

Appendix R

**Baseline Compliance Monitoring Plan Report
and
NJDEP Approval letter dated March 1, 2019**



State of New Jersey

PHIL MURPHY
Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Mail Code – 401-02B
Water Pollution Management Element
Bureau of Surface Water Permitting
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CATHERINE R. McCABE
Commissioner

SHEILA OLIVER
Lt. Governor

March 1, 2019

To: Distribution List

Re: Approval of “NJCSO Group Compliance Monitoring Program Report”

Passaic Valley Sewage Commissioners, NJPDES Permit No. NJ0021016
Bayonne City Municipal Utilities Authority, NJPDES Permit No. NJ0109240
Borough of East Newark, NJPDES Permit No. NJ0117846
Town of Harrison, NJPDES Permit No. NJ0108871
Jersey City Municipal Utilities Authority, NJPDES Permit No. NJ0108723
Town of Kearny, NJPDES Permit No. NJ0111244
City of Newark, NJPDES Permit No. NJ0108758
North Bergen Municipal Utilities Authority, NJPDES Permit No. NJ0108898
City of Paterson, NJPDES Permit No. NJ0108880
Joint Meeting of Essex and Union, NJPDES Permit No. NJ0024741
Middlesex County Utilities Authority, NJPDES Permit No. NJ0020141
North Bergen MUA Woodcliff STP, NJPDES Permit No. No. NJ0029084
Town of Guttenberg, NJPDES Permit No. NJ0108715
North Hudson Sewage Authority – Adams Road STP, NJPDES Permit No. NJ0026085
North Hudson Sewage Authority - River Road STP, NJPDES Permit No. NJ0025321
Borough of Fort Lee, NJPDES Permit No. NJ0034517
City of Hackensack, NJPDES Permit No. NJ0108766
Ridgefield Park Village, NJPDES Permit No. NJ0109118
City of Elizabeth, NJPDES Permit No. NJ0108782
City of Perth Amboy, NJPDES Permit No. NJ0156132
Bergen County Utilities Authority, NJPDES Permit No. NJ0020028

Dear Permittees:

Thank you for your submission dated October 5, 2018 as submitted cooperatively by Passaic Valley Sewage Commissioners on behalf of the above referenced permittees. This submission serves to provide a response to the Department's comments dated September 7, 2018 on the June 30, 2018 "NJCSO Group Compliance Monitoring Program Report" (Report). This Report was submitted in accordance with Part IV.D.3.d and Part IV.G.1.d.3 and 9 of your NJPDES CSO permit. The Department acknowledges that the above referenced permittees have committed to submitting single, coordinated Long Term Control Plans for each of the respective hydraulically connected groups and this Report represents all above permittees for the purposes of permit compliance. This letter serves to provide a response to your revised submission and serves to outline future uses of this data.

Background

This submission serves as a necessary element to the Long-Term Control Plan (LTCP) as due on June 1, 2020 for all the above referenced NJPDES permits. An excerpt of Part IV.G.9.a and Part IV.G.9.b is provided as follows to frame the review objectives of this letter:

“9. Compliance Monitoring Program (CMP)

- a. The monitoring information collected from the ambient baseline monitoring phase of the CMP, in accordance with D.3.a., will be compared to subsequent CMP events during and after LTCP implementation to evaluate the effectiveness of implemented CSO controls.
- b. The permittee shall implement a CMP adequate to: verify baseline and existing conditions, the effectiveness of CSO controls, compliance with water quality standards, and protection of designated uses. This CMP shall be conducted before, during and after implementation of the LTCP and shall include a work plan to be approved by the Department that details the monitoring protocols to be followed...”

As required by Part IV.G.1.d.3 and 9.b above, a work plan was required and was submitted on December 30, 2015 (revised on February 19, 2016 and May 10, 2016) and the QAPP was approved by the Department on February 24, 2016 with a subsequent approval on June 8, 2016 (for the May 10, 2016 revisions).

Page 24 of the Report summarizes three parallel data collection efforts which include:

- 1) Baseline Sampling - modeled after and intended to supplement the approved routine sampling program of the New Jersey Harbor Discharges Group (NJHDG));
- 2) Source Sampling - targets the major influent streams within the study area to establish non-CSO loadings, and coincides with the NJHDG and Baseline Sampling); and
- 3) Event Sampling - timed to coincide with rainfall to capture three discrete wet weather events over the course of the year on each segment of the NY-NJ Harbor complex impacted by CSOs).

As described in the Report, a total of 23 baseline and source sampling events were completed. The goal of the event sampling was to capture three significant wet weather events (precipitation >0.5 inches in 24 hours) at each targeted location, which was completed across four sampling events (one set of samples was collected across two precipitation events because of sampling logistics). All samples collected were analyzed for fecal coliform and enterococcus; freshwater samples were also analyzed for E. coli. As included in the revised Report, Table 12 on page 32 is entitled "Baseline Compliance Monitoring Event Sampling Dates and Completeness" and shows survey dates of June 6, 2016, January 4, 2017 (land only), April 26, 2017 (boat only) and January 24, 2017.

NJDEP Technical Review for Part IV IV.D.3.d and Part IV.G.1.d.3 and 9

The Department provided *Specific Comments* and *General Findings* in its September 7, 2018 letter which served to provide technical comments on the June 30, 2018 Report. With respect to the *Specific Comments*, the Department finds the October 5, 2018 revisions to the Report acceptable for the purposes of addressing the Department's comments.

Within its *General Findings*, the Department articulated concern regarding the fact that the rainfall totals for the sampling period of April 17, 2016 to April 28, 2017 were below normal conditions and that roughly half the data had qualifiers. However, the primary goal of the baseline monitoring at this time is to provide a snapshot to characterize the water quality conditions in the NY/NJ Harbor Area to represent baseline and existing conditions. Despite the limitations to the wet weather data set, the Department finds that the recent data collection effort, in concert with the ongoing NJHDG Monitoring Network, does provide sufficient information for the purposes of data characterization for baseline and existing conditions. **In summary, the Report is hereby approved for the purposes of compliance with Part IV IV.D.3.d and Part IV.G.1.d.3 and 9 for baseline and existing conditions.**

However, as indicated in the Department's September 7, 2018 comments, the June 30, 2018 Report (revised October 5, 2018) is not intended to assess attainment of the waterbody against water quality standards at N.J.A.C. 7:9B. This is stated on page 35 of the Report:

“The BCMP [Baseline Compliance Monitoring Program] was not designed to provide an adequate data volume for assessing attainment of water quality standards, which would have required five samples per month at each sampling location to compute monthly geometric means.”

Future Use of Compliance Monitoring Program

As referenced in Part IV.G.9 “this CMP shall be conducted before, during and after implementation of the LTCP.” However, the acceptability of the CMP on a long-term basis beyond baseline and existing conditions is conditional on the continuation of the on-going NJHDG Monitoring Network to supplement the CMP data for future conditions to ensure consistency for sampling stations, parameters etc.

The Department also reserves the right to require follow-up monitoring, including but not limited to Event Sampling, at periodic intervals in the future. This sampling would be required to ensure that the goals of the CMP are attained for “during” and “after” implementation of the LTCP. Data collected as part of any future CMP effort could aid in assessing the attainment of water quality standards provided the Department determines that such data is sufficient and acceptable.

Additionally, while not required by the NJPDES permit, the Department acknowledges that PVSC submitted a “Pathogen Water Quality Model (PWQM) Quality Assurance Project Plan (QAPP)” as dated May 19, 2016 (revised January 14, 2017). As described in the QAPP:

“The enhanced, validated model will be used to project bacteria concentrations in the waters of the NY/NJ Harbor complex under existing and anticipated future conditions to demonstrate attainment of applicable water quality standards.”

The final PWQM has not yet been submitted to the Department for review. However, the Department acknowledges that the use of modeling is allowable for assessment as described on page 4-7 of EPA’s January 1999 guidance entitled “Combined Sewer Overflows Guidance for Monitoring and Modeling” (EPA 832-B-99-002) as noted in the Department’s September 7, 2018 letter. Therefore, provided that the Department determines that the calibrated/validated PWQM is acceptable for use, this PWQM can be utilized in future assessments against N.J.A.C. 7:9B, in addition to the ongoing NJHDG monitoring network data (and any other appropriate data).

Thank you for your continued cooperation.

Sincerely,



Susan Rosenwinkel
Bureau Chief
Bureau of Surface Water Permitting

C: Marzooq Alebus, Bureau of Surface Water Permitting
Biswarup Guha, Bureau of Environmental Analysis, Restoration and Standards
Joe Mannick, Bureau of Surface Water Permitting
Dwayne Kobesky, Bureau of Surface Water Permitting, CSO Team Leader
Nancy Kempel, Bureau of Nonpoint Pollution Control, CSO Team Leader

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NJCSO GROUP COMPLIANCE MONITORING PROGRAM REPORT

**Prepared on behalf of the following participating Permittees by Passaic Valley
Sewerage Commission (NJ0021016) to Satisfy Permit Condition Part
IV.D.3.d:**

**Bayonne City (NJ0109240) PVSC
East Newark Borough (NJ0117846) PVSC
Harrison Town (NJ0108871) PVSC
Jersey City MUA (NJ0108723) PVSC
Kearny Town (NJ0111244) PVSC
Newark City (NJ0108758) PVSC
North Bergen MUA (NJ0108898) PVSC
Paterson City (NJ0108880) PVSC
Joint Meeting of Essex and Union Counties (NJ0024741) JMEUC
Middlesex County Utilities Authority (NJ0020141) MCUA
North Bergen MUA (Woodcliff) (NJ029084) NBMUA
Guttenberg Town (NJ0108715) NBMUA
North Hudson Sewage Authority - Adams Street STP (NJ0026085) NHSA
North Hudson Sewage Authority - River Road STP (NJ0025321) NHSA
Fort Lee Borough (NJ0034517) BCUA
Hackensack City (NJ0108766) BCUA
Ridgefield Park Village (NJ0109118) BCUA
Elizabeth City (NJ0108782) JMEUC
Perth Amboy City (NJ0156132) MCUA
Bergen County Utilities Authority (NJ0020028) BCUA**



"Protecting Public Health and the Environment"

**Passaic Valley Sewerage Commission
Essex County
600 Wilson Avenue
Newark, New Jersey
JUNE 30, 2018
Revised 10/5/2018**

SUMMARY OF CHANGES

This Report is for the Baseline Compliance Monitoring Program to be utilized by the NJ CSO Group. This Report describes the methodology that was utilized for the Baseline Compliance Monitoring Program, the analysis that was completed, and the Compliance Monitoring results to be used in the development of a CSO Long Term Control Plan (LTCP). In future versions, this section will include summaries of changes and when they were incorporated as appropriate. The history of this document and changes made to it are summarized below:

- June 28, 2018: Submitted Baseline Compliance Monitoring Program Report in fulfillment of the LTCP Permit requirement.
- Revised October 4, 2018: Modified the Compliance Monitoring Program Report to address comments made by NJDEP in letter dated September 7, 2018. A copy of the September 7, 2018 letter is included as Attachment 4 of this document. The 06/28/2018 submitted Compliance Monitoring Program Report was 206 pages. This version includes updates that resulted in a page total of 206 pages plus the 7-page NJDEP comment letter and a divider page for a total of 214 report pages plus the cover. Page number updates are not reflected with redline-strikeout in this document. The following pages in this document have been changed to address NJDEP comments, with changes shown in redline-strikeout throughout the document:
 - a. DEP Comment 1 – Page 25 Modified.
 - b. DEP Comment 2 – Page 28 Modified.
 - c. DEP Comment 3 – Page 31 Modified.
 - d. DEP Comment 4 – Page 32 Modified.
 - e. DEP Comment 5 – Page 35 Modified.
 - f. DEP Comment 6 – Page 131 Modified.
 - g. DEP Comment 7 – Page 35 Modified.
 - h. DEP Comment 8 – Pages 57 and 131 Modified.
 - i. DEP Comment 9 – BCMP data provided under separate cover.
 - j. DEP Comment 10 – Attachments 1, 2 and 3. Charts were modified per comment.
 - k. DEP Comment 11 – Variability in the strength of the sanitary flow, the amount of sedimentation in sewer pipes, the time between storms, the intensity of storms, upstream conditions, the temperature and salinity of the water column can all lead to variability in the receiving water concentrations. There are no indications that there were problems with the April sampling or laboratory analysis. No change.

In future versions, this section will be further updated to include summaries of changes and when they were incorporated as appropriate.

CERTIFICATIONS

Title: NJ CSO Group Baseline Compliance Monitoring Program Report

Preparer:

Project Officer:


Michael J. Hope, P.E., Greeley & Hansen

6/6/18
Date

QA Officer:


Timothy J. Dupuis, P.E., CDM Smith

6/6/18
Date

Passaic Valley Sewerage Commission:

Program Manager:


Bridget McKenna, Chief Operating Officer, PVSC

06/06/2018
Date

New Jersey Department of Environmental Protection

DEP Permits:

Joseph Mannick, CSO Coordinator

Date

DEP QA:

Marc Ferko, Office of Quality Assurance

Date

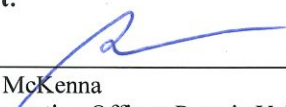
BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0021016 (Passaic Valley Sewage Commission)

Approval of Data Report:

Permittee:



Bridget McKenna
Chief Operating Officer, Passaic Valley Sewage Commission

06/06/2018
Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Bridget McKenna
Chief Operating Officer, Passaic Valley Sewage Commission

06/06/2018
Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0109240 (Bayonne City)

Approval of Data Report:

Permittee:

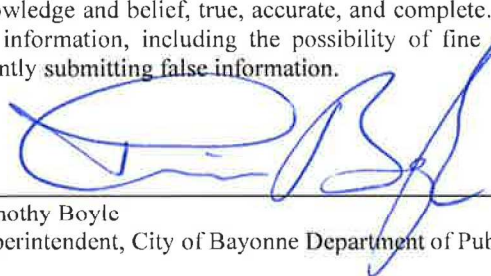

Timothy Boyle
Superintendent, City of Bayonne Department of Public Works


Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Timothy Boyle
Superintendent, City of Bayonne Department of Public Works


Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0117846 (East Newark)

Approval of Data Report:

Permittee:


Frank Pestana
Licensed Operator, Borough of East Newark


Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Frank Pestana
Licensed Operator, Borough of East Newark


Date


**BASELINE COMPLIANCE MONITORING PROGRAM
DATA REPORT**

**Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group**

NJPDES Number NJ0108871 (Harrison)

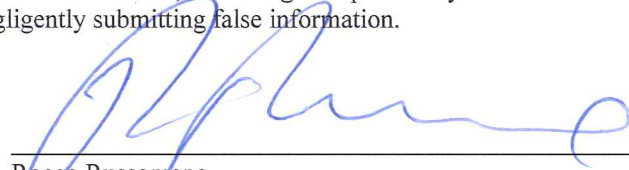
Approval of Data Report:

Permittee:


Rocco Russomano
Town Engineer, Town of Harrison6/8/18
Date**NJPDES Certification:**

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Rocco Russomano
Town Engineer, Town of Harrison6/8/18
Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

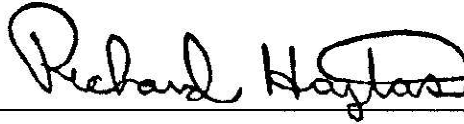
Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0108723 (Jersey City MUA)

Approval of Data Report:

Permittee:

Rich Haytas
Senior Engineer, Jersey City MUA



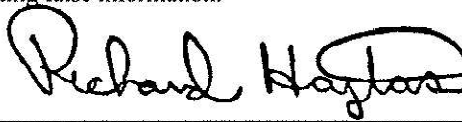
6/4/18
Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:

Rich Haytas
Senior Engineer, Jersey City MUA



6/4/18
Date


BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0111244 (Kearny)

Approval of Data Report:

Permittee:



Robert J. Smith
Town Administrator, Town of Kearny


Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Robert J. Smith
Town Administrator, Town of Kearny


Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number ~~NJ0108758~~ (Newark)

Approval of Data Report:

Permittee:


Ras J. Baraka
Mayor, City of Newark

Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Ras J. Baraka
Mayor, City of Newark

Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0108898 (North Bergen MUA)

Approval of Data Report:

Permittee:



Frank Pestana
Exec. Director, North Bergen MUA


Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Frank Pestana
Exec. Director, North Bergen MUA


Date

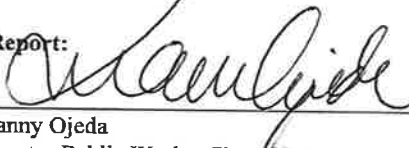
**BASELINE COMPLIANCE MONITORING PROGRAM
DATA REPORT**

**Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group**

NJPDES Number NJ0108880 (Paterson)

Approval of Data Report:

Permittee:


Manny Ojeda
Director Public Works, City of Paterson

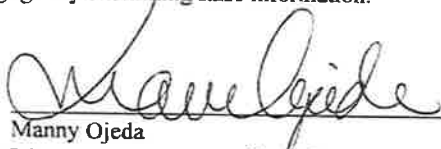
Date

6/20/18

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Manny Ojeda
Director Public Works, City of Paterson

