \$120k in return for 7% of the company's equity. The startups move to Silicon Valley for 3 months. During that time startup founders have regular meetings with each of Y-Combinator's counselors, or partners, at which they receive technical advice, emotional support and lessons on being great salespersons. There is no campus, but instead an office building. Startup founders are therefore advised to rent apartments nearby so that they can access the office as soon as possible, if a potential investor were to visit. Like Highway 1, each cycle ends in Demo Day where, a representative from each startup delivers a short pitch before 450 of the world's richest and most influential technology investors and about two dozen journalists. (Rich, 2013). Afterward the investors meet with the most-impressive startups, which can receive up to millions of dollars in financing.



Photo 4: Workspace at the Y-Combinatory Office; Source: Retrieved on September 29th, 2016 from <http://marcobambini.com/my-y-combinator-experience/>)

Y-Combinator typically acquires funds from individual lenders, as well as venture and crowd funding. Recently the accelerator raised \$700 million for a later-stage fund that will be used to fund select companies well after they have graduated from the program. Y-Combinator does not target specific types of companies and does not divide their companies into various groups by industry. However, they are particularly beneficial to startups manufacturing hardware, helping such companies create prototypes, test them with potential customers, reiterate the product, launch in a way that maximizes the likelihood of success, and scale production in response to demand.

Forbes ranked Y-Combinator as the #1 accelerator in 2014 which, in itself speaks to the company's success. Among the eight start-ups that graduated from the first class were the social-news site Reddit, and Infogami, the website builder which subsequently merged with Reddit. Other Y-Combinator success stories include Dropbox, Airbnb and Stripe. Today the average value of a Y-Combinator-financed start-up is \$22.4 million and for the most recent term Y-Combinator received 2,633 applications. (Rich, 2013).

MakerSpace

Creation stands as the core of makerspace in its origin and purpose. Makerspaces are formed out of the desire to share resources, e.g., space, equipment, and ideas, in a flexible and collaborative way that would enable independent people and small business owners to transform their ideas into physical form. Thus, majority of the successful spaces are formed by individuals who strive to create a new alternative model to the cooperative world that would allow for more independence. Although the layout and the equipment of makerspaces varied widely based on the scale and purpose of the space, makerspaces can be defined by its availability of equipments and shared work space. It is important to note that makerspaces can share many characteristics of other co-working and “disruptive” spaces, such as active programs to encourage collaboration among members and many do function as hybrids on two or more types of spaces.

Makerspace Ingredients List

- *Client base:* Majority of the makerspaces in America caters to engineering, technology, and art sectors. Locations concentrated with young, educated professionals in these sectors, such as Boston, Massachusetts, are ideal locations for makerspaces.
- *Financing Model:* Primarily structured around a membership-based model. Many makerspaces also form a partnership with local and governmental organizations to help finance the space and the ventures of their members.
- *Physical characteristic:* Workshop-centered coworking concept lends itself to wide open spaces that allows flexible setup of equipment. Ideally, there should be individual work and storage spaces that members can rent out to allow for professionally oriented use of the space.
- *Networking opportunities:* One of the advantages of having a shared work environment is the networking opportunities that it provides. To fully take advantage of it, many successful makerspaces have actively encouraged certain partnership among members and outside organizations.

Case Studies

Industry Lab, Cambridge

Industry Lab provides an excellent example of the makerspaces’ ability to bring together individuals of varied but complementary skillsets to allow for fruitful joint-ventures. It was started by an MIT grad who received a discount from a landlord to organize a small hardware startup in his building. Similar to the paths of many makerspaces, Industry Lab moved to a new location once the volume of the membership exceeds the original space allowance. It should be noted that Cambridge has a much younger and educated demographic than Annapolis, and the concentration of educational facilities provided a marked advantage.

The current workspace is 20,000 square feet and the space gives equal importance to workspace and equipment space. There is a variety of working space which includes open co-working stations, dedicated workspaces, lock and key space, and two conference/classrooms. The equipment space contain 3D printers as well as other fabrication tools. The space is flooded with natural light due to the abundance of windows and an open-floor plan. Currently, the space is funded mainly by membership fees.

The official website stated that it is a “curated community of artists, entrepreneurs and inventors who gather in mutual support to work, play and learn.” (About, Industry Lab) Mutual support seemed to be the key considering its impressive record of successful joint ventures. One example of this is the partnership between LeafLabs and Kendall Research Systems, which has led to a client referral that produced a six figure contract. Another example of a joint project is between FormLabs and LeafLabs where the LeafLabs provided the hardware as a basis for producing a high resolution 3D printer that raised \$3 million on Kickstarter, a crowdfunder website. Industry Labs’ founder is in the process of seeking marketing, public relations, and business development services to further reinforce the commercial potential of these collaborative ventures.

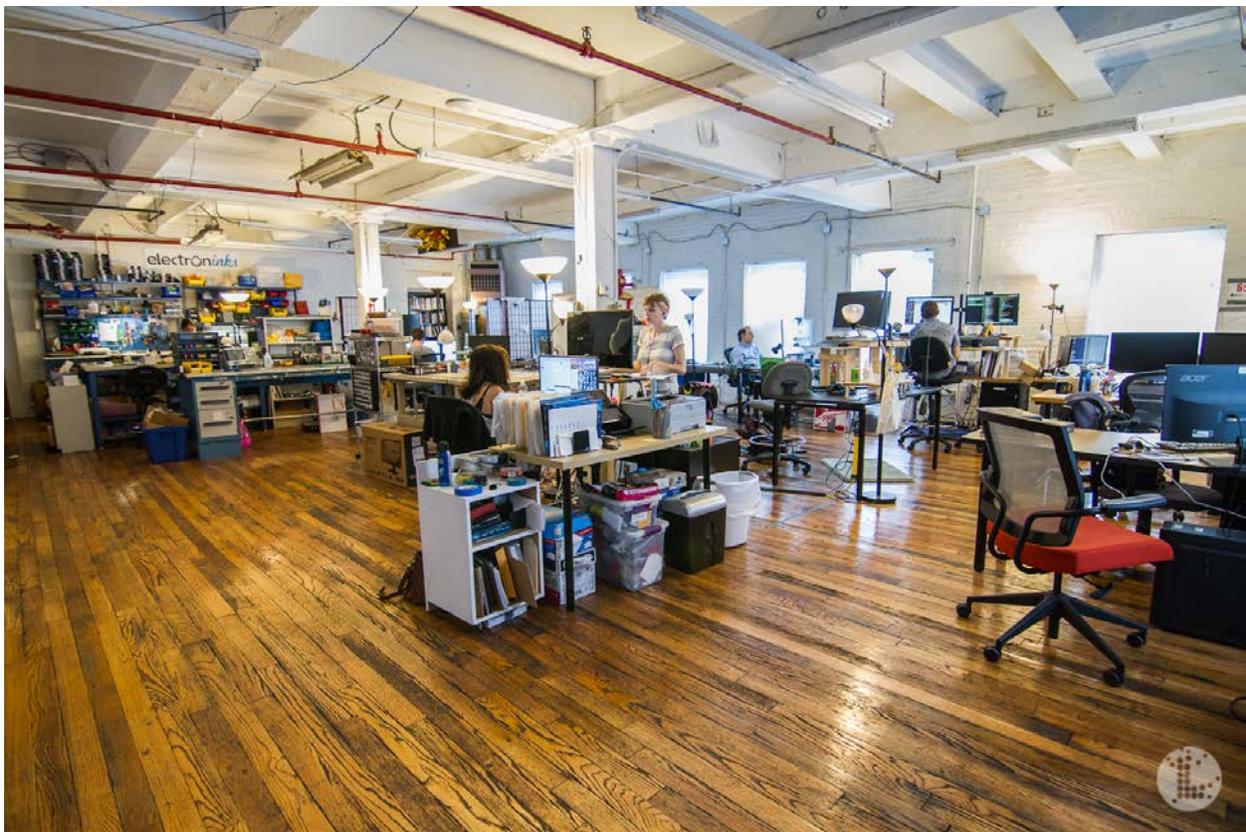


Photo 1: Open workspace of Industry Lab

Photo source: <http://industrylab.squarespace.com/gallery/>

Artisan's Asylum, Somerville, Massachusetts

Artisan's Asylum is an example of a large-scaled and well-established makerspace which operates more as an office for professionals with ability to accommodate large scale production. Its modest origin took place through a series of meeting over a year in the living room of Olin College alumni Gui Cavalcanti. The result of these meetings was a 1,000 square feet space which opened in 2010. Within four months, with the rapid membership growth which totaled 450 people, the space expended to 10,000 square feet.

Currently, Artisan's Asylum has 31,000 square feet of workspace which is divided to 20% workshop space and 80% cube space. The workshop space houses fabrication tools and equipment which caters to electronics, robotics, woodworking, jewelry, and metal smith. The tools allow for welding, precision machining, rapid prototyping, digital fabrication, fiber arts, screen printing and more. There is also an additional 9,000 square feet of special project space for a super-large scale robotics project.

The cube space provides three variety of spaces to accommodate differing needs of the members: studio workspaces, storage-only spaces, and flex space. Studio workspaces cater more to professionals looking for a long-term home base that could also serve as an office space. Shelf and storage spaces are for members who are more focused on the use of equipment and just need space for storage. Flex space are for immediate and short-term needs, thus is more fitted for hobbyists than professionals.

The space is funded mainly by membership fees, which are priced based on the type of space rented and the duration of the time needed. Artisan's Asylum also works with large sponsorships such as the Robert W. Deutsch Foundation, Autodesk, and MathWorks. Individuals can also contribute donations on their official website as well serve as volunteers.

The large scale of this makerspace allows enough funds to maintain a paid staff that includes managers for the shop and for administrations. This enables the Artisan's Asylum to become a program-driven space where events such as competition entries and The Maker's Masquerade help to instill a sense of community. It also offers classes which are open to the public and do not require membership to connect with and enhance the wider community. The result is a well-equipped and organized facility with a sense of community where ideas and creative energy flows freely. One example of the result of this space is the 3Doodler which raised \$2.3 million in March 2013.



Photo 2: Cube space of Artisans Asylum

Photo source: <http://www.starhub.org/workspaces/artisans-asylum>

Open Works, Baltimore

Open Works is a makerspace which had just recently opened on September 28, 2016. It offers an extensive list of equipment which includes 3D printing, CNC routers, metal shop, and woodshop. The upper floor is dedicated to classroom and digital fabrication spaces, and the lower floor is dedicated wood and metal shop. There is an open studio on both floors.



Photo 3: Main gathering space of Open Works
Photo source: <http://www.openworksbmore.com/>

Coworking Spaces

Coworking Spaces is the result of a “confluence of technological, demographic, and cultural influences [that] has fueled rapid transformation in the workplace” (Foertsch, 13). Technological advancement, such as the internet, wifi, and social media changed the way the information is shared. The open-sourced, fast sharing of information have produced a new generation of workers that prefers to work in a flexible, non-hierarchical environment. Thus, a new typology of workspaces, most commonly referred to as coworking spaces, with no walls, no set hours, and community driven spaces have emerged as the main alternative to the traditional office model.

Coworking Space Ingredients List

- *Formation:* According to Foertsch, there are four basic types of coworking center founders.
1) Startup company owners seeking the company of fellow innovators
2) Individual or a nucleus of prospective users
3) Intermediary/third party operators
4) Property owner.
Coworking spaces created by individual or group of prospective users tend to be the most successful because they started with the community of people who are more invested in the space.

- *Multifunctional Physical Layout:* Flexibility trumps privacy as the members look for spaces for working, learning, and socializing. Open layout are the most common floor plan, though there are designated closed spaces such as phone booths. Aesthetics is very important as it contributes to the identity of coworking space and helps establish a sense of community.
- *Targeted users:* Freelancers, entrepreneurs, and small start-ups make up the main user base for coworking centers. A sense of community that allows for networking is cited as one of the main attraction for these targeted users.
- *Funding:* The initial budget of majority of coworking centers founded by small group or individuals often come from their founders' own equity. Foertsch found that "the key to success is incrementally growing, furnishing and equipping the space as membership increases." (Foertsch, 19) During the initial growth stage, some founders have turned to the U.S. Small Business Administration to obtain loans. Corporate sponsors are another source of funding which some founders have succeeded in attracting once the coworking center has reach a stable size.