Date

6/20/18

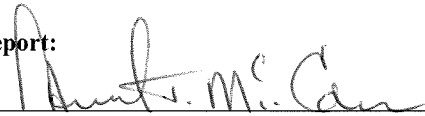

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0024741 (Joint Meeting of Essex and Union Counties)

Approval of Data Report:

Permittee:

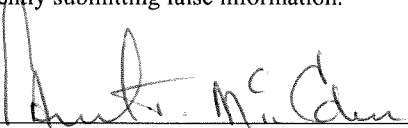

 

Samuel McGhee Date
Executive Director, Joint Meeting of Essex and Union Counties

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:

Samuel McGhee Date
Executive Director, Joint Meeting of Essex and Union Counties


BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0020141 (Middlesex County Utilities Authority)

Approval of Data Report:

Permittee:



Joseph Cryan
Executive Director, Middlesex County Utilities Authority


6/19/18

Date

NJPDES Certification:

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Permittee:



Joseph Cryan
Executive Director, Middlesex County Utilities Authority

6/19/18

Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0029084 (North Bergen Woodcliff)

Approval of Data Report:

Permittee:


Frank Pestana
Executive Director, North Bergen MUA


Date

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Permittee:


Frank Pestana
Executive Director, North Bergen MUA


Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0108715 (Town of Guttenberg)

Approval of Data Report:

Permittee:


Frank Pestana
Licensed Operator, Town of Guttenberg


Date

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Permittee:


Frank Pestana
Licensed Operator, Town of Guttenberg


Date

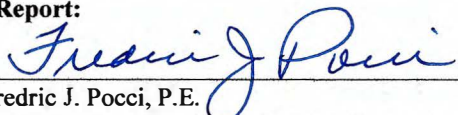
BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

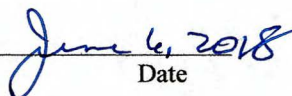
Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Numbers NJ0025321 & NJ0026085 (North Hudson Sewerage Authority)

Approval of Data Report:

Permittee:

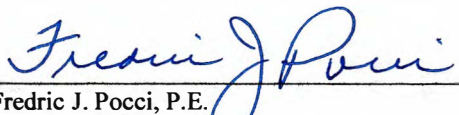

Fredric J. Pocci, P.E.
Authority Engineer, North Hudson Sewerage Authority

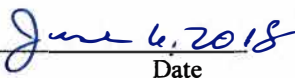

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Permittee:


Fredric J. Pocci, P.E.
Authority Engineer, North Hudson Sewerage Authority


Date


BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0034517 (Borough of Fort Lee)

Approval of Data Report:

Permittee:



Alfred R. Restaino
Borough Administrator, Borough of Fort Lee


Date

NJPDES Certification:

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Permittee:


Alfred R. Restaino
Borough Administrator, Borough of Fort Lee


Date

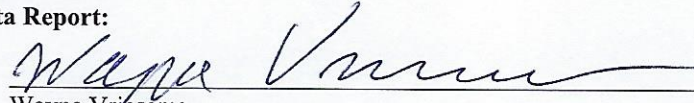
BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0108766 (City of Hackensack)

Approval of Data Report:

Permittee:

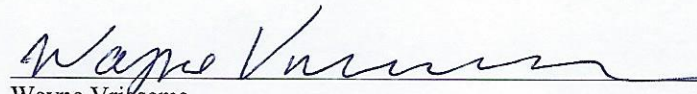

Wayne Vriesema
Project Manager, City of Hackensack

6/4/18
Date

NJPDES Certification:

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Permittee:


Wayne Vriesema
Project Manager, City of Hackensack

6/4/18
Date

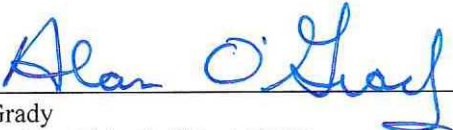
BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ 0109118 (Village of Ridgefield Park)

Approval of Data Report:

Permittee:

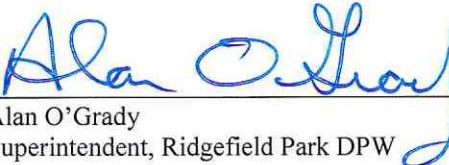

Alan O'Grady
Superintendent, Ridgefield Park DPW

6/5/18
Date

NJPDES Certification:

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Permittee:


Alan O'Grady
Superintendent, Ridgefield Park DPW

6/5/18
Date

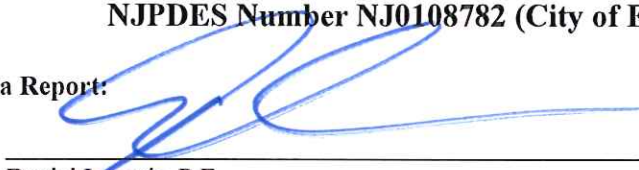
BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0108782 (City of Elizabeth)

Approval of Data Report:

Permittee:

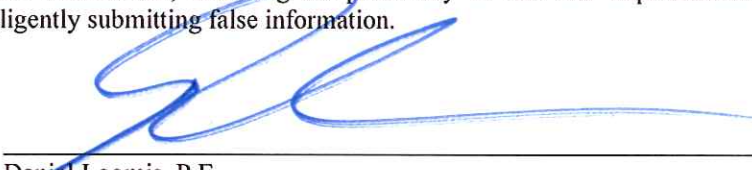

Daniel Loomis, P.E.
City Engineer, City of Elizabeth

6/6/2018
Date

NJPDES Certification:

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Permittee:


Daniel Loomis, P.E.
City Engineer, City of Elizabeth

6/6/2018
Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0156132 (Perth Amboy City)

Approval of Data Report:

Permittee:


Luis Perez-Jimenez
Director of Water Operations, Perth Amboy City

6/26/18
Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Luis Perez-Jimenez
Director of Water Operations, Perth Amboy City

6/26/18
Date

BASELINE COMPLIANCE MONITORING PROGRAM DATA REPORT

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage
Commission on behalf of the NJ CSO Group

NJPDES Number NJ0020028 (Bergen County Utilities Authority)

Approval of Data Report:

Permittee:


Robert Laux
Executive Director, Bergen County Utilities Authority


Date

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information. Based on my inquiry of the person or persons who reviewed this report, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information.

Permittee:


Robert Laux
Executive Director, Bergen County Utilities Authority


Date

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SECTION 1 – INTRODUCTION

This report and its attachments summarize the data that HDR has collected in support of PVSC's LTCP modeling under the Baseline Compliance Monitoring Program (BCMP). The BCMP was designed to generate sufficient data to establish existing ambient water quality conditions for pathogens in the CSO receiving waters and to update, calibrate and validate a pathogen water quality model of the receiving water bodies. The resulting model will be used to support the development of CSO Long Term Control Plans (LTCPs) by the Passaic Valley Sewerage Commission (PVSC) and participating members of the NJ CSO Group. The data collected was paid for by the participating members of the NJ CSO group, who own the data and may use it to satisfy certain NJPDES permit requirements. Table 1 defines the participating members of the NJ CSO Group.

The BCMP conforms to the "Baseline Compliance Monitoring Program Quality Assurance Project Plan" (QAPP) prepared by PVSC on behalf of the NJ CSO Group and submitted to the New Jersey Department of Environmental Protection (DEP) December 31, 2015 as revised February 19, 2016.

The BCMP included three parallel data collection efforts:

- 1) Baseline Sampling, which was modeled after and intended to supplement the approved routine sampling program of the New Jersey Harbor Discharges Group (NJHDG), of which PVSC is a member. The sampling frequency matched NJHDG, varying with time of year as follows:
 - a. Spring (May-Jun): Biweekly (4 dates);
 - b. Summer (Jul-Sep): Weekly (12 dates); and
 - c. Winter (Oct-Apr): Monthly (7 dates).
- 2) Source Sampling, which targeted the major influent streams within the study area to establish non-CSO loadings, and coincided with the NJHDG and Baseline Sampling. Any discussion of field activities applicable to Baseline Sampling is also applicable to Source Sampling because both sets of stations were sampled during the same field efforts.
- 3) Event Sampling, which was timed to coincide with rainfall to capture three discrete wet-weather events over the course of the year on each segment of the NY-NJ Harbor complex impacted by CSOs¹.

Field work for these three elements was completed on April 28, 2017; the last of the laboratory results were provided June 10, 2017. A total of 23 baseline and source sampling events were completed. The goal of the event sampling was to capture three significant wet weather events (precipitation >0.5 inches in 24 hours) at each targeted location, which was completed across four sampling events (one set of samples was collected across two precipitation events because of sampling logistics). All samples collected were analyzed for fecal coliform and enterococcus; freshwater samples were also analyzed for E. coli.

¹ Please refer to the companion System Characterization Report for any information related to CSO discharges.

The remainder of the body of this memo discusses methods and data quality. Assessment of the data quality will continue through the model calibration process, but a preliminary review indicates the data have met the goals of the QAPP and will be acceptable for its intended uses (baseline conditions assessment and model development).

The data itself is provided in two attachments and includes preliminary NJHDG data ~~includes preliminary NJHDG data collected between March and December 2016~~ in addition to the data collected by HDR. Data is shown in 6-panel time series plots of temperature, salinity, Secchi depth / turbidity, fecal coliform, enterococcus, and E. coli by sampling location, and are ordered spatially by waterbody, generally starting from the head end and continuing toward the mouth. Attachment 1 shows the sampling locations. Attachment 2 provides the Baseline, Source, and Event Sampling data for the full time period. Attachment 3 focuses on the Event Sampling, which is shown on a three-day timescale.

Table 1. NJ CSO Group Members and Associated Sewage Treatment Facilities

NJ CSO Group Member	Associated Sewage Treatment Facility¹
Bayonne MUA	PVSC
East Newark	PVSC
Elizabeth	JMEUC
Fort Lee	BCUA
Guttenberg	NBMUA
Hackensack	BCUA
Harrison	PVSC
Hoboken ²	NHSA
Jersey City	PVSC
Kearny	PVSC
Newark	PVSC
North Bergen MUA	PVSC
Paterson	PVSC
Perth Amboy	MCUA
Ridgefield Park	BCUA
Union City ²	NHSA
Weehawken ²	NHSA
West New York ²	NHSA

¹BCUA: Bergen County Utility Authority; JMEUC: Joint Meeting of Essex and Union Counties; MCUA: Middlesex County Utilities Authority; NBMUA: North Bergen Municipal Utility Authority; NHSA: North Hudson Sewage Authority; PVSC: Passaic Valley Sewage Commission. ²Municipality with CSOs within their limits but not a permit holder.

SECTION 2 – METHODS

The BCMP is modeled in part on the program performed by the New Jersey Harbor Dischargers Group. NJHDG is a similarly allied collaborative undertaking that has been collecting data since 2003. PVSC has taken the lead for the NJHDG monitoring program which is modeled after the successful New York City Department of Environmental Protection (NYCDEP) Harbor Survey.

2.1 Field Methods

Field sampling activities were performed by HDR Engineering, Inc., in conformance with the applicable requirements of the NJDEP Field Sampling Procedures Manual (FSPM, 2005). HDR holds NJDEP certifications for all parameters for which field sampling was conducted. Table 2 presents the measurement methodologies.

Table 2. Field Sampling Parameters

Parameter	Method	RL ¹	MDL ²	Holding Time
Temperature	SM 2550 B	0.1 °C	0 °C	Analyze Immediately
Salinity	SM 2520 B	0.1 ppt	0 ppt	Analyze Immediately
Dissolved Oxygen	SM 4500-O C, G	0.1 mg/L	0 mg/L	Analyze Immediately
pH	SM 4500-H B, EPA 150.2	0.1 Units	0 Units	Analyze Immediately
Light Penetration	Secchi Depth	0.1 ft	0.1 ft	Analyze Immediately
Turbidity	SM 2130 B	0 FNU	0 FNU	Analyze Immediately

¹Reporting Limit. ²Method Detection Limit

Data were collected during wet and dry conditions. At all locations, fecal coliform and enterococcus were sampled; E. coli was sampled at seven freshwater sites located on the Upper Passaic and Elizabeth Rivers. Table 3 lists details of the routine sampling locations; Table 4 presents the source sampling locations; and Table 5 lists the event sampling locations. A map of these sampling locations is provided in Attachment 1.

Table 3. Baseline Compliance Monitoring Routine Sampling Locations

Station		Waterbody	Samples ¹	Station		Waterbody	Samples
Passaic River	B24	Passaic R	1 ²	Hackensack River	B1	Hackensack R	1
	2	Passaic R	1 ²		B2	Hackensack R	1
	B22	Passaic R	1 ²		B11	Overpeck Cr	1
	S7	Third R	1 ²		S1	Berry's Cr	1
	11	Passaic R	1		B3	Cromakill Cr	2
	B8	Franks Cr	1		S2	Cromakill Cr	1
	B6	Passaic R	2		B4	Cromakill Cr	1
Hudson River	B5A	Hudson R	2	Newark Bay	S3	Sawmill Cr	1
	B5B	Hudson R	2		B7	Hackensack R	2
	B18A	Hudson R	2		S5	Penhorn Cr	1
	B18B	Hudson R	2		B10	Newark Bay	2
	B23A	Hudson R	2		B17	Newark Bay	1
	B23B	Hudson R	2		B16	Elizabeth R	1 ²
Upper Bay	B9	Upper Bay	2	Arthur Kill, Raritan	B14	Elizabeth R	1 ²
	B20	Upper Bay	2		B13	Elizabeth R	1 ²
	B12	Kill Van Kull	2		S4	Peripheral Ditch	1
	B21B	Upper Bay	2		B25	Great Ditch Outlet	1
	B21A	Upper Bay	2	Arthur Kill, Raritan	24	Arthur Kill	2
	B26	Upper Bay	2		S6	Woodbridge Cr	1
	B27	Upper Bay	2		B15	Arthur Kill	2
	B28	Upper Bay	2		B19	Raritan R	2

¹All locations sampled for enterococcus and fecal coliform. ²Also sampled for E coli.

Table 4. Routine Source Monitoring Locations

Station ¹		Waterbody
Hackensack River	S1	Berry's Cr
	S2	Cromakill Cr
	S3	Sawmill Cr
	S5	Penhorn Cr
Newark Bay	S4	Peripheral Ditch
Arthur Kill	S6	Woodbridge Cr
Passaic River	S7 ²	Third River

¹All locations sampled at mid-depth for enterococcus and fecal coliform. ²Also sampled for E coli.

Table 5. Baseline Compliance Monitoring Event Sampling Locations

Station ¹		Waterbody	Samples	Station ¹		Waterbody	Samples
Passaic River	1 ²	Passaic R	1	Hudson River	31	Hudson R	2
	B24 ²	Passaic R	1		32	Hudson R	2
	3 ²	Passaic R	1		33 ³	Hudson R	2
	4 ²	Passaic R	1	Hackensack River	B1	Hackensack R	1
	7 ²	Passaic R	1		B2	Hackensack R	1
	8 ²	Passaic R	1		14	Hackensack R	2
	10 ³	Passaic R	1		15	Hackensack R	2
	B6	Passaic R	2	Newark Bay	17	Newark Bay	2
Upper Bay	B12	Kill Van Kull	2		18 ³	Newark Bay	2
	B26	Upper Bay	2	Arthur Kill, Raritan	20	Elizabeth R	1
	B27	Upper Bay	2		24	Arthur Kill	2
	B28	Upper Bay	2		B15	Arthur Kill	2
					29	Raritan Bay	2

¹All locations sampled for enterococcus and fecal coliform twice per day for 3 days, except as noted. ²Also sampled for E. coli. ³Sampled for enterococcus and fecal coliform four times per day for 3 days.

2.2 Laboratory Methods

Laboratory analyses for all samples collected by HDR were performed by Eurofins QC analytical laboratories, a New Jersey certified analytical testing laboratory. Laboratory analyses for all NHDG data were performed by the PVSC laboratory, also a New Jersey certified analytical testing laboratory. Table 6 presents the laboratory methodologies. The following parameters were analyzed in a laboratory:

- Fecal Coliform (all locations);
- Enterococcus (all locations); and
- E. coli (freshwater locations only; Elizabeth River & Upper Passaic River).

Table 6. Fecal Indicator Bacteria Laboratory Methodologies

Parameter	Laboratory Method	Preservation	Holding Time ¹	RL ²
Fecal Coliform	EPA Micro Manual p. 124 (1978), Single Step Membrane Filtration	Cool $\leq 4^{\circ}\text{C}$	8 hrs	1, 2, 4, 10 CFU/100 mL
Enterococci	EPA 1600 (Dec 2009), Membrane Filtration	Cool $\leq 4^{\circ}\text{C}$	8 hrs	1, 2, 4, 10 PE/100 mL
E. coli	EPA 1603 (Dec 2009), Membrane Filtration	Cool $\leq 4^{\circ}\text{C}$	8 hrs	1, 2, 4, 10 CFU/100 mL

¹Time between collection and initiation of analyses. ²Reporting Limit; values are current as of issuance of QAPP and are based on dilutions, i.e., lower dilutions yield lower reporting limits and vice versa. CFU: colony forming units; PE: presumptive enterococci.