Case Studies

CO+HOOTS, Phoenix

CO+HOOTS is a coworking space that "promotes collaboration and provides a professional, inspirational and self-sustaining space to grow and nurture entrepreneurialism." (aboutus, cohoots) It is the first coworking space in the central Phoenix office location, and it aims to represent the "Phoenix's growing vibrancy" by providing a space that is a stark departure from the sterile, closed, traditional office space. Because of this, young professionals such as graphic designers, startup entrepreneurs, and filmmakers make up the main member base.

A substantial portion of this coworking space is dedicated to spaces of interaction. In the work space, there are conference rooms and main space that encourage collaboration among its members. The supporting spaces which include a kitchen, lounge, and coffee shop further encourage social interaction. The supporting spaces also recognize and meet the needs of its members who often have to be economical about money and time, and thus would not be able to go out for meals. Individual workspaces are located in an open plan where privacy takes a back seat to transparency. Nevertheless, call booths are available to fulfill certain instances where privacy is required.

Building community is one of the main objective of CO+HOOTS. A dedicated cohort of paid staff maintain a program-intense coworking space that aims to not only strengthen connection among its members but also to reach out to the community that it is located in. Organized events such as workshops, happy hour, and educational talks give the members and the public an opportunity to connect and share ideas. In addition, conference spaces are available for community used.



Photo 4: Open work space of CO+HOOTS
Photo source: <https://cohoots.com/portfolio/main-space-8/>

Impact HUB Baltimore

Impact HUB Baltimore is one of the 86 Impact Hubs located across 5 regions. The coworking space in Baltimore is founded in 2014 by a team that has been working in the city to deliver “innovative program” since 2012. (Baltimore Impact Hub) The founding team is made up of Michelle Geiss (Program Director), Pres Adams (Business Director), and Rodney Foxworth (Strategy Advisor). The coworking space is funded mainly by private and public foundations that include Gensler, American Communities Trust, and John Hopkins University. Membership fees make up another source of funding. There are variety of membership types to accommodate different types of users.

The physical layout of the coworking space is multifunctional and aims to maximize efficiency and collaboration. Similar to CO+HOOTS, Impact HUB offers dedicated desks in an open space, conference room, and phone booth. In addition, private offices are available on a 12 month lease, which aimed to attract a long-term professional use. The layout can be seen in the floor plan below.

Members are encouraged to host events and meetings ranging from coffee meeting to happy hour. Public can also book the space for both public and private use. As of now, Impact HUB is not as

program-oriented as CO+HOOTS and does not seem to have a dedicated staff to organize events to build a sense of community.

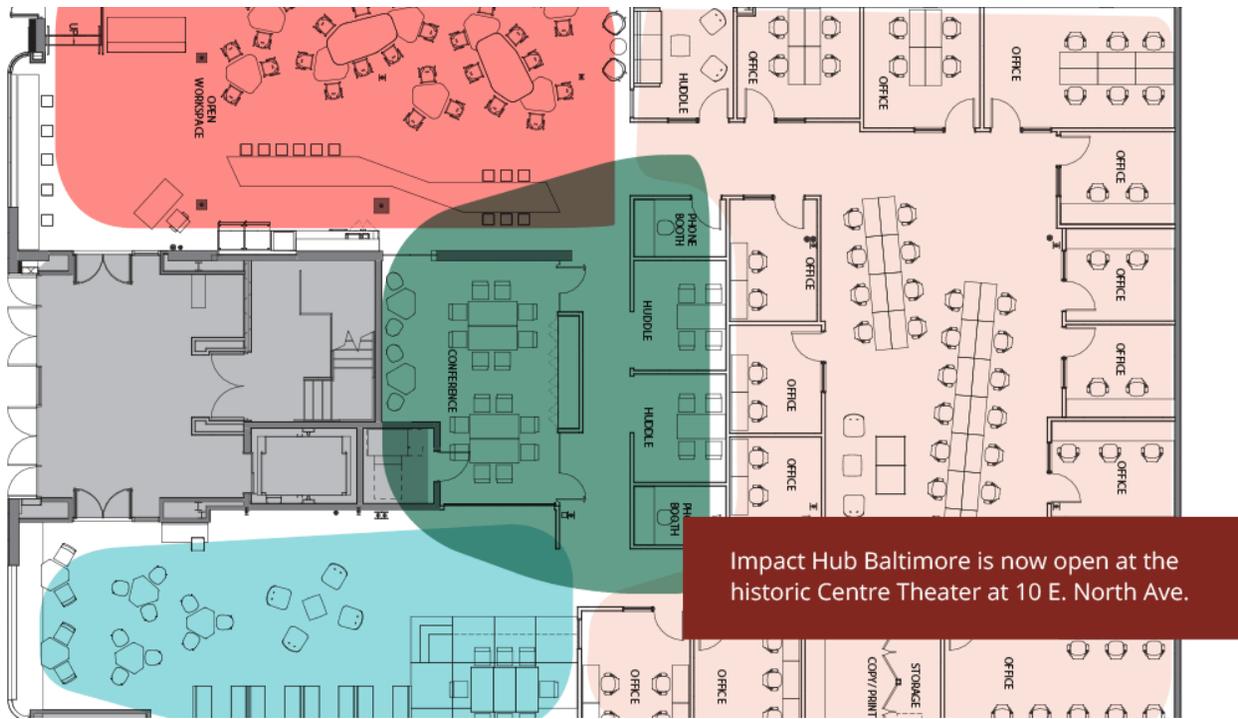


Photo 5: Floor Plan of Impact HUB Baltimore
Photo source: <http://baltimore.impacthub.net/about-us/>

Graphics and Pictures

Graphic 1: The Economist Intelligence Unit's big six success factor for successful Innovation Clusters; Source: Retrieved Sept.29, 2016 from <http://destinationinnovation.economist.com/part-1/>

Graphic 2: Marine Industries Science & Technology Cluster; Source: MIST presentation, retrieved Sept.15, 2016 from <http://www.mistcluster.org/past-events.html>

Graphic 3: MIST's members; Source: MIST presentation, retrieved Sept.15, 2016 from <http://www.mistcluster.org/past-events.html>

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Graphic 5: Boston's Innovation District Map; Source: Cities as a Lab: Designing the Innovation Economy, The American Institute of Architects.2013.

Graphic 6: Conceptual representations of the New England Ocean Cluster House design; Source: Retrieved Sept. 27th, 2016 from <http://www.newenglandoceancluster.com/new-page-1/>

Picture 1: Four of the five Core Industries in the Barcelona 22 cluster (Design is missing); Retrieved on September 15, 2016 from https://www.brookings.edu/wp-content/uploads/2016/07/06_barcelona_22_presentation.pdf

Picture 2: A plane being assembled stands in the middle of TechShop Arlington, VA; Source: Retrieved Sept. 29, 2016 from <http://www.makery.info/2015/09/15/on-a-jete-un-coup-doeil-au-chantier-du-futur-techshop-parisien/>

Photo 3: Highway 1 DemoDay; Source: Retrieved on Sept. 29th, 2016 from <http://thinkapps.com/blog/post-launch/highway1-accelerator-hardware-startups/>

Photo 4: Workspace at the Y-Combinatory Office; Source: Retrieved on Sept. 29th, 2016 from <http://marcobambini.com/my-y-combinator-experience/>

Photo 1: Open workspace of Industry Lab; Source: Retrieved on Sept. 27th, 2016 from <http://industrylab.squarespace.com/gallery/>

Photo 2: Cube space of Artisans Asylum; Source: Retrieved on Sept. 27th, 2016 from <http://www.starhub.org/workspaces/artisans-asylum>

Photo 3: Main gathering space of Open Works; Source: Retrieved on Sept. 27th, 2016 from <http://www.openworksbymore.com/>

Photo 4: Open work space of CO+HOOTS; Source: Retrieved on Sept. 27th, 2016 from <https://cohoots.com/portfolio/main-space-8/>

Photo 5: Floor Plan of Impact HUB Baltimore; Source: Retrieved on Sept. 27th, 2016 from Photo source: <http://baltimore.impacthub.net/about-us/>

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Local Economic Development

The Stability of the Maritime Industry: is it dynamic?

Location quotients were calculated for the various maritime industries in Anne Arundel County to display the concentration of these industries with reference to the country as a whole. The stability of the industries can be assessed by looking at a comparison of the location quotients for two separate years: 2001 and 2015. Knowing the location quotients makes it possible to consider the dynamics of the industries. The chart below suggests some stability over time with industries such as “sporting goods stores,” “fish & seafood markets,” and “freight transportation arrangement,” among others. It can also be seen that there are industries that have much lower or much higher location quotients between the two chosen years. Boat dealers have a lower LQ in 2015 than in 2001, as does “process and logistics consulting services”. Additionally, there are some industries that only appear in the year 2015: “other physical and biological research”, “all other travel arrangement services”, “remediation services”, and “management training”.

Many of these changes show how dynamic the maritime industry is as a whole. Likewise, the addition of new categories and the growth of other categories can support the idea that the maritime industry adapts with changes occurring over time. Categories such as “environmental consulting services” and “other physical and biological services” exhibit the maritime industry’s ability to adapt with changes occurring in the area as environmental concerns have become a large component of many cities, especially those on the water.

Location Quotient Comparisons for the Annapolis Maritime Industry, 2001 and 2015

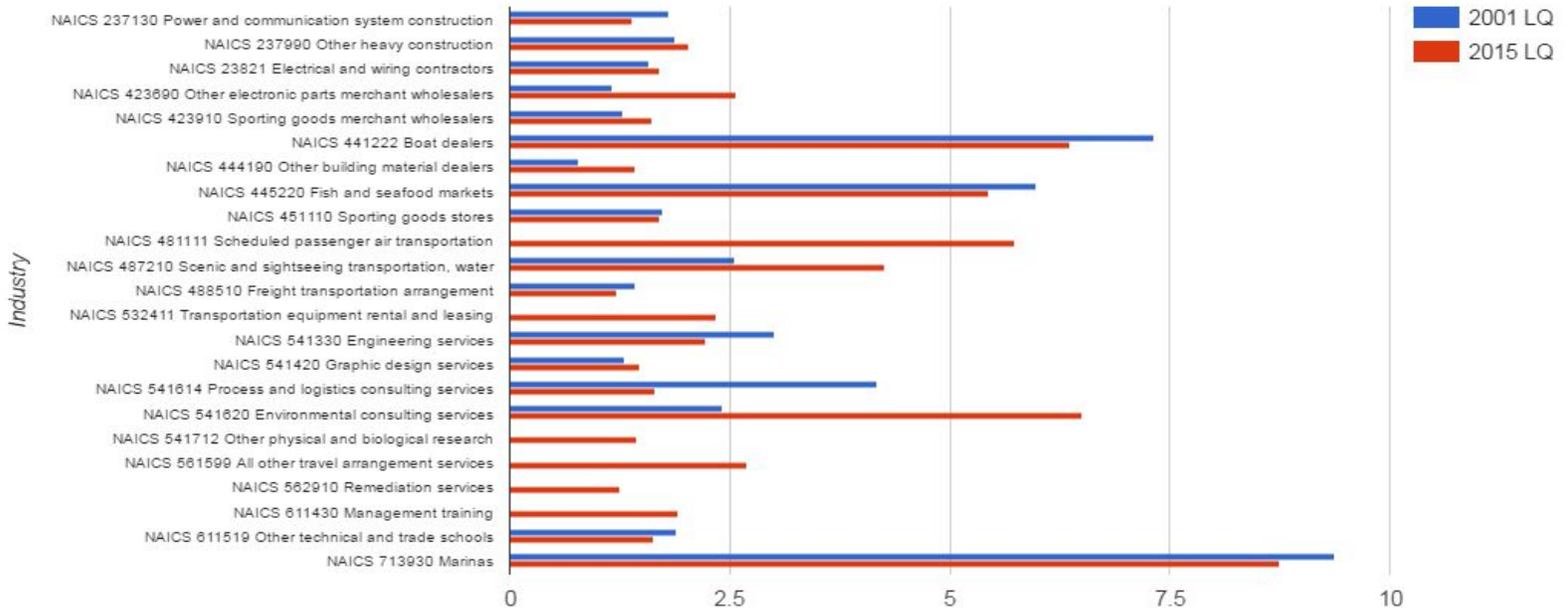


Chart 1: Comparison of location quotients for the Annapolis maritime industry for the years 2001 and 2015

When comparing Anne Arundel County to neighboring Queen Anne’s County, several things can be noted. While Anne Arundel County has just a slightly lower LQ for “marinas,” Queen Anne’s County’s LQ for this industry has greatly increased from 19.62 to 56.34. This is a drastic jump, possibly indicating a more suitable economy with cheaper costs and more waterfront availability than is available in Anne Arundel County. Additionally, “fish and seafood markets”

went from being nonexistent in Queen Anne’s County to reaching an LQ of 41.04. Again, this may suggest that there is greater affordability for new businesses in this category in Queen Anne’s County.