2.3 Data Quality Objectives

Quality control (QC) measures were applied in the field and the laboratory to characterize the data quality to ensure end-users are aware of any qualified data. Field measurements and sample collection addressed goals of completeness, precision, and representativeness through data validation, duplicate collection, and field and equipment blank samples. Laboratory quality controls addressed bias, accuracy, sensitivity, and comparability through analyzing Laboratory Fortified Blanks, establishing and reporting predetermined method detection and reporting limits, and analyzing Performance Test (PT) samples as part of annual laboratory & method certification. Tables 7 and 8 present the data quality criteria.

Table 7. Data Quality Criteria and Performance Measurement for Field Collection

Data Quality Indicator	Performance Criterion	Assessment Activity
Completeness	Valid data from 90% of collected samples	Percentage of valid measurements
Precision	RPD ¹ < 30% for duplicates	1 field duplicate/crew-day
Representativeness	Blanks \leq MDL ²	1 field blank/crew-day 1 equipment blank/crew-day

¹ Relative Percent Difference on a log basis; non-representative when (a) both the original and duplicate results are not detected or are less than 5x the reporting limit or (b) either result is estimated, rejected, or suspected of contamination. ²Method Detection Limit, calculated where applicable.

Table 8. Data Quality Criteria and Performance Measurement for Laboratory Analyses

Data Quality Indicator	Performance Criterion	Assessment Activity
Bias/Accuracy	80%-120% Recovery	Reference material
Sensitivity	MDL ¹ and RL ²	Daily calibration curve
Comparability	Acceptable PT ³ samples	PT ³ samples and recertification

¹Method Detection Limit. ²Reporting Limit. ³Performance Test. Part of annual laboratory & method certification for the laboratory performing the analysis.

SECTION 3 – RESULTS

Samples were collected during a 377-day span from April 17, 2016 through April 28, 2017. Table 9 summarizes the observed and normal precipitation at Newark Liberty International Airport (KEWR). Note that April 2016 included only 14 days and April 2017 included 28 days. Both the rainfall totals and number of days exceeding the target threshold were below normal for the time window the field program was executed.

Table 9. Precipitation Summary, April 17, 2016 – April 28, 2017

Month	Volume (inches)			Days \geq 0.50 inches		
	Observed	Normal ¹	Difference	Observed	Normal ¹	Difference
Apr-16	0.17	1.91	(1.74)	0	1.2	(1.2)
May-16	3.85	4.02	(0.17)	3	2.9	0.1
Jun-16	2.40	4.76	(2.36)	2	2.7	(0.7)
Jul-16	6.08	3.70	2.38	4	3.0	1.0
Aug-16	0.93	3.82	(2.89)	0	2.6	(2.6)
Sep-16	2.17	3.60	(1.43)	1	2.7	(1.7)
Oct-16	3.00	3.65	(0.65)	3	2.5	0.5
Nov-16	6.51	3.81	2.70	3	2.7	0.3
Dec-16	2.46	3.54	(1.08)	1	2.9	(1.9)
Jan-17	3.86	2.88	0.98	3	2.6	0.4
Feb-17	2.09	4.18	(2.09)	2	2.1	(0.1)
Mar-17	5.09	4.20	0.89	3	2.7	0.3
Apr-17	3.28	3.82	(0.54)	3	2.4	0.6
Total	41.89	47.89	(6.00)	28	33.0	(5.0)

¹Standardized three-decade average (1981-2010).

Table 10 shows the number of days of field measurement activities versus the precipitation condition. Water quality data was collected during 19 of the 28 target events that occurred during the field program (68%). Data was collected during an additional 36 wet weather days, and 81 days with little to no rain were also captured.

Table 10. Summary of Precipitation during Field Collection Days

Rainfall	Days	BCMP	Wet Weather ²	Other Sampling ^{3,2}	No Sampling
Rain > Target ¹	28	5	5	9	9
Rain < Target ¹	94	27	6	3	58
No Rain / Trace	255	76	5	0	174
Total Days	377	108	16	12	241

¹Precipitation >0.5 inches in 24 hours. ²Includes prior day and three days of sampling (i.e., four Field Collection Days per Wet Weather Event) ³System-System Characterization sampling for CSO and stormwater was executed in parallel to the BCMP

3.1 Completeness

Tables 11 and 12 present the collection dates for routine and event sampling respectively, along with the percentage of samples collected during each survey. In total, 1,439 samples out of a targeted 1,449 samples were collected during the 23 baseline surveys (99.4%), and a 100% success rate was attained during 19 of the 23 routine surveys. Only one survey had more than one missed sample: survey 22, which was hindered by snowpack on the boat launch used to deploy the small boat. As a result, Stations B2 (1-depth), B3 (2-depths), B11 (1-depth), S2 (1-depth), S3 (1-depth) and S5 (1-depth) could not be sampled. These six stations are inaccessible by the larger boats, due to shallow station depths and low bridge clearances. The three remaining missed samples were due to site access (S4 during survey 6) or laboratory accident (B23A during survey 7 and B18A during survey 21).

Table 11. Routine Baseline and Source Sampling Dates and Completeness

Survey	Week of	Percent of Targeted Samples Collected	Number Missed	Survey	Week of	Percent of Targeted Samples Collected	Number Missed
1	4/25/2016	100	0	13	8/22/2016	100	0
2	5/9/2016	100	0	14	8/29/2016	100	0
3	5/23/2016	100	0	15	9/6/2016	100	0
4	6/9/2016	100	0	16	9/12/2016	100	0
5	6/22/2016	100	0	17	9/19/2016	100	0
6	7/5/2016	98.4	1	18	10/3/2016	100	0
7	7/11/2016	98.4	1	19	11/7/2016	100	0
8	7/18/2016	100	0	20	12/5/2016	100	0
9	7/25/2016	100	0	21	1/9/2017	98.4	1
10	8/1/2016	100	0	22	2/6/2017	88.9	7
11	8/8/2016	100	0	23	3/6/2017	100	0
12	8/15/2016	100	0	Total		99.4	10

Table 12. Baseline Compliance Monitoring Event Sampling Dates and Completeness

Survey, Date(s)	Antecedent Precipitation	Percent of Samples Collected	Number Missed
1. 6/6/2016	0.94"	97.4%	7 of 270
2a ¹ . 1/4/2017	0.36"	100%	0 of 110
2b ²⁺ . 4/26/2017	0.88"	100%	0 of 160
3. 1/24/2017	1.24"	95.9%	11 of 270
Totals		97.8%	18 of 810

¹ Sampling locations accessible by land only, i.e., split across two rain events due to sampling logistic limitations: 1, 3, 4, 7, 8, 10, 20, B1, and B24. ²Sampling locations accessible by boat only, i.e., 31, 14, 15, 17, 18, 24, 29, 31, 32, 33, B2, B6, B12, B15, B26, B27, B28)

In total, 792 of a targeted 810 samples were collected during the event sampling surveys. The seven samples not collected during the first event included B2 (2-depth), B6 (1-depth), 14 (2-depth), and 15 (2-depth). These stations were accessed using a small aluminum-hulled boat, and thunderstorms and high winds during the afternoon of the third day rendered it unsafe to sample. The eleven samples not collected during the third event included four at Station 29 (2-depth) and one at Station 18 (2-depth) due to high winds, and one at Station 20 that was not analyzed as the bottle broke in transit to the lab.

In addition to field issues, one sample at Station 20 on 6/8 was not analyzed for fecal coliform due to a lab accident, and all twelve samples collected on 6/8 were not analyzed for *E. coli* because of a lab oversight.

3.2 Qualified Data

The methodologies approved for bacteria require preparation of appropriate sample dilutions so that the number of colonies to be counted on the plate is between 20 and 60. Due to the wide variability of bacteria concentrations across ‘clean’ surface waters, stormwater, and sanitary sewage, it is not always possible to accurately estimate the level of dilution necessary. As a result, some of the concentrations reported are considered estimates because the number of colonies fell outside of this range when counted. These results are given a qualifier of “E.” E-qualified data still meet the needs of the program and can be used in the water quality analysis, but must be treated as estimates rather than direct measured values.

The bacteria measurements also have a specific holding time required by the laboratory methodology, which is less than 8 hours. When analysis is conducted outside of 8 hours, the concentrations are given a qualifier of “Q².” Q-qualified data still meet the needs of the program and can be used in the water quality analysis, but could not be used for a regulatory assessment of compliance.

Q-qualified data occurred more frequently during the initial stages of the sampling program, most notably during the first event-based sampling in early June 2016. The laboratory processed coolers as they arrived rather than based on the coolers’ chain-of-custody end sample times. Procedures were adopted to address this issue and the number of Q-qualified data decreased over the course of the sampling program. Table 13 presents the number of non-qualified, E qualified, and Q qualified samples.

3.3 Precision

Precision assesses the variability associated with sample collection, handling, and storage in the field, as well as variability associated with the analytical processes. To measure this, one sample from each crew-day was collected in duplicate, and the laboratory analyses of duplicate samples were compared against one another. Table 14 summarizes these comparisons for routine, event, and source sampling by indicator bacteria. Overall, 92% of usable duplicates had a relative percent difference at or below 30% (on a log basis). Usable duplicates are those where both samples are at

² Other types of Q-qualifying issues can arise, but in this sampling program all Q-qualified data was flagged as such based on holding time exceedance.

least five times the reporting limit and neither is estimated, suspected of contamination, or otherwise rejected.

Table 13. Counts for Qualified Data

Qualifier	Routine			Event			Total		
	Fecal	Entero	Ecoli	Fecal	Entero	Ecoli	Fecal	Entero	Ecoli
None	1,125	1,210	99	417	361	63	1,542	1,571	162
E	313	229	40	349	390	30	662	619	70
Q	1	0	0	13	15	3	14	15	3
Both	0	0	0	11	25	0	11	25	0
Qualified	22%	16%	29%	47%	54%	34%	31%	30%	31%

Table 14. Analysis of Duplicates

Duplicates	Fecal	Entero	Ecoli	Total
Total Pairs	179	180	31	390
Usable Pairs	85	68	20	173
RPD <30%	80	60	20	160
Percent Good	94%	88%	100%	92%

3.4 Representativeness

Representativeness is a measure of the degree to which data accurately and precisely represent conditions at the sampling point. Programmatic and procedural controls are designed to minimize contamination between sample collection and the laboratory (or subsequent sample collections), and the effectiveness of these controls can be measured by analyzing blank samples that underwent similar handling to collected samples.

The sampling program relied on two types of blanks. Equipment blanks were generated each sampling crew-day by passing laboratory de-ionized (DI) water through sampling equipment prior to collecting the first sample. Field blanks were similarly prepared, but were collected between sampling events within the crew-day.

Table 15. Equipment and Field Blank Results, Routine, Event, and Source Sampling

Blanks	Equipment			Field			All Blanks		
	Fecal	Entero	Ecoli	Fecal	Entero	Ecoli	Fecal	Entero	Ecoli
Lab Analyses	181	181	61	180	180	60	361	361	121
≤MDL	150	179	45	144	164	42	294	343	87
Percent Good	83%	99%	74%	80%	91%	70%	81%	95%	72%

SECTION 4 –PRELIMINARY CONCLUSIONS

A preliminary review indicates that tThe data collected under the Baseline Compliance Monitoring Program is sufficient for the intended goal of calibrating the water quality model to be used for PVSC and NJCSO communities' LTCPs. Data quality met QAPP objectives, i.e.:

- The data completeness goal of valid data from 90% of collected samples was achieved. Over 99% of targeted samples were collected and analyzed, representing nearly 4,700 points of pathogen data. Of this data, 29% were reportable as estimates based on laboratory plate counts being outside of the recommended window, and less than 1% were qualified based on holding times. The preliminary review of flagged data shows that it is consistent with comparable non-flagged data and is likely to be informative to the model calibration process.
- The sample duplicate goal of calculated relative percent difference (RPD) being less than 30% on a log-basis was achieved in 92% of duplicates analyzed, which excludes pairs disqualified after collection and analysis for failure to meet reporting or method detection limit requirements, a determination that cannot be made prior to collecting and analyzing samples.
- The field and equipment blanks were below the method detection limit (MDL) for 86% of all blanks analyzed. The overwhelming majority of the remaining 14% were in the range of 1 to 10 colonies per 100 mL, indicating that sample contamination was very low in those cases and not likely to have altered the results.
- The BCMP was not designed to provide an adequate data volume for assessing attainment of water quality standards, which would have required five samples per month at each sampling location to compute monthly geometric means. ~~However, a review of the data collected can indicate the likelihood of attainment in a particular area:~~
 - ~~• The lower regions of the Passaic and Hackensack Rivers appear likely to violate water quality criteria, but attainment appears to improve closer to Newark Bay.~~
 - ~~• The larger waterbodies (Newark Bay, Hudson River, Arthur Kill, Kill Van Kull) appear to meet existing water quality criteria. Newark Bay and the Kills are primarily SE3 waterbodies, and Raritan Bay is subject to more stringent shellfishing water quality standards.~~
 - ~~• Several smaller riverine waterbodies appear unlikely to meet attainment. This includes the Rahway River, Saddle River, Second River, and Elizabeth River. The Raritan River may also have attainment issues.~~
 - ~~• Many rivers without CSOs have high bacteria loads. Data collected at source sampling locations indicate non-attainment of waters entering the Passaic and Hackensack Rivers, contributing pollutant loads into the study area from areas that do not have CSOs.~~

The attachments to this memo list the applicable water quality standards for each waterbody region, and provide the numeric criteria associated with those standards in a summary table at the front.

ATTACHMENT 1 – SAMPLING LOCATIONS

Figures are organized by associated sewage treatment facility

Passaic Valley Sewerage Commission (PVSC)

- 01 Overview
- 02 Bayonne City
- 03 East Newark
- 04 Harrison
- 05 Jersey City MUA
- 06 Kearny
- 07 Newark
- 08 North Bergen
- 09 Paterson

Bergen County Utilities Authority (BCUA)

- 10 Ridgefield Park Village
- 11 Borough of Fort Lee
- 12 City of Hackensack

Joint Meeting of Essex and Union Counties (JMEUC)

- 13 City of Elizabeth

North Bergen Municipal Utilities Authority (NBMUA)

- 14 North Bergen Woodcliff
- 15 Town of Guttenberg

North Hudson Sewerage Authority (NHSA)

- 16 Adams Street
- 17 River Road

Middlesex County Utilities Authority (MCUA)