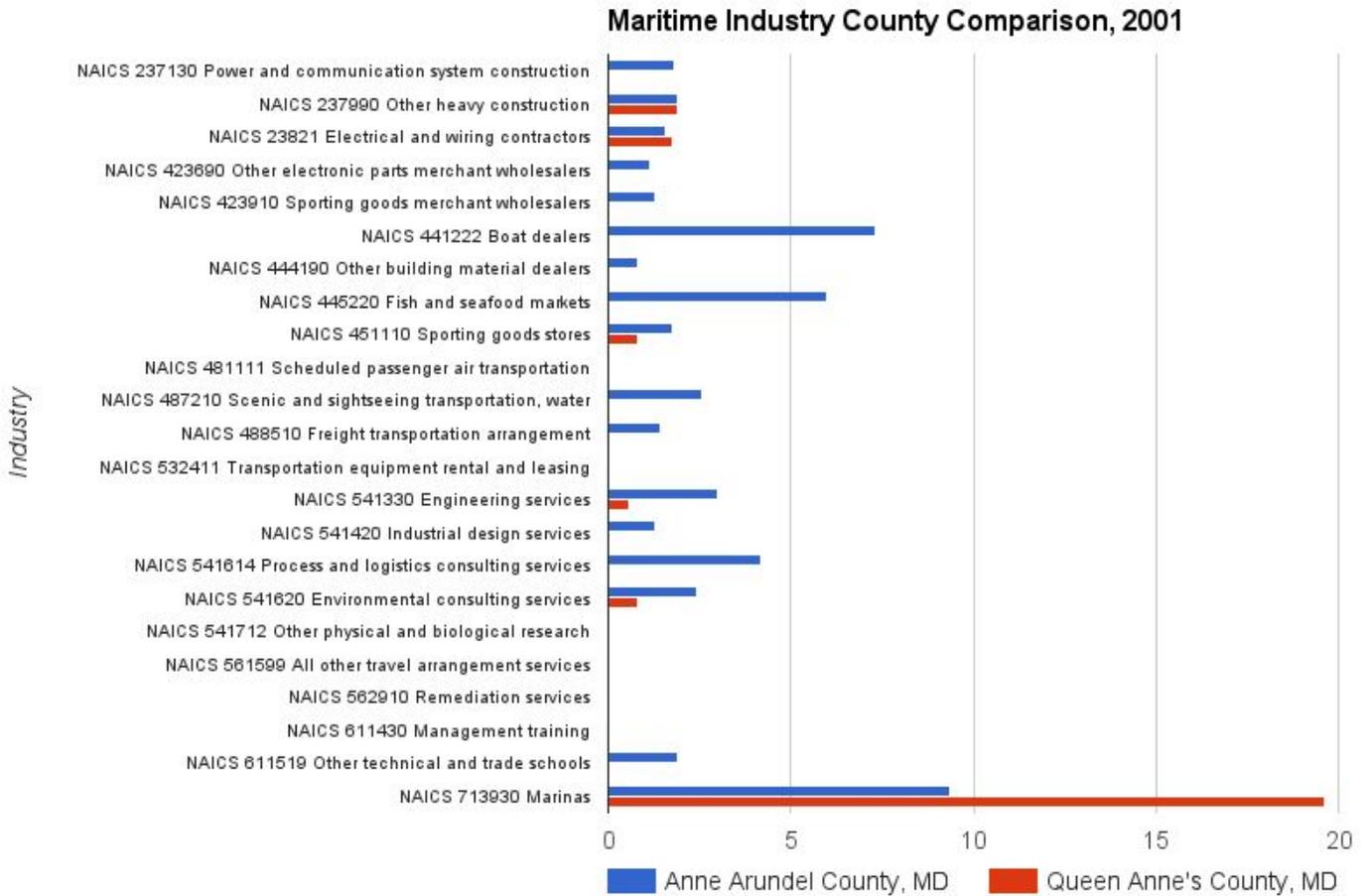


Chart 2: Comparison of location quotients for the maritime industries in Anne Arundel County, MD and Queen Anne’s County, MD for the year 2001