- 18 Perth Amboy City

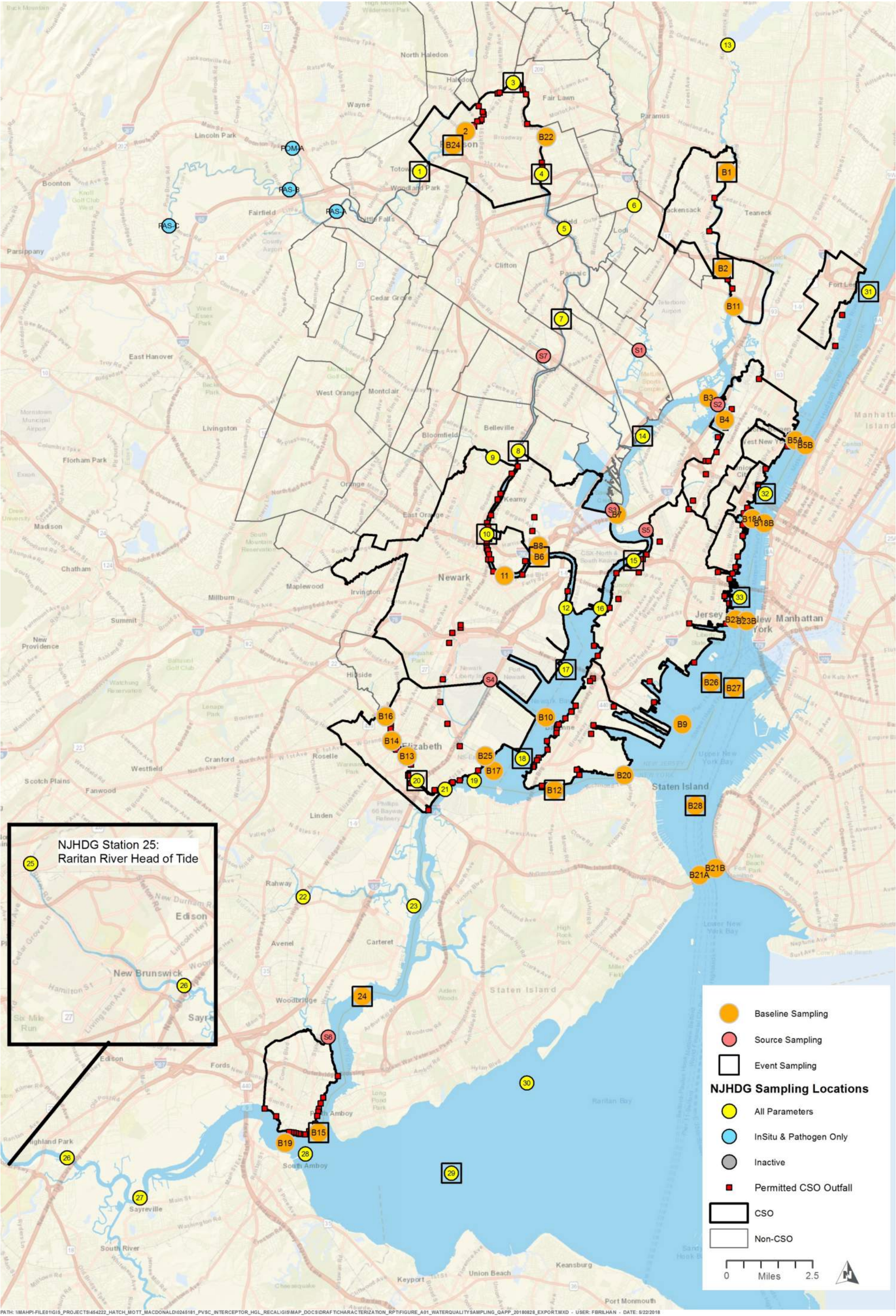


Figure 1 - Overview



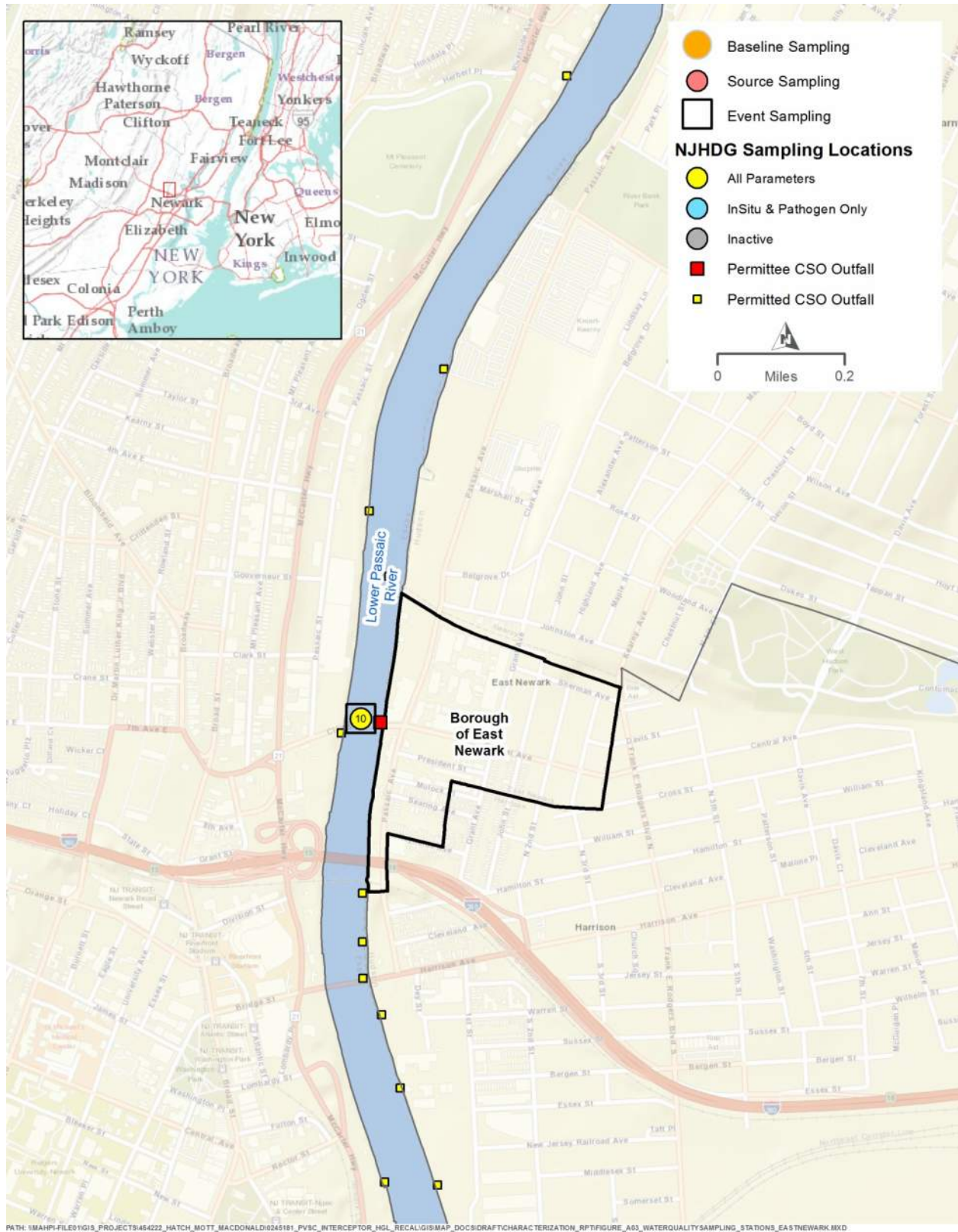


Figure 3 – East Newark Borough (PVSC)

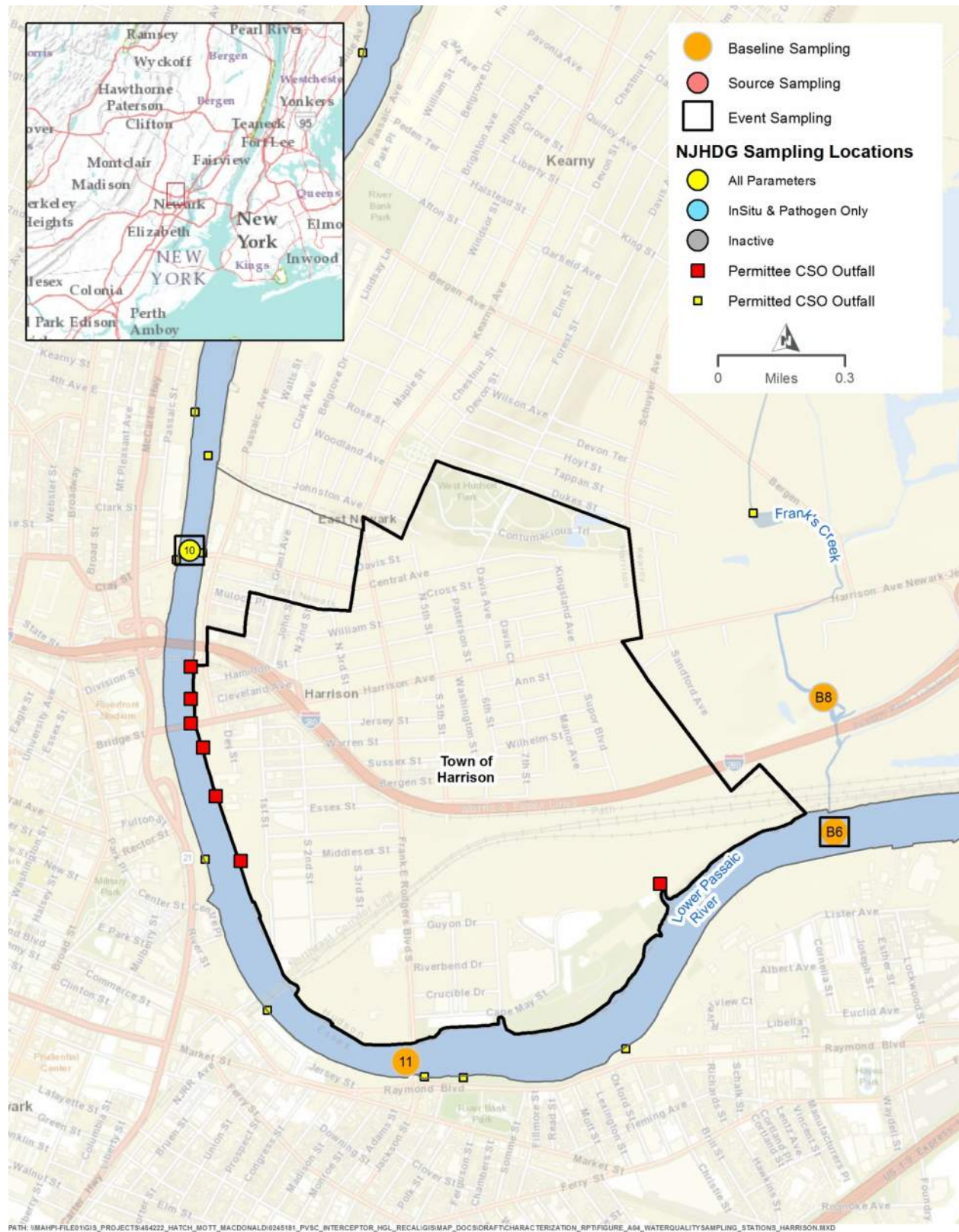


Figure 4 – Harrison Town (PVSC)



Figure 5 – Jersey City MUA (PVSC)

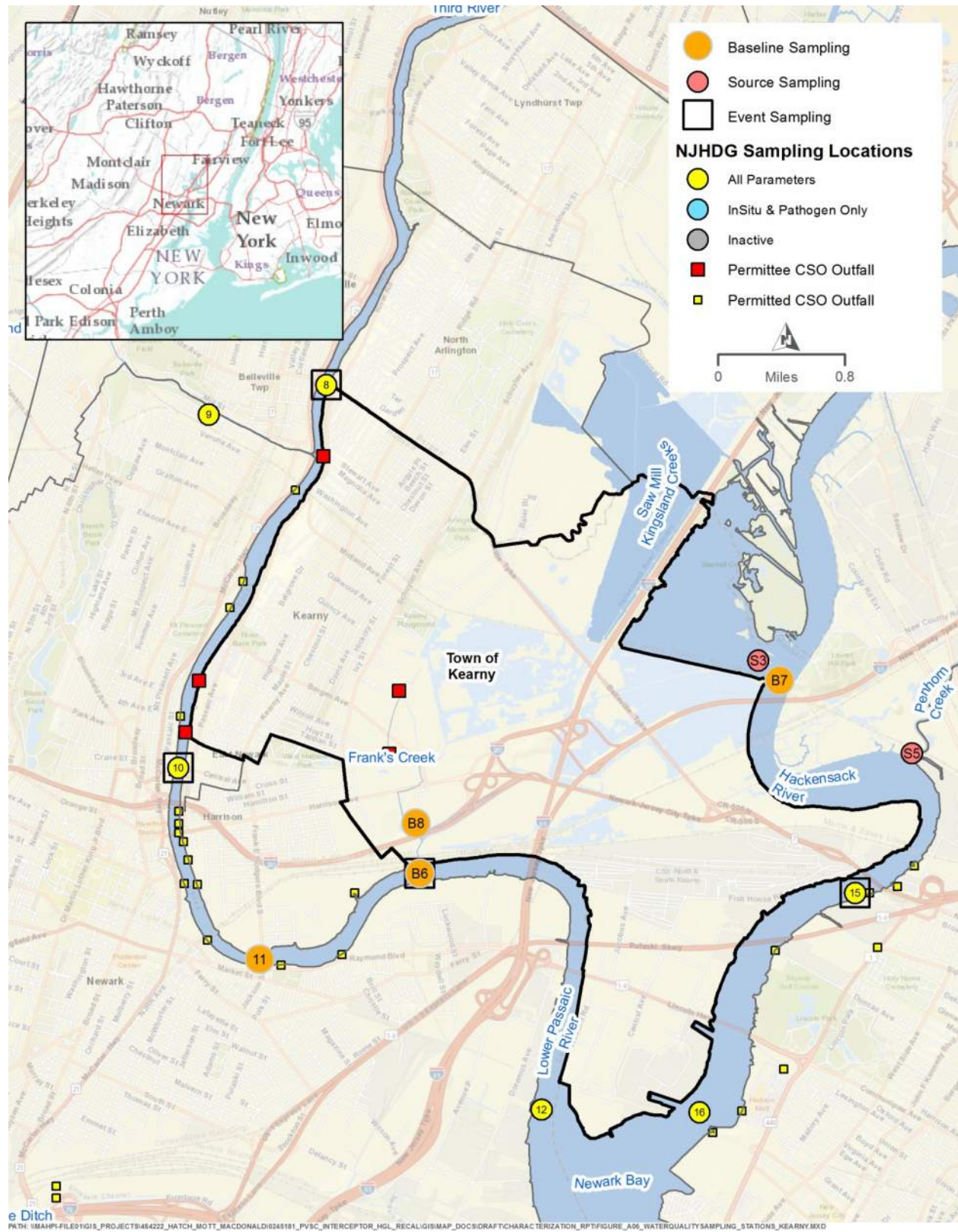


Figure 6 – Kearny Town (PVSC)

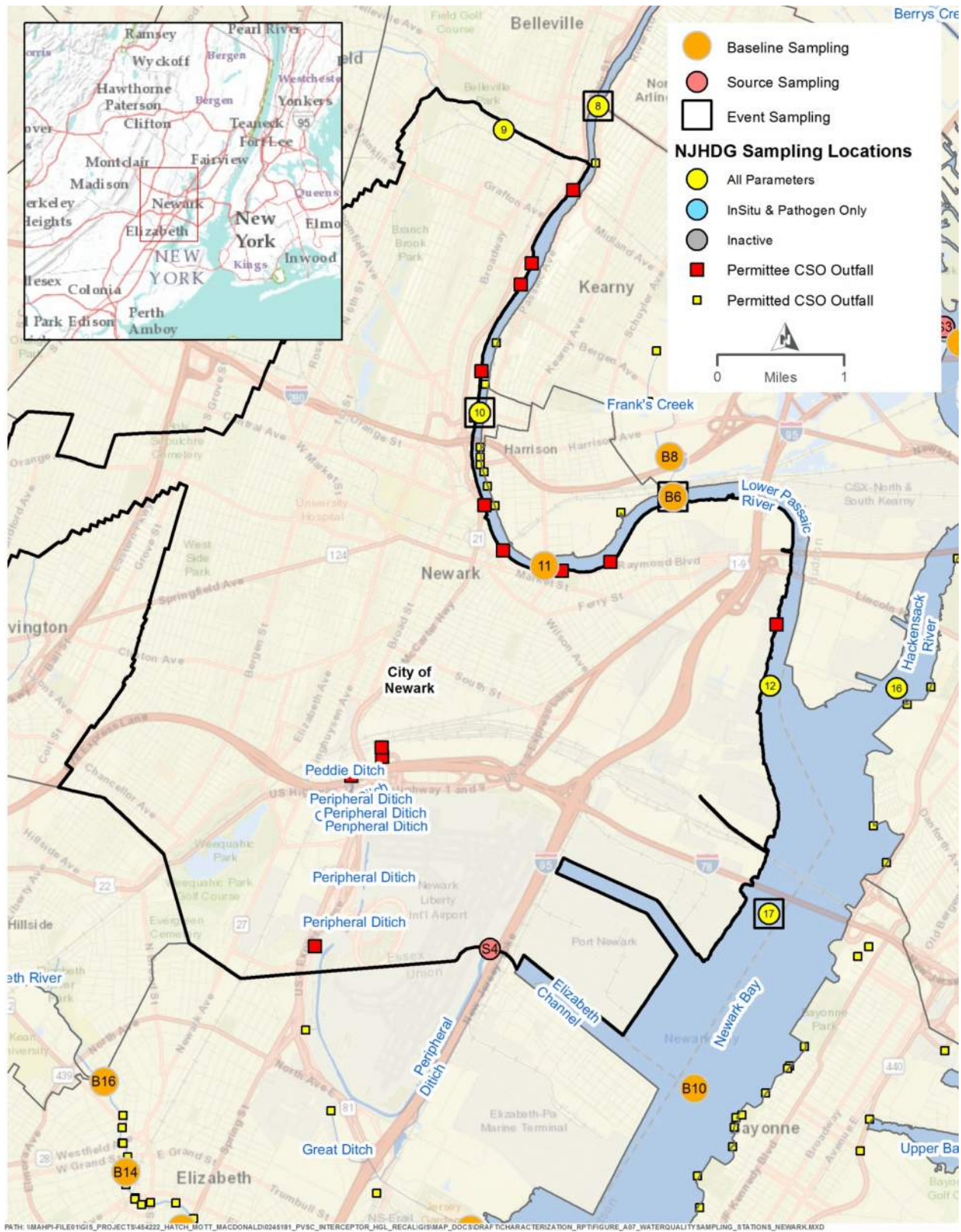


Figure 7 – Newark City (PVSC)