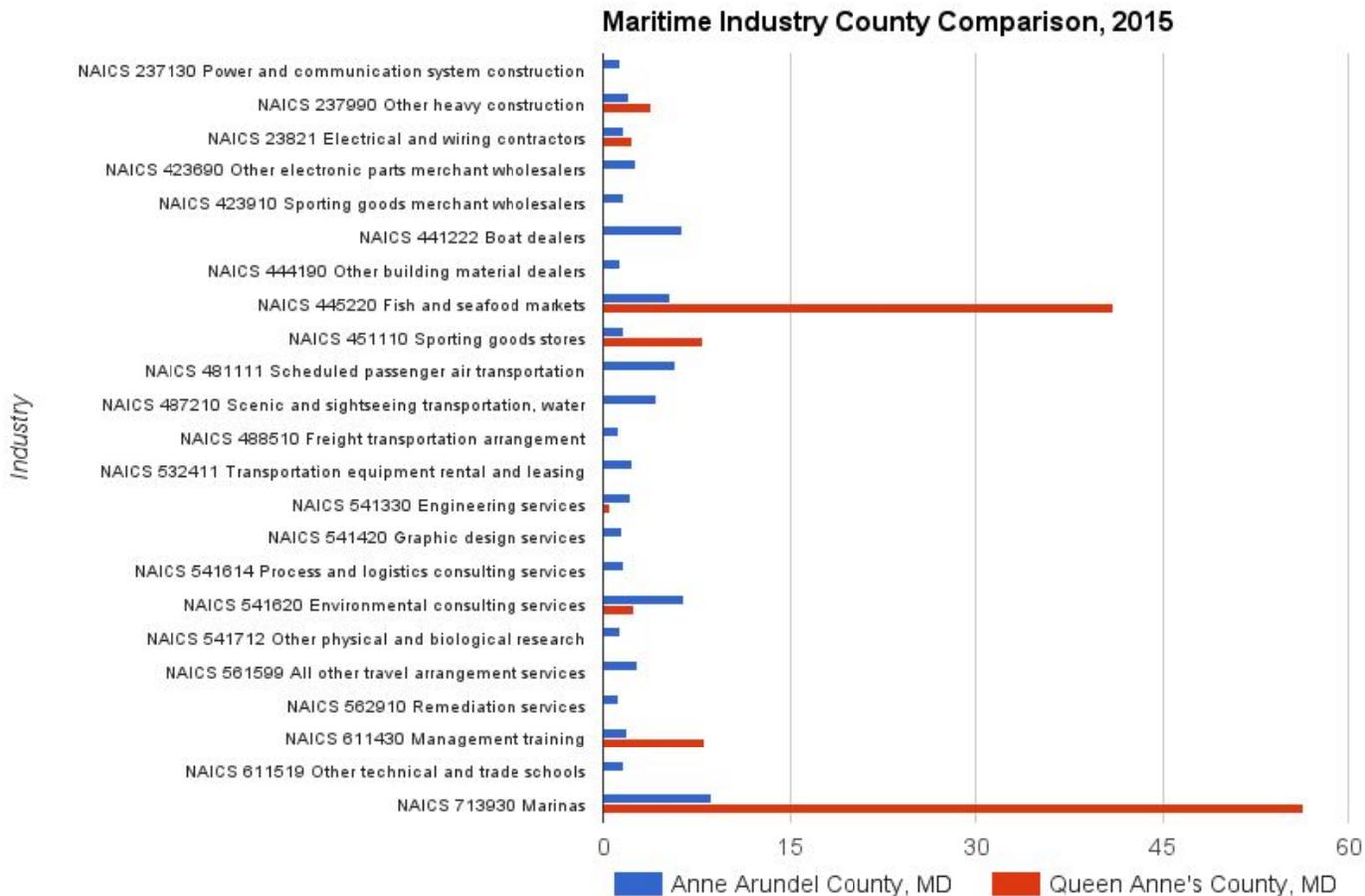


Chart 3: Comparison of location quotients for the maritime industries in Anne Arundel County, MD and Queen Anne’s County, MD for the year 2015

The “Image” of Annapolis as a Place of Maritime: what’s actually happening?

It is no secret that Annapolis is defined by its waterfront location. Often compared to cities like Newport, Charleston, and Ft. Lauderdale, the water plays a large role in the image of Annapolis. Many city advertisements and brandings take advantage of this, using images such as anchors, sailboats, and waves to showcase the city as a maritime hub. It is important to consider what is actually happening with the maritime industry in Annapolis. Is it a growing, well-supported

industry? Or is the focus mainly on the outer image of the city? While maritime zones have been created to protect the industry’s place in Annapolis, it is difficult to find other initiatives that support the desire for maritime to play a role in the economy of the city. In the 2009 Annapolis Comprehensive Plan, one objective is to “promote Annapolis for maritime business, maritime tourism, and charter and fishing activities as part of Economic Development efforts.” (Annapolis Comprehensive Plan, 2009) This makes it apparent that the desire to support the maritime industry is present, but the initiatives to support this are lacking.

Comparing Maritime Industry In Anne Arundel County to Other Maryland Counties

The narrative spread about the maritime industry in Annapolis is one of decline, but it is important to use data to back this up. The following analysis examines three specific maritime industries based on NAICS codes (Boat Building 336612, Boat Dealers 441222, and Marinas 713930). For each category, the number of establishments, the revenue, and the amount of employees will be examined to see the impact of the industry on each county. Only counties that have these three industries are included. Because of the small number of boat building establishments in the state of Maryland, revenue data and the number of people employed is not available. Employment numbers for the whole state of Maryland are available though, and it shows a significant decline since 2008 with how many employees are employed by the boat building industry, but does show an increase again starting in 2013.

Amount of Boat Building Employees in Maryland	
Year	Amount of Employees
2008	410
2009	163
2010	148
2011	124
2012	116
2013	144
Source: US Census Bureau - 2008-2013 County Business Patterns, Boat Building	

Number of Establishments			
County	Boat Dealers	Boat Builders	Marinas
Anne Arundel County, MD	45	6	56
Queen Anne's County, MD	11	5	6
Cecil County, MD	9	0	16
Talbot County, MD	9	0	10
Baltimore County, MD	8	0	16
Worcester County, MD	7	0	5
Garrett County, MD	4	3	4
Kent County, MD	4	0	15
Somerset County, MD	4	0	1
Calvert County, MD	3	0	8
Dorchester County, MD	3	0	4
Harford County, MD	3	0	5
Charles County, MD	2	0	2
St. Mary's County, MD	2	0	6
Washington County, MD	2	0	0
Baltimore city, MD	2	0	4
Frederick County, MD	1	0	0
Montgomery County, MD	1	0	1
Prince George's County, MD	1	0	1
Caroline County, MD	0	0	2
Wicomico County, MD	0	0	1

Source: US Census Bureau- 2012 Economic Census Industry Snapshot

Sales (millions)		
County	Boat Dealers	Marinas
Anne Arundel County, MD	12	18
Queen Anne's County, MD	3	1
Cecil County, MD	3	
Talbot County, MD	1	2
Baltimore County, MD		4
Dorchester County, MD		1
Harford County, MD		1
St. Mary's County, MD		1
Baltimore city, MD		1

Source: US Census Bureau- 2012 Economic Census Industry Snapshot

Number of Employees		
County	Boat Dealers	Marinas
Anne Arundel County, MD	310	531
Queen Anne's County, MD	65	49
Cecil County, MD	79	0
Talbot County, MD	29	76
Baltimore County, MD	0	123
Garrett County, MD	0	16
Dorchester County, MD	0	39
Harford County, MD	0	44
St. Mary's County, MD	0	22
Baltimore city, MD	0	38

Source: US Census Bureau- 2012 Economic Census Industry Snapshot

In these charts, it is clear that Anne Arundel County contains the majority of boat dealers, boat builders, and marinas in Maryland. The county also employs the highest number of workers in these maritime industries and has the highest revenue, presumably due to the large amount of boat dealer and marinas. Queen Anne's County and Cecil County, both on the Eastern Shore, also consistently have high rates of establishments, employees, and revenue. This follows the narrative that Annapolis is competing with the Eastern Shore to hold onto its maritime industries. Other information that can be gleaned from the data is that marinas are more popular in Anne Arundel County than boat dealers are, and therefore produce higher revenue and employ more people. This is not true for every county, such as Baltimore County which has no boat dealers but is tied for the second most marinas out of the state.