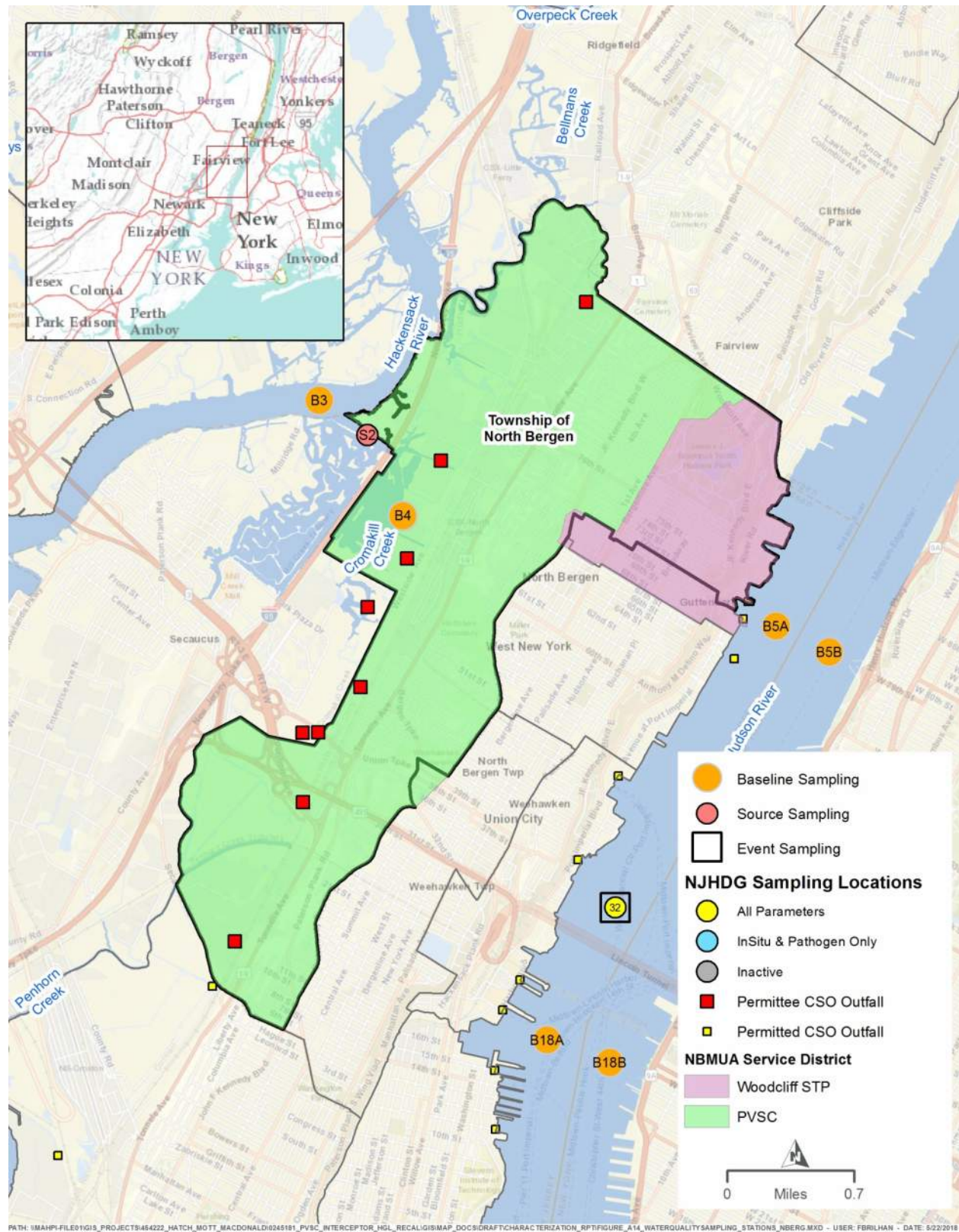


Figure 8 – North Bergen MUA (PVSC)

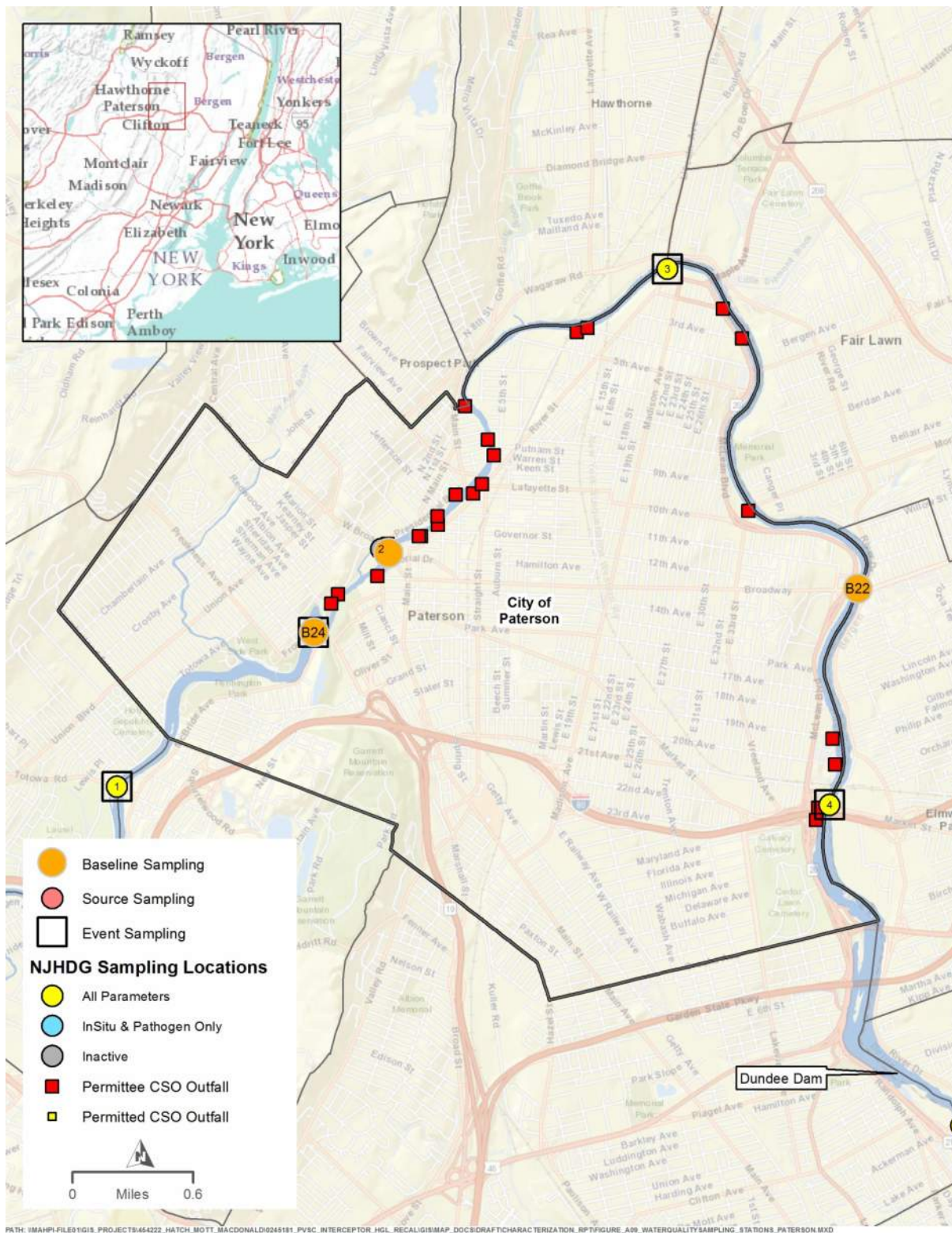
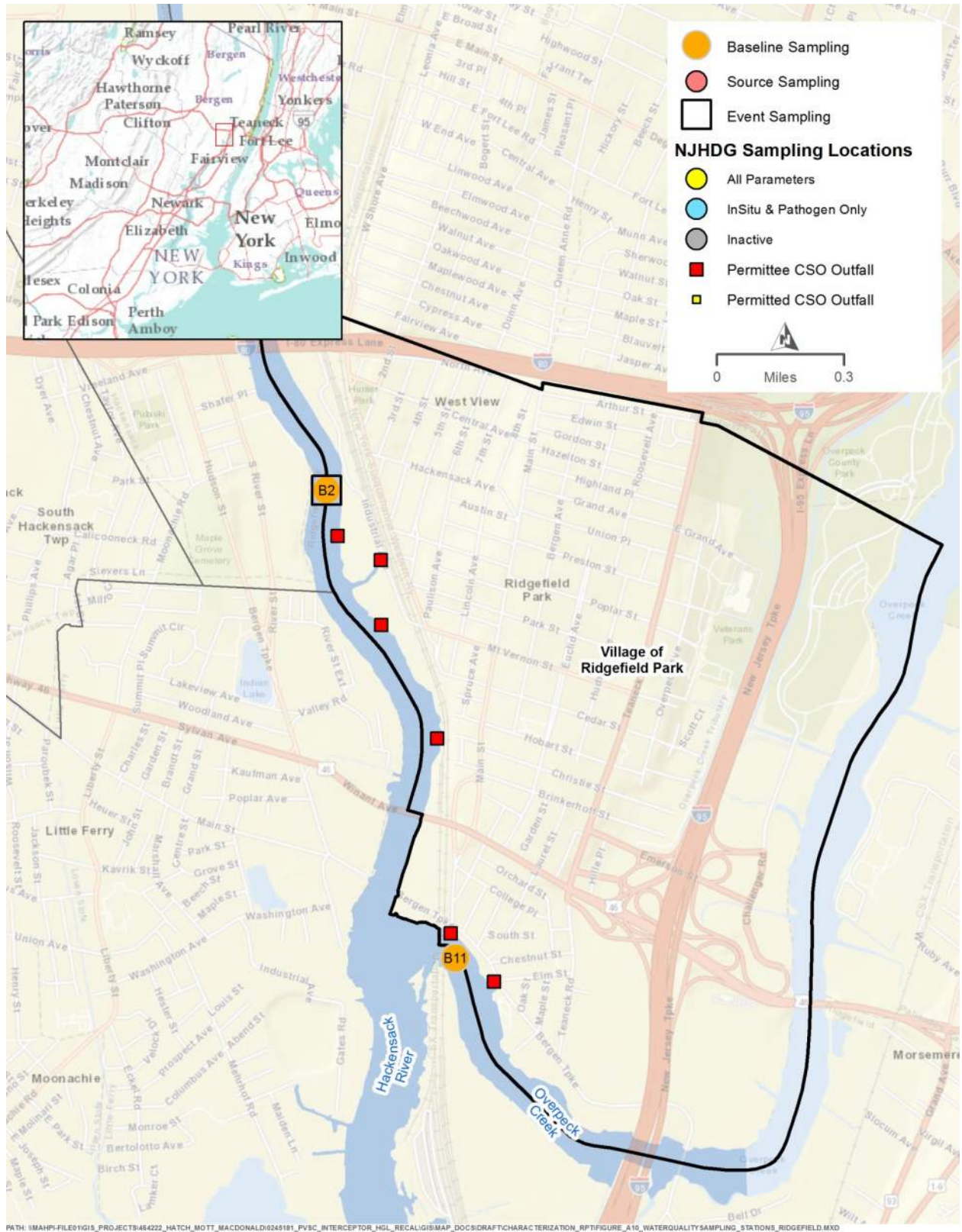


Figure 9 – Paterson (PVSC)



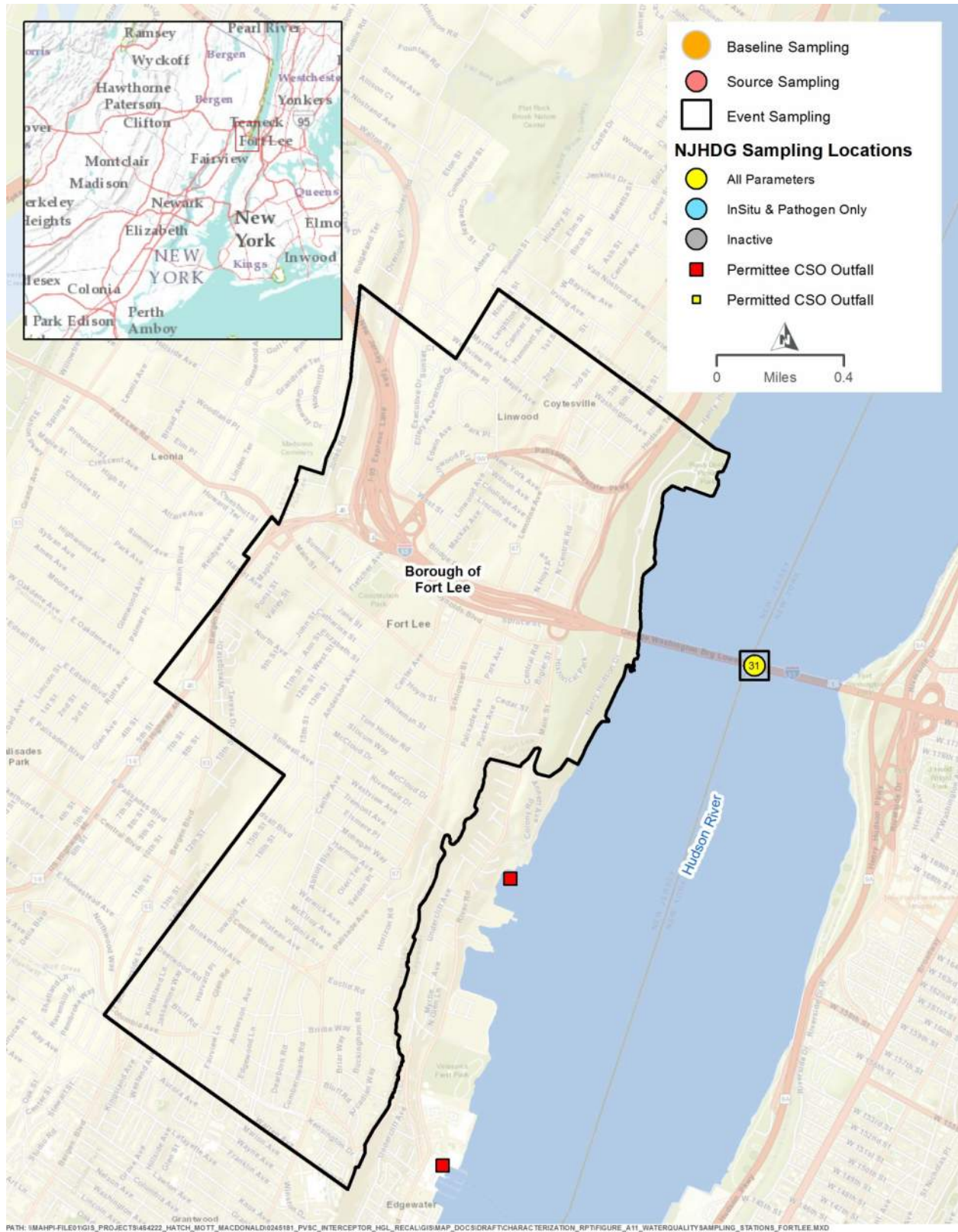


Figure 11 – Borough of Fort Lee (BCUA)



Figure 12 – City of Hackensack (BCUA)

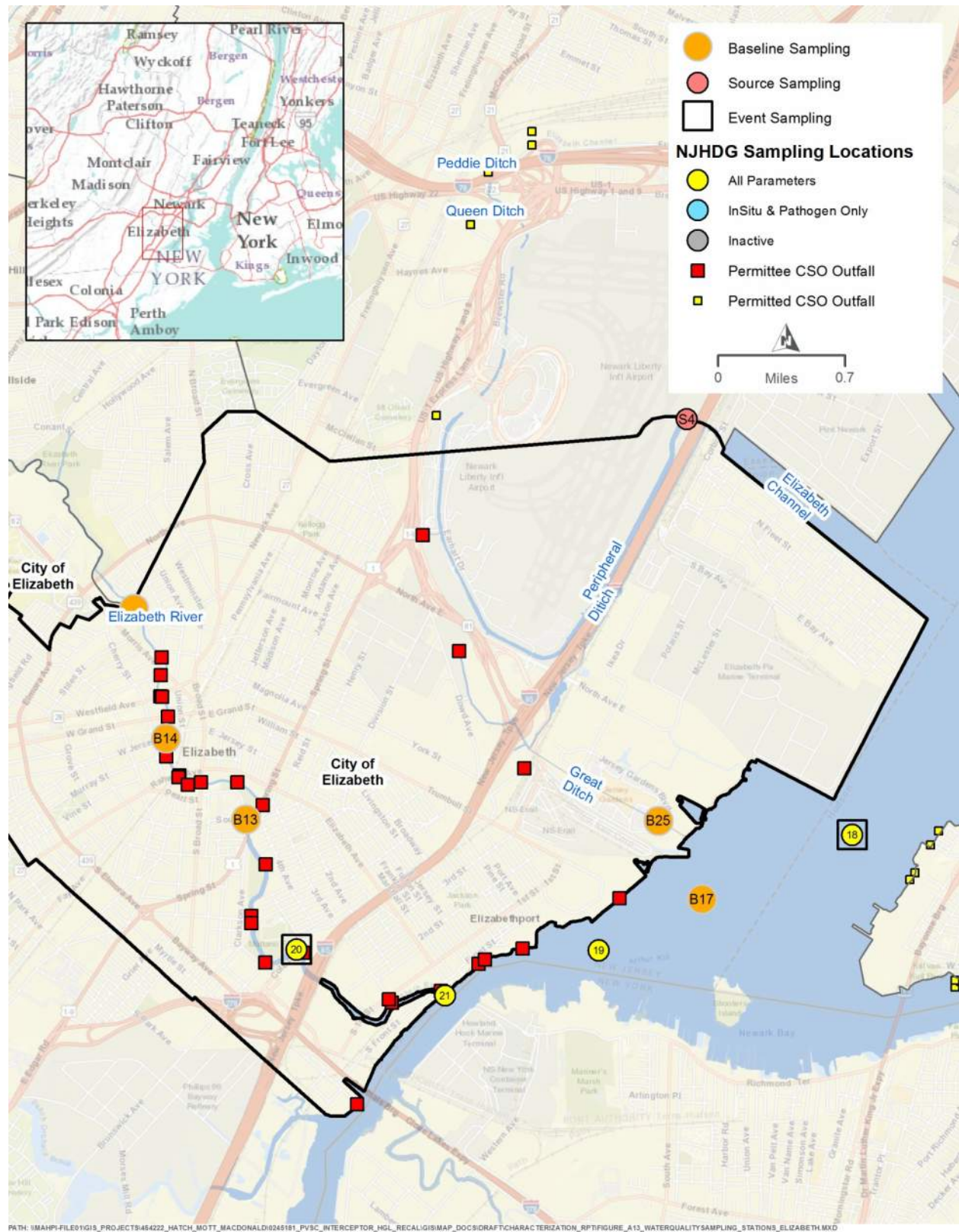




Figure 14 – North Bergen Woodcliff (NBMUA)

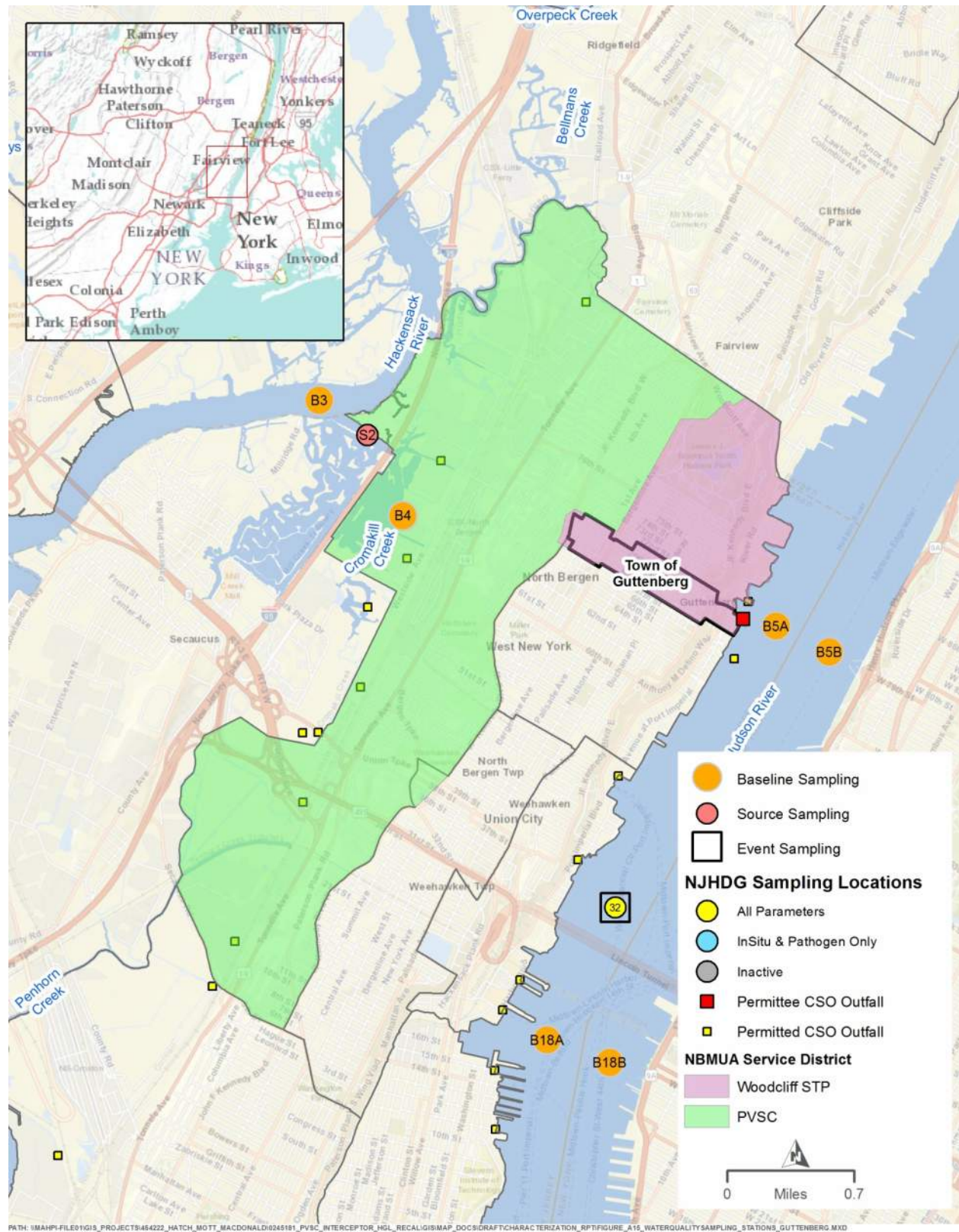


Figure 15 – Town of Guttenberg (NBMUA)

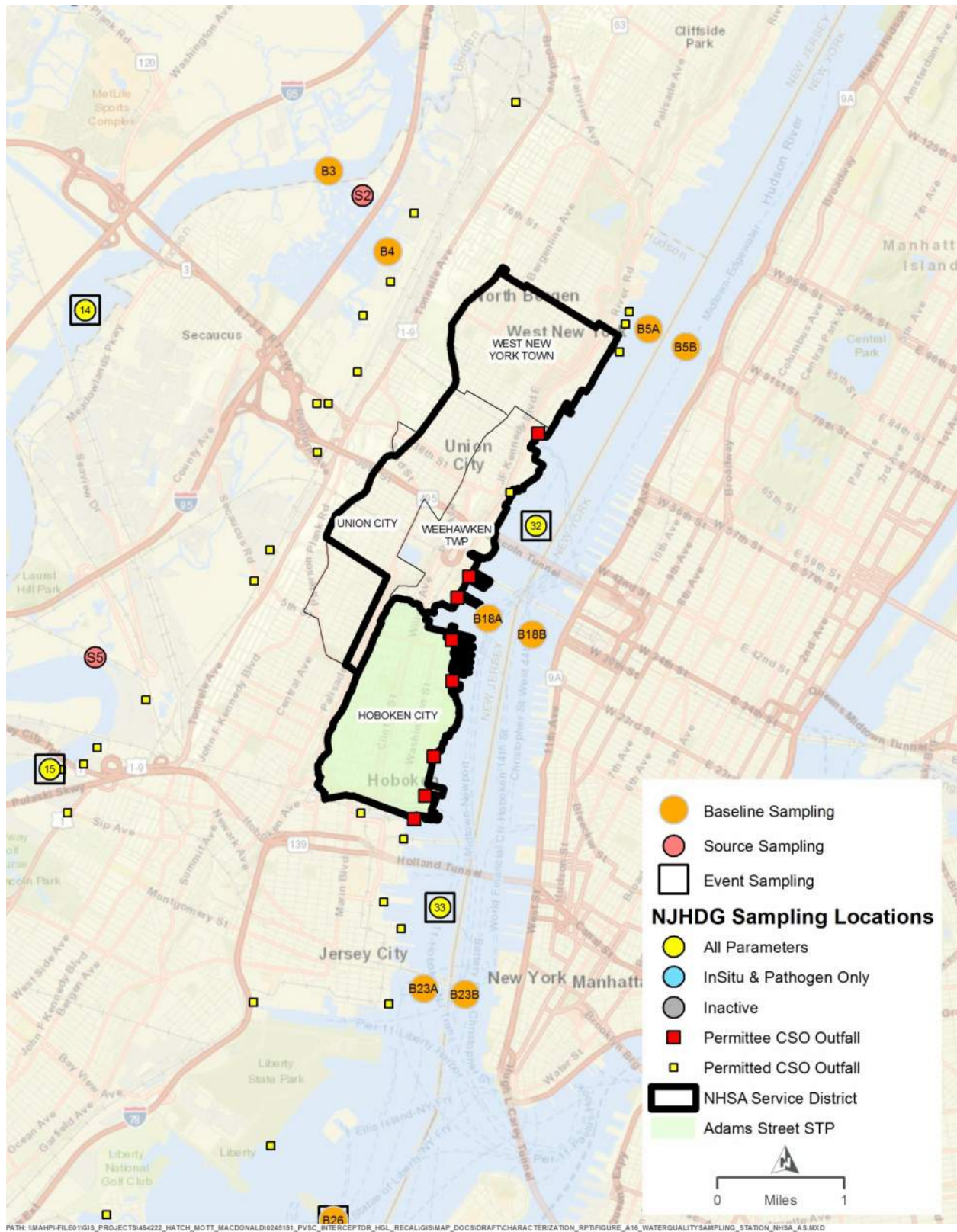


Figure 16 – Adams Street (NHS)

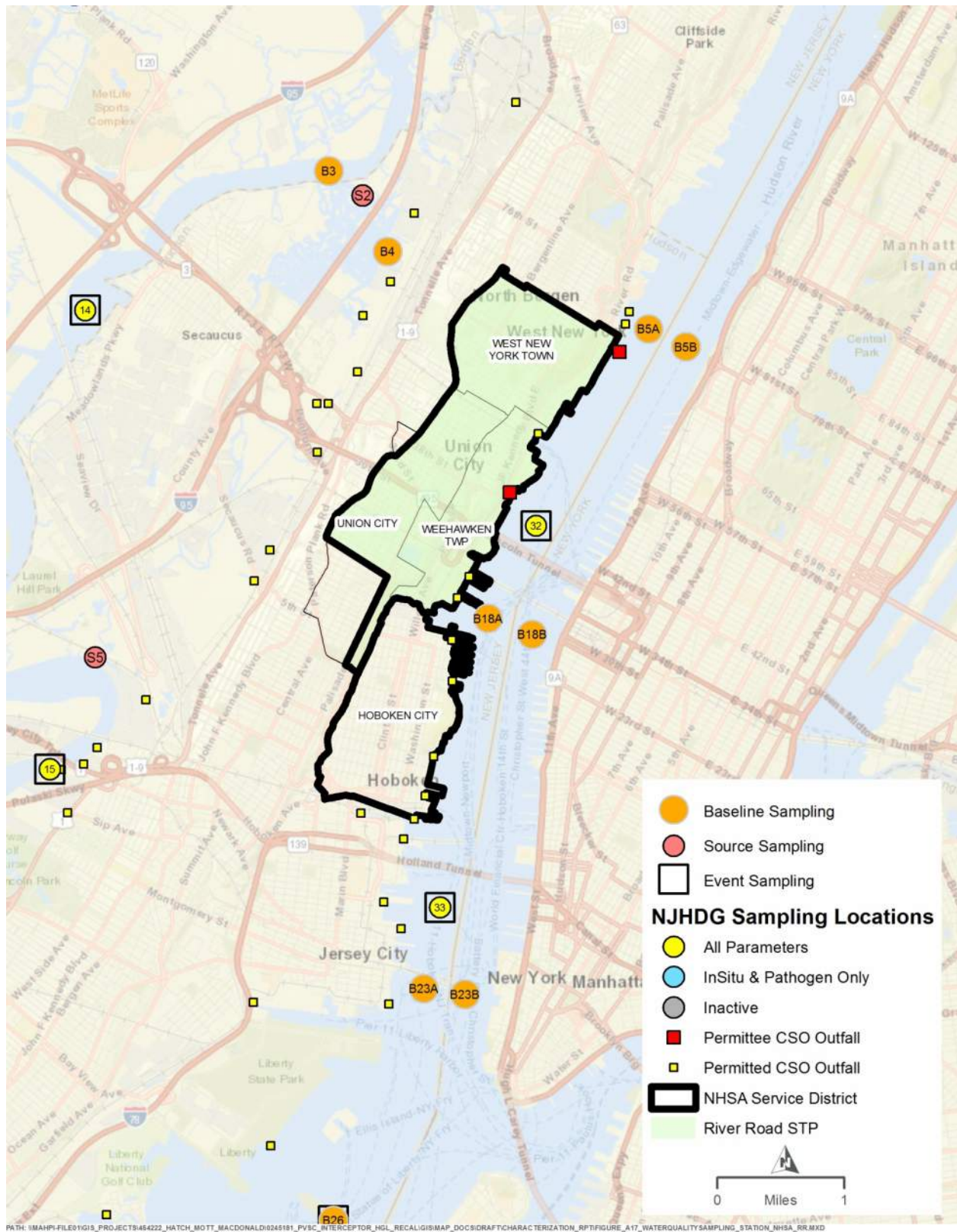


Figure 17 – River Road (NHS)



ATTACHMENT 2 – RECEIVING WATER QUALITY DATA

EXPLANATION OF RECEIVING WATER QUALITY DATA PRESENTATION

Graphs of available receiving water data collected by HDR and NJHDG during April 2016 through ~~March~~ April 2017 ~~and NJHDG data collected between March 2016 and December 2016~~ are presented here within. Note the NJHDG data is still considered preliminary. Refer to Attachment 1 figures for sampling locations. On the following figures, temperature, salinity, Secchi depth, turbidity, fecal coliform, enterococci, and E. coli are plotted by station. The pages are ordered spatially by waterbody, generally starting from the head end of a waterbody and continuing toward the mouth. Tributaries to the main waterbody are included in a manner consistent within the location of the tributary along the main waterbody. Figures are labeled with a waterbody grouping, specific waterbody name, station, and waterbody classification (see table below). Data collected during this period were not collected frequently enough to assess attainment of geometric mean standards, which require five samples within a 30-day period.