Comparing Maritime Industry In Maryland to Other States

When looking at the amount of boat builders, boat dealers, and marinas in each state, Maryland has a significant amount, especially when considering the size of the state and the amount of coastline compared to states like Florida and California, or states with a significant amount of lakes like Michigan. It ranks 14th for the most amount of boat building establishments, 12th for the amount of boat dealers, and 7th for the amount of marinas.

States with the Most Establishments- Boat Building		
Rank	State	Amount
1	Florida	167
2	Washington	78
3	Maine	65
4	California	55
5	North Carolina	50
6	Louisiana	33
7	Rhode Island	29
8	Massachusetts	28
9	Michigan	28
10	New York	27
11	South Carolina	27
12	Texas	27
13	Tennessee	22
14	Maryland	19

States with the Most Establishments- Boat Dealers		
Rank	State	Amount
1	Florida	795
2	California	251
3	New York	234
4	Texas	233
5	Michigan	209
6	Washington	174
7	Wisconsin	161
8	North Carolina	154
9	Minnesota	153
10	New Jersey	128
11	Massachusetts	122
12	Maryland	121

States with the Most Establishments- Marinas		
Rank	State	Amount
1	Florida	428
2	New York	417
3	California	243
4	New Jersey	209
5	Michigan	192
6	Massachusetts	173
7	Maryland	163

Source: United States Census Bureau: 2007-2012 Economic Census Industry Snapshot

Comparing Maritime Industry Trends in Anne Arundel County to National Trends

The maritime industry in the United States from 2007-2012 declined, but Maryland suffered from those declines at much higher rates. The following charts compare Maryland's declines with the United States a whole. For all three industries, the decline in number of establishments, revenue, and employees were significantly higher than for the United States.

Changes from 2007-2012: Boat Building		
	Maryland	United States
# of Establishments	-24.0%	-20.9%
Revenue	N/A	-35.7%
Employees	N/A	-47.2%

Changes from 2007-2012: Boat Dealers		
	Maryland	United States
# of Establishments	-31.6%	-19.0%
Revenue	-44.7%	-33.5%
Employees	-49.8%	-32.1%

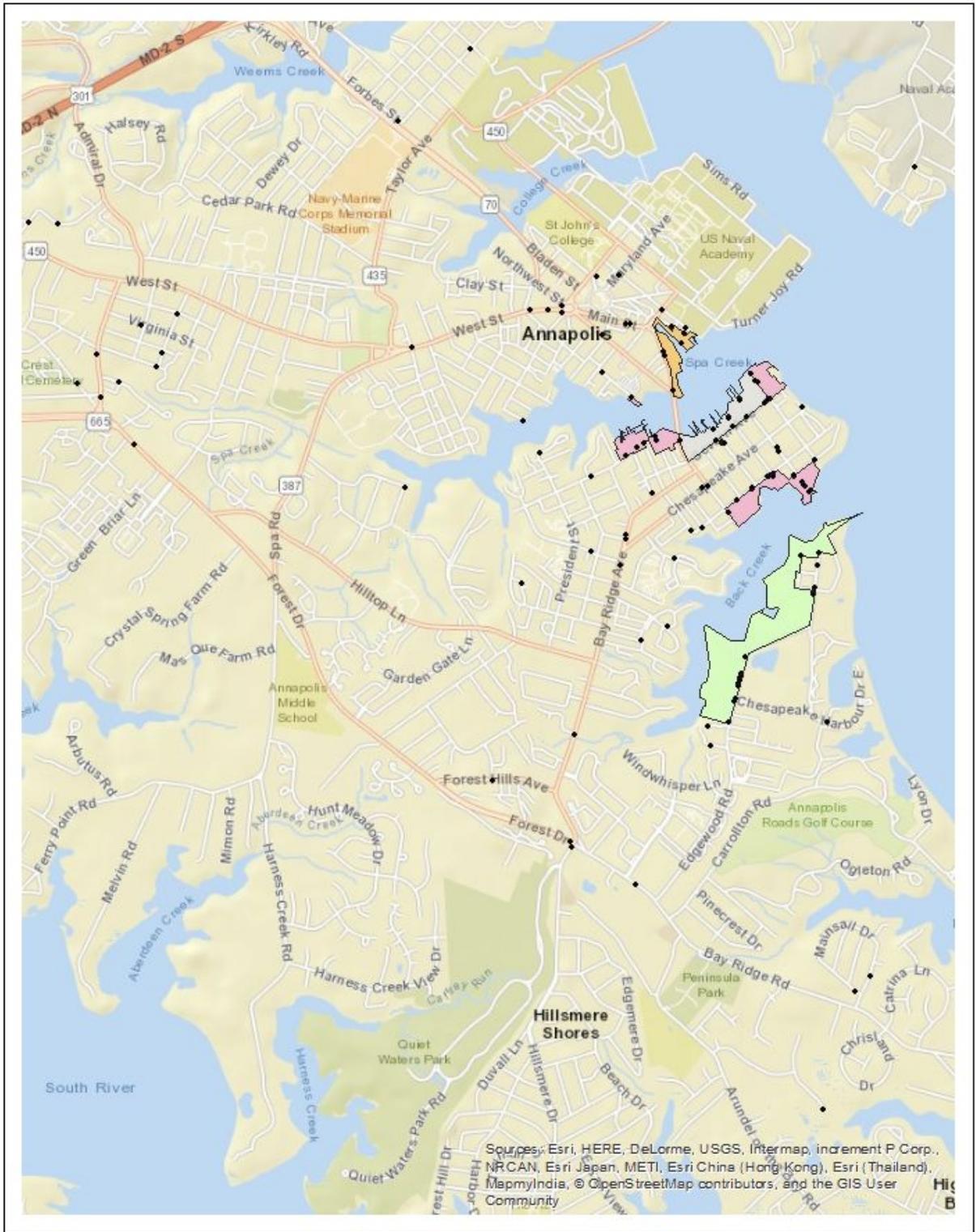
Changes from 2007-2012: Marinas		
	Maryland	United States
# of Establishments	-12.4%	-5.5%
Revenue	-7.5%	-3.7%
Employees	-11.1%	-6.8%