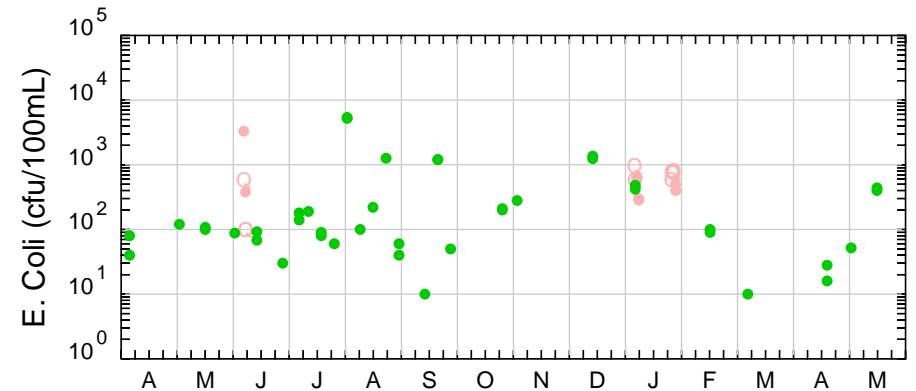
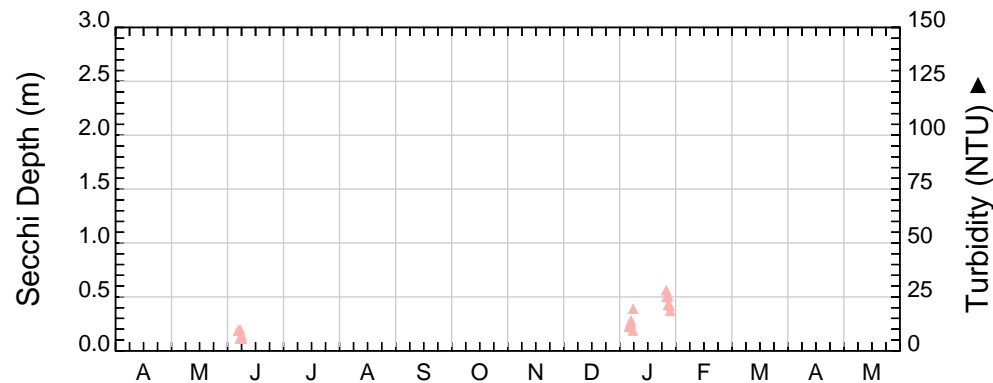
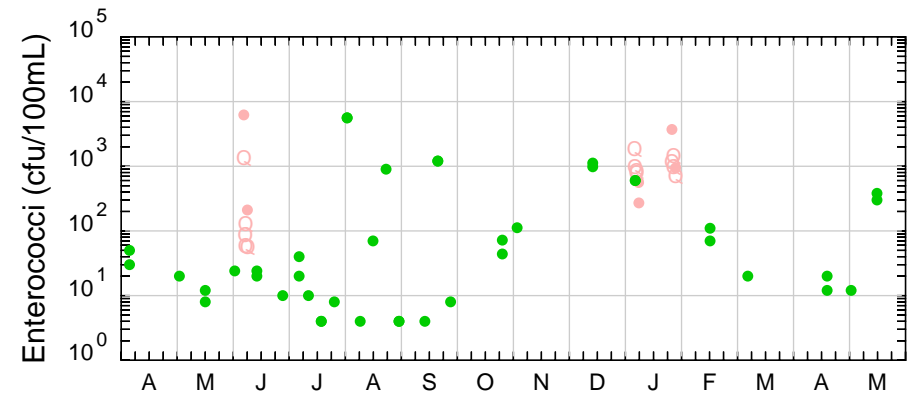
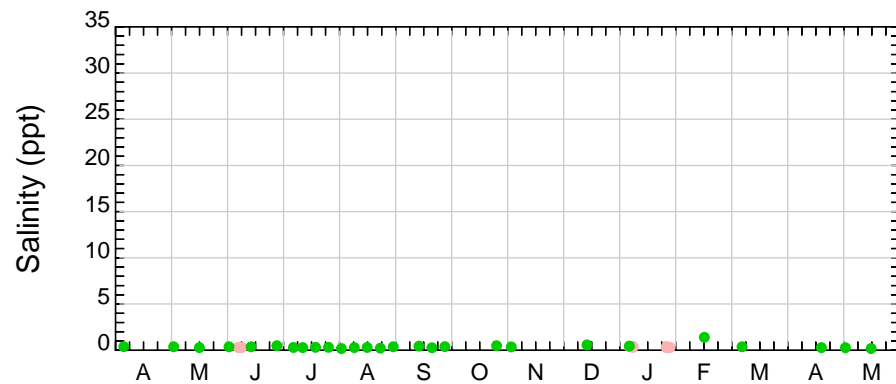
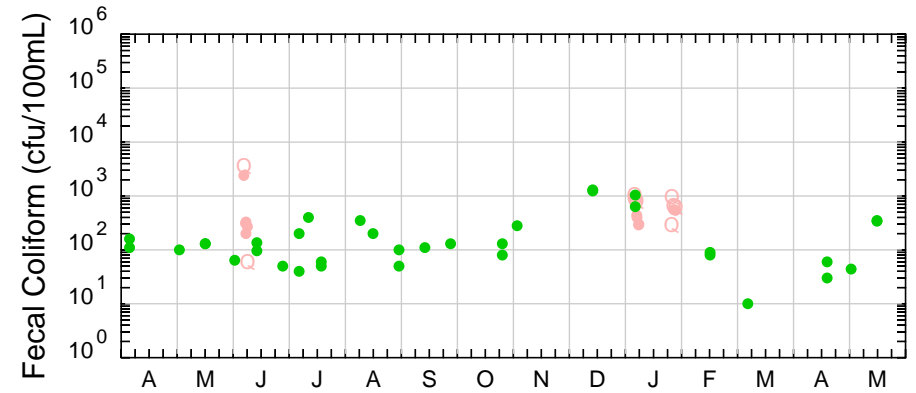
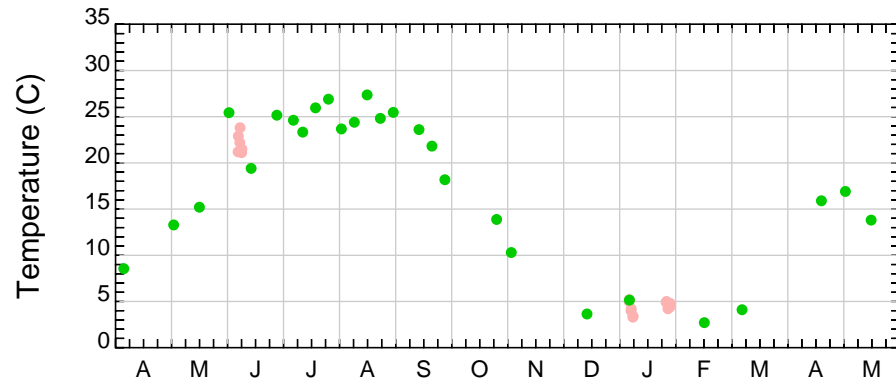
Data are presented as open circles for surface data, filled gray circles for mid-depth data, and filled black circles for bottom data. Secchi depth does not fall into a specific depth category, but is plotted with filled black circles. Turbidity is shown on the same panel as Secchi depth and is presented with filled green circles. Only the Data collected by HDR under this BCMP report includes laboratory qualifiers (either as estimated or as exceeding holding times) which are presented as a “Q”. These data still meet the needs of the program and can be used in the water quality analysis. Refer to Section 3.2 for details on data qualifiers. All planned receiving water data have been collected.

The post-collection review of the data indicates the data have met the goals of the QAPP and will be acceptable for use in baseline conditions assessment, and for use in the model calibration. Assessment of the data quality will continue through the model calibration process.

WATER QUALITY STANDARDS

Class	Type	Bacteria Standard			Highest Protected Uses	
		Path	GM	SSM	Recreational	Other
SC	Saline	Entero	35	104	Primary	Shellfishing*
SE1	Saline	Entero	35	104	Primary	Shellfishing*
SE2	Saline	Fecal	770	na	Secondary	Diadromous fish migration
SE3	Saline	Fecal	1500	na	Secondary	Diadromous fish migration
FW2	Fresh	Ecoli	126	235	Primary	Public water supply

*Shellfish Waters are subject to the National Shellfish Sanitation Program standard for approved shellfish waters



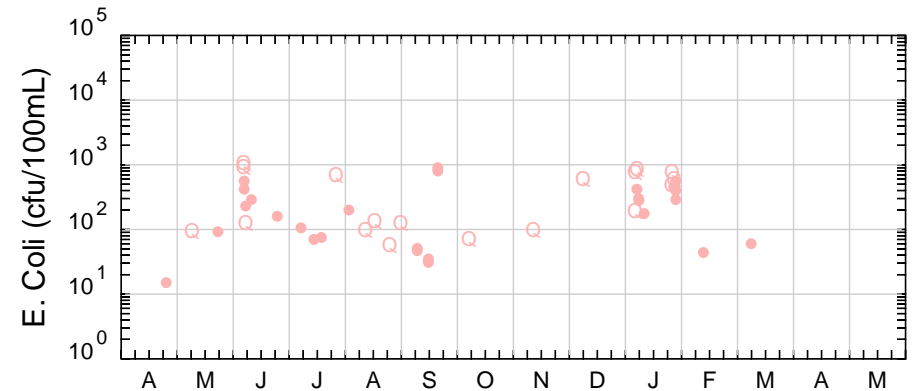
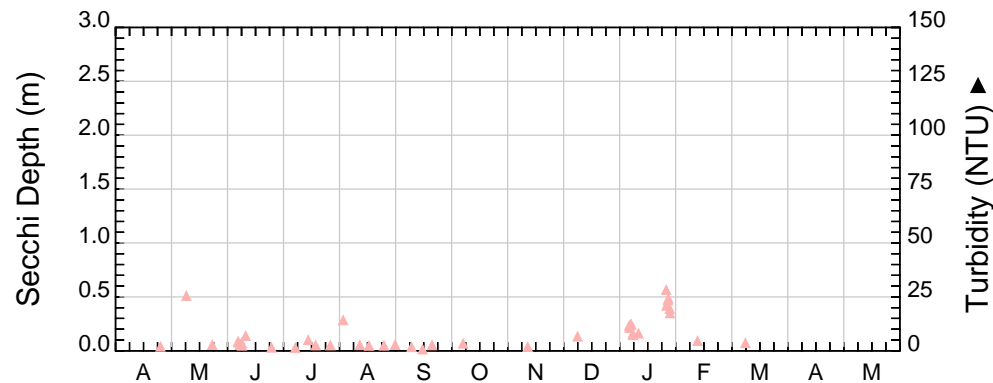
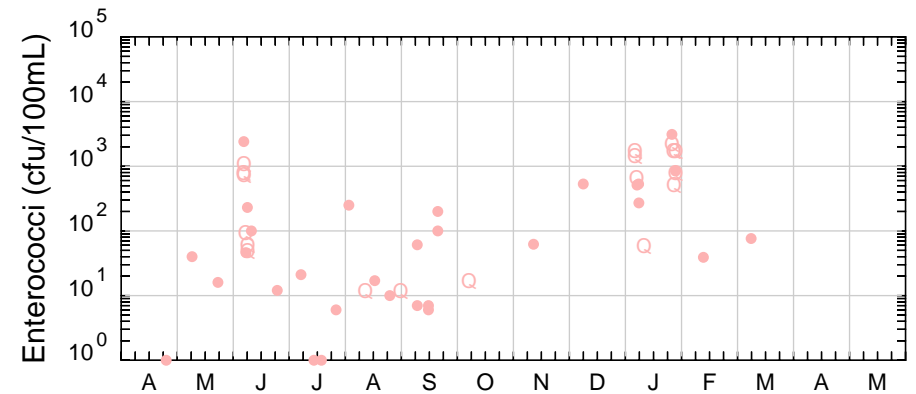
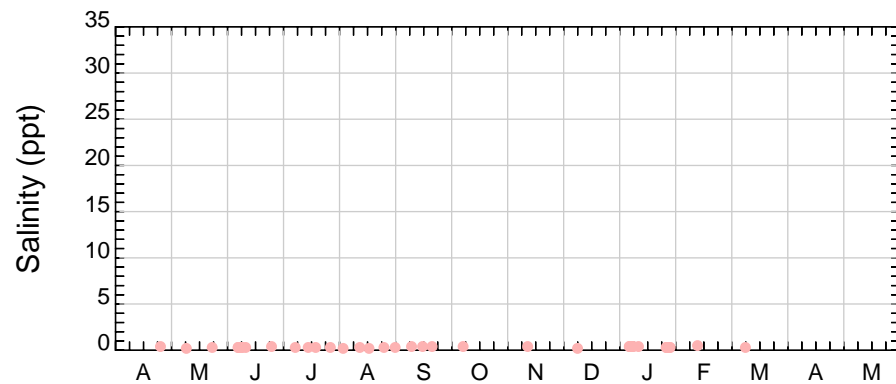
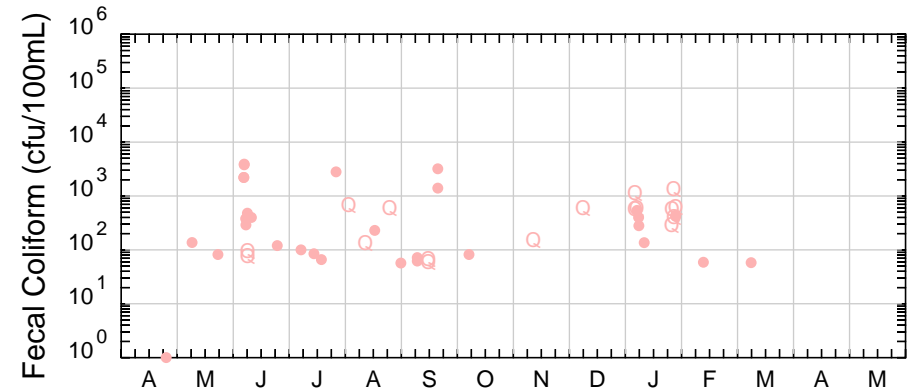
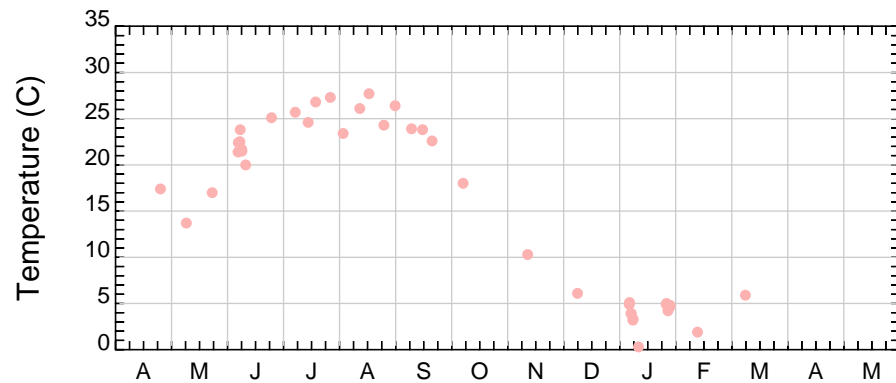
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG
○ Q See page 1 of attachment
for notes on qualifiers