Source: United States Census Bureau: 2007-2012 Economic Census Industry Snapshot

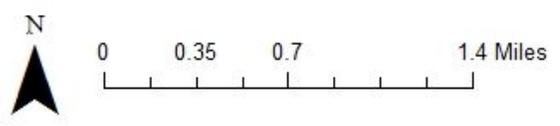
Maritime-related Business Locations in Annapolis

The following map shows the location of maritime-related businesses in Annapolis. While Annapolis does have four maritime districts (Waterfront Maritime Industrial, Waterfront Mixed Maritime, Waterfront Maritime Eastport, Waterfront Maritime Conservation), not all maritime-related businesses are located in these areas. This is not surprising however, when the types of business that are related to maritime are considered. For example, the category of Finance, Insurance, and Law would tend to be located in a traditional office or storefront setting, as opposed to the industrial areas offered by some of the maritime zones. The widespread location of maritime-related businesses also shows how embedded the industry is in Annapolis, as it is not concentrated to one small area separate from the rest of the city, but instead lends itself to much of the downtown area.

If the maps are broken down into the four maritime zones, it is possible to see the types of maritime business that are at each location. However, there does not appear to be any trends as to what businesses are located in which zone. Instead, different types of businesses are located throughout and each zone contains a mix.



	WME
	WMC
	WMI
	WMM



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Type of Business

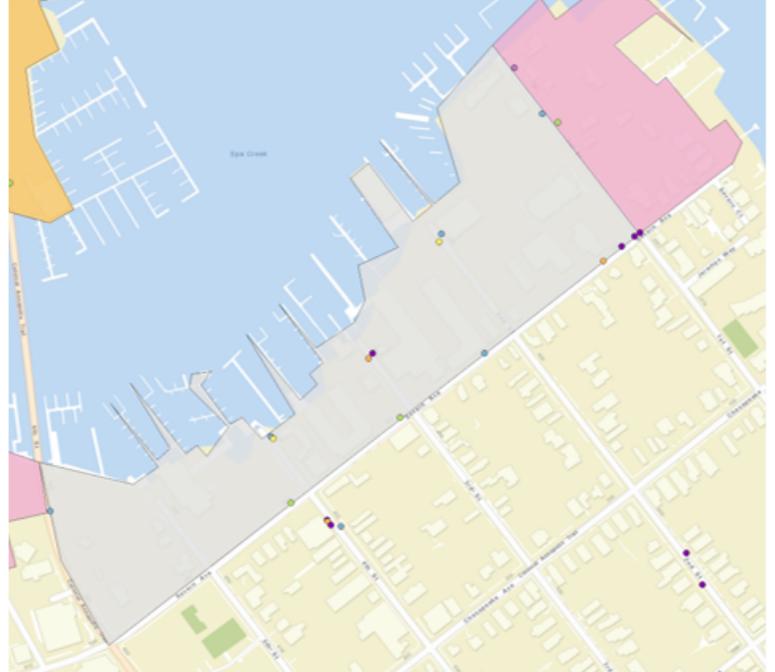
- Boat Servicing and Supplies
- Brokerage and Sales
- Marinas and Clubs

- Maritime Organization
- Charter and Recreation
- Finance, Insurance, Law
- Boating School and Instruction

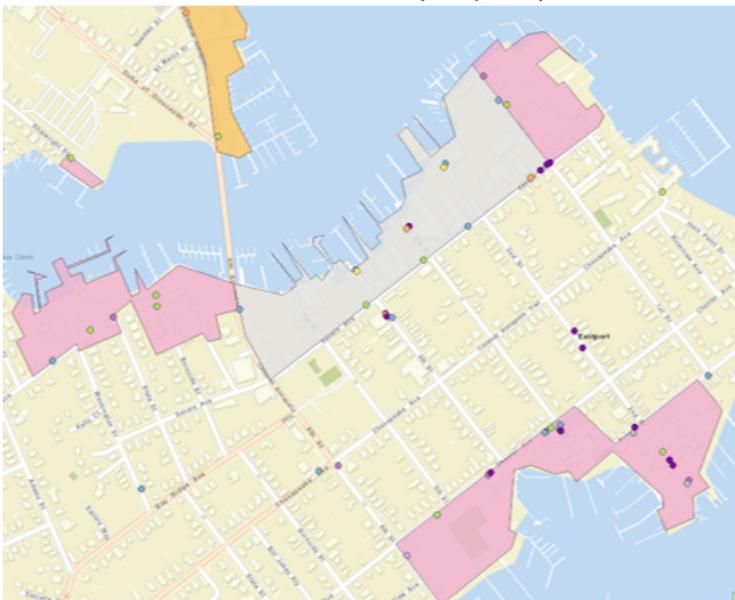
Waterfront Maritime Industrial (WMI)



Waterfront Mixed Maritime (WMM)



Waterfront Maritime Eastport (WME)



Waterfront Maritime Conservation (WMC)



Impact of the Annapolis Boat Shows

Since 1970, the Annapolis Boat Shows have had the reputation of offering the most comprehensive boating exhibitions in the industry. In 2013, 4 local Annapolis business owners purchased the Boat Shows with the ambition of preserving the event and supporting the local Annapolis economy (Annapolis Boat Shows, 2013). With the Sailboat Show being the largest in the world and the Powerboat Show taking the title as the first in-water show of its kind, Annapolis has been placed on the map in the boating community.

Taking place on two separate weekends in October annually, the Annapolis Boat Shows draw in many boat enthusiasts from across the state and country. It is estimated that 80,000 to 90,000 people visit each show, contributing greatly to the local economy (Cook, 2015). An economic impact computer simulation was able to show that at least \$112 million was fed into the Annapolis economy during two weeks in October (Annapolis Boat Shows, 2016). The combination of business sales and personal income allow for \$15 million to be collected in federal, state, and local taxes. The Boat Shows are required to pay a rent of \$375,950 or 50 percent of their gross receipts, whichever is greater. In addition, \$25,750 will be payed to the city for costs incurred from hosting the Boat Shows (Ordinance No. O-7-11, 2011).

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