Time (Month)
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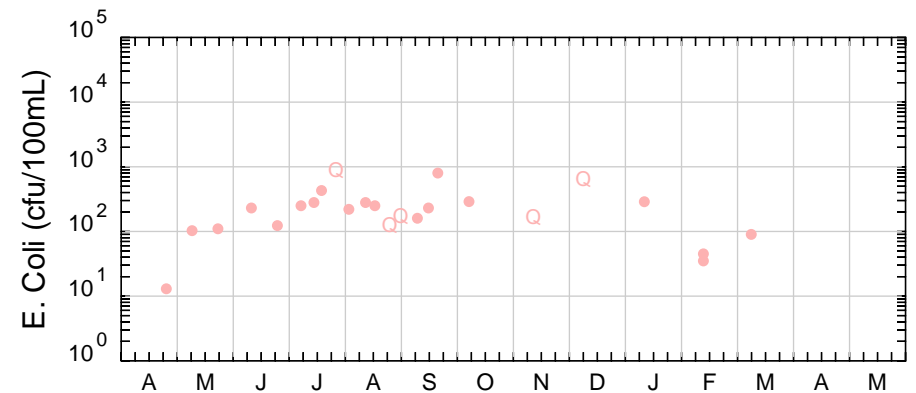
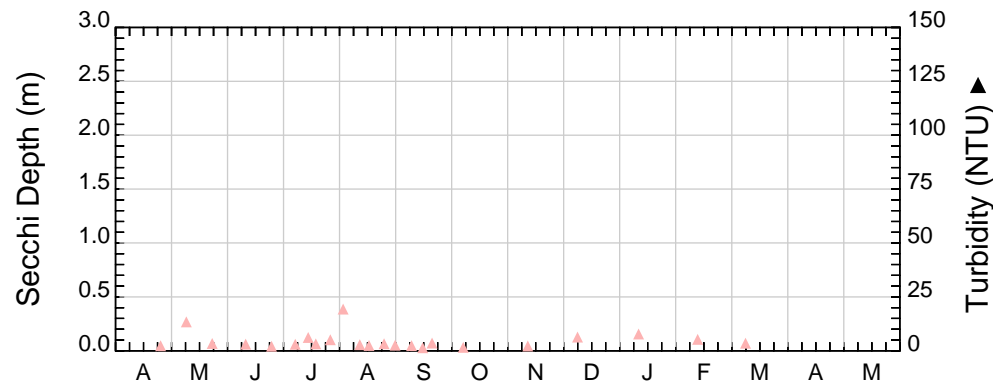
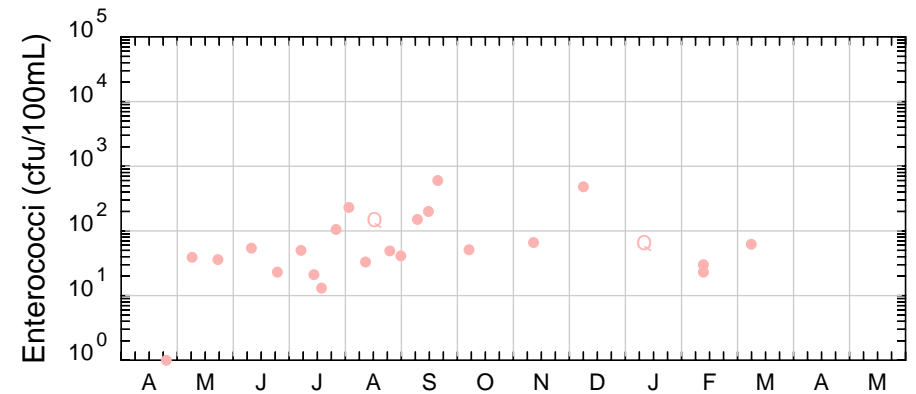
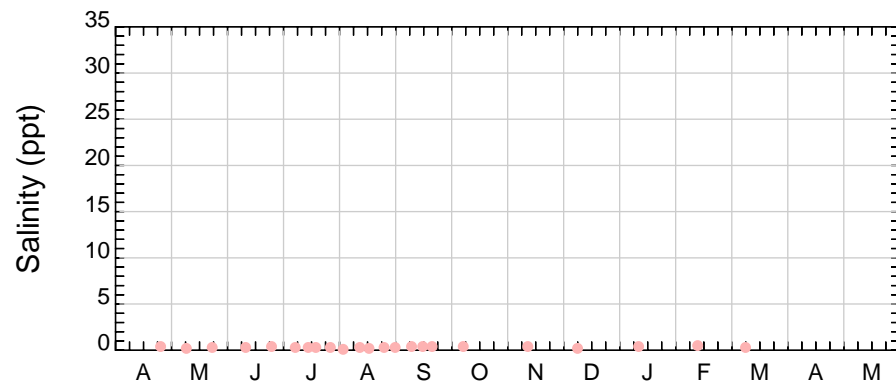
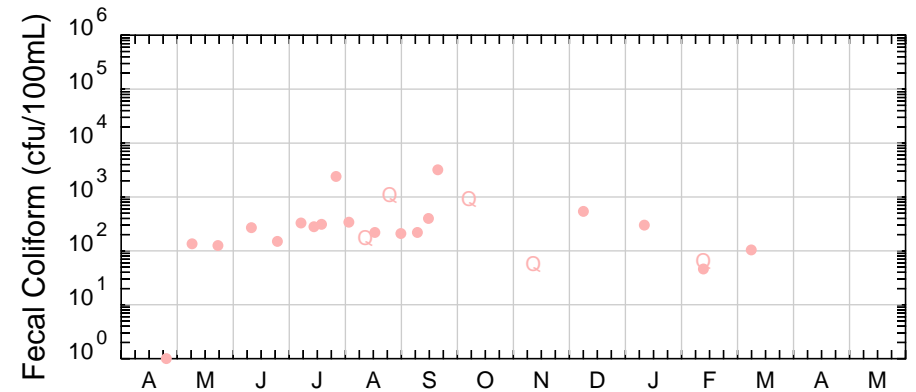
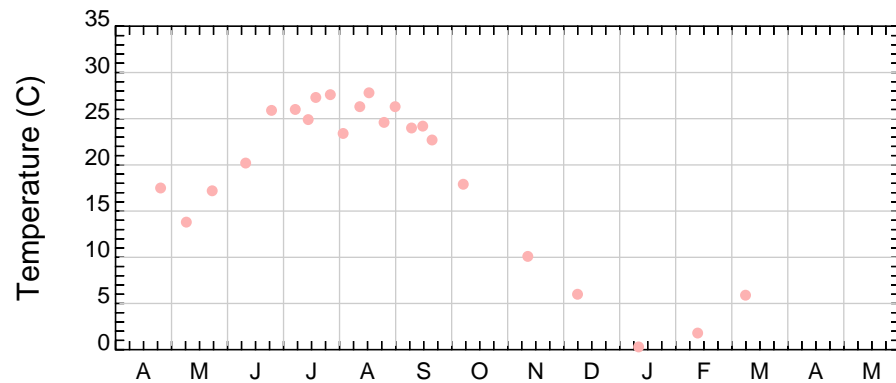
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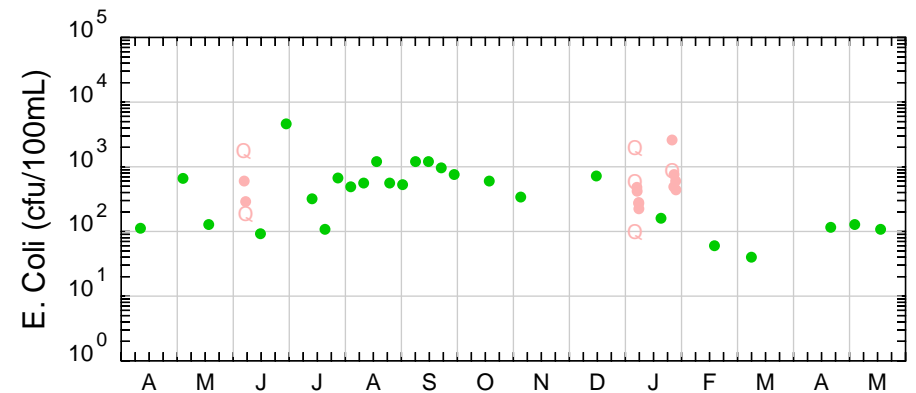
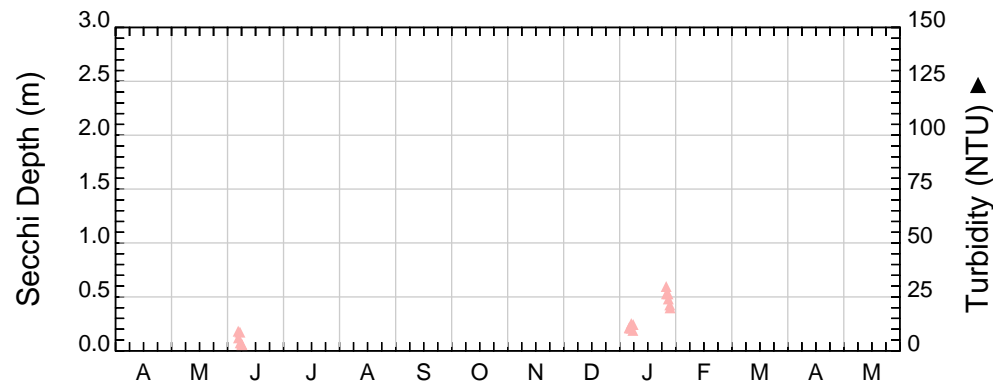
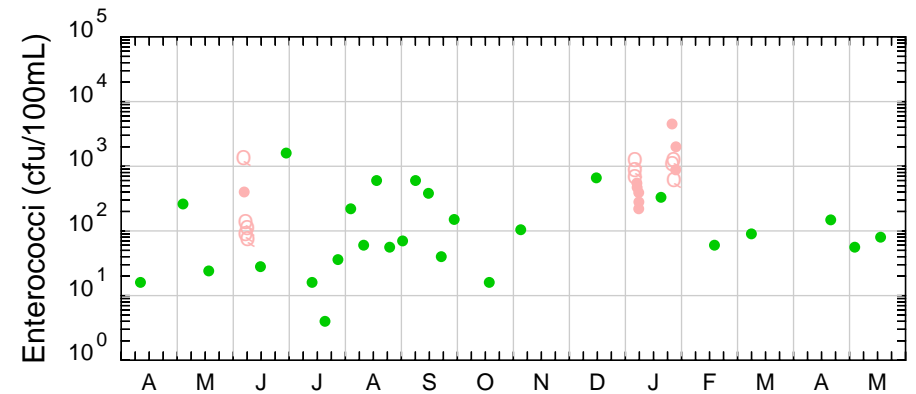
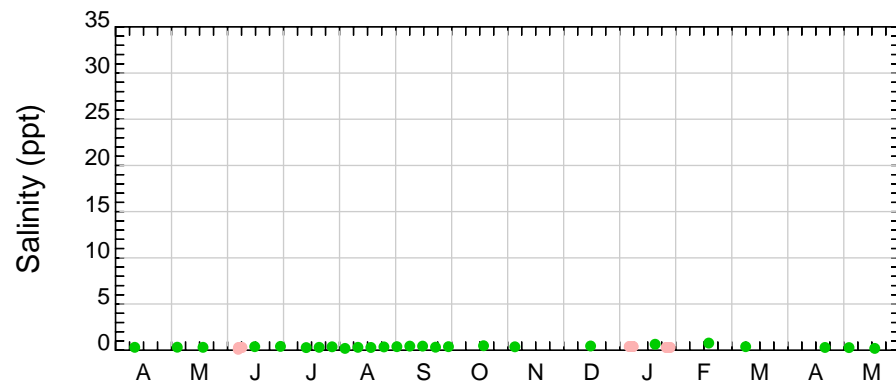
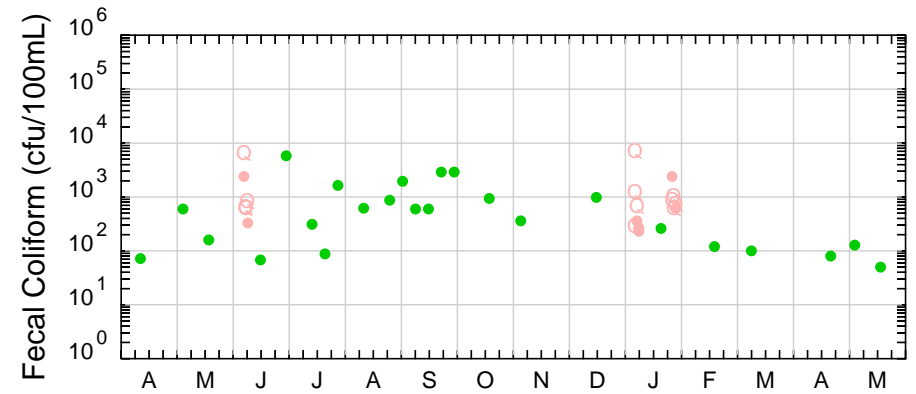
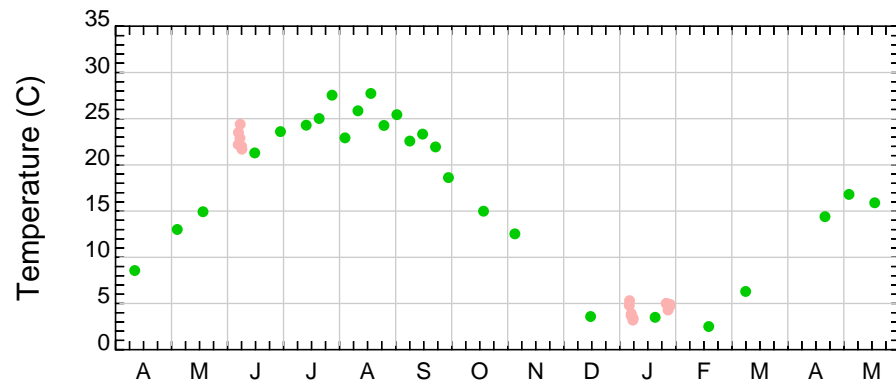
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for notes on qualifiers

Time (Month)
2016 / 2017

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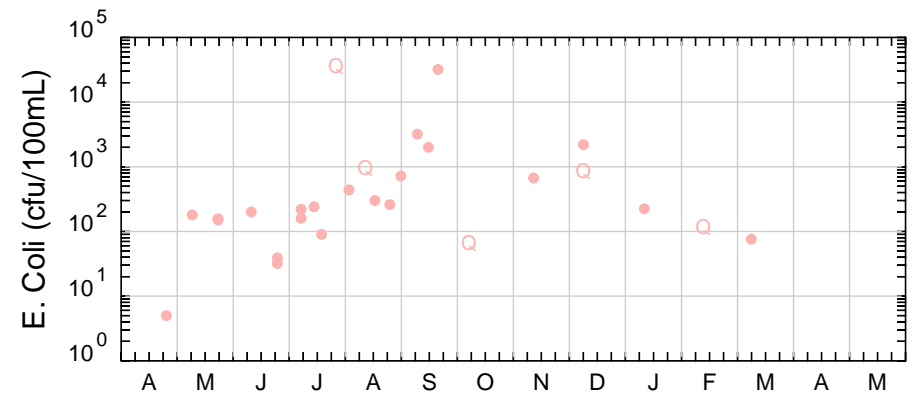
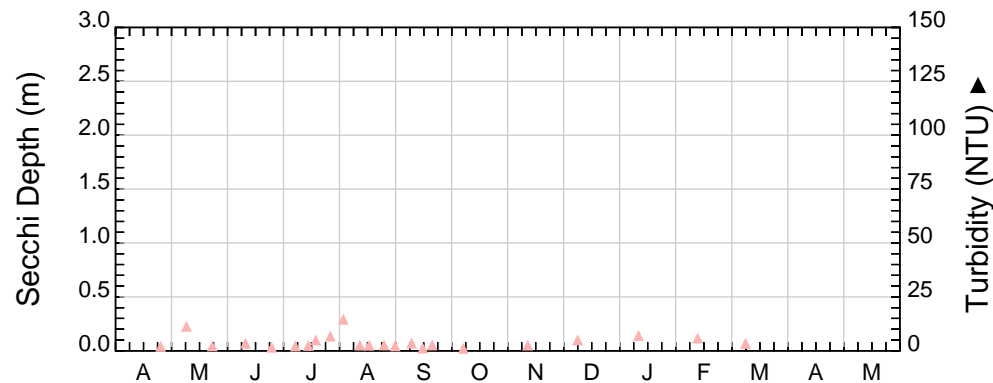
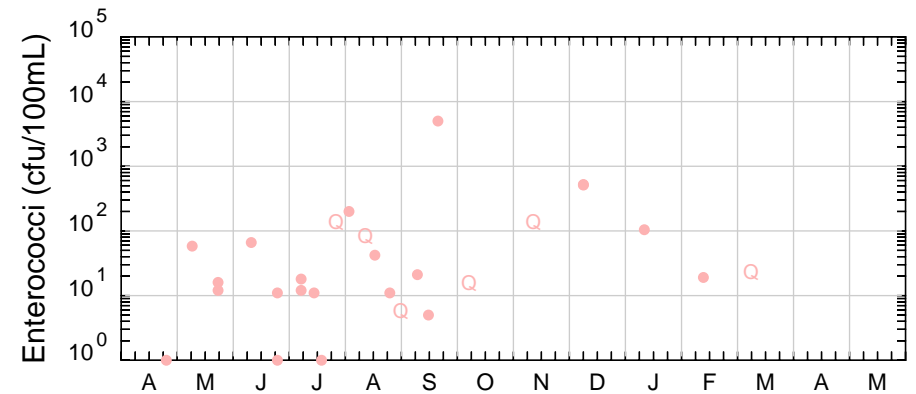
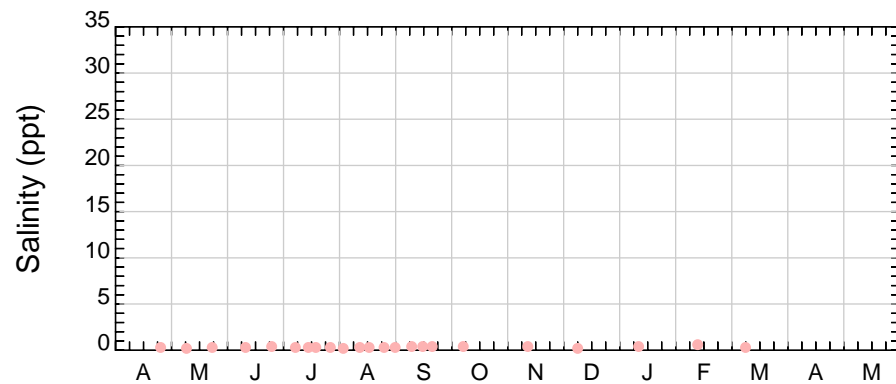
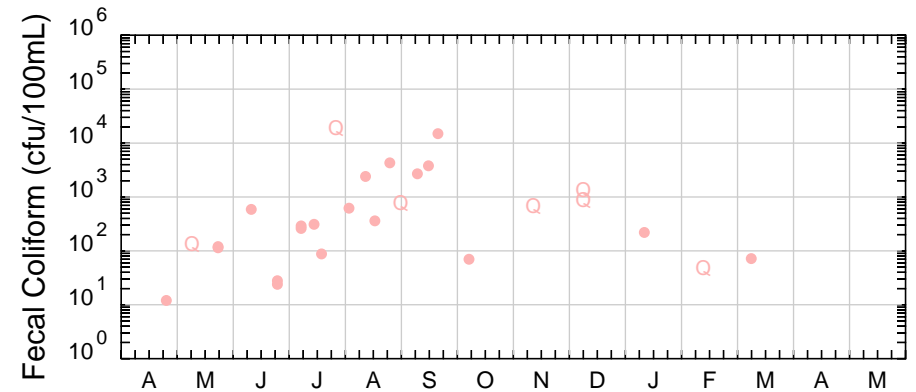
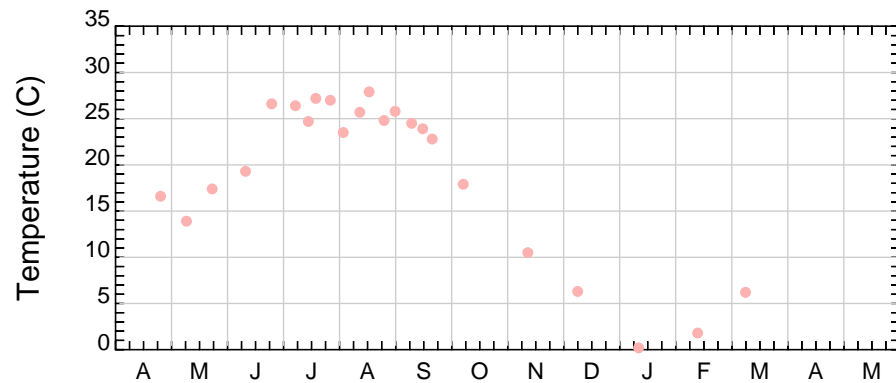
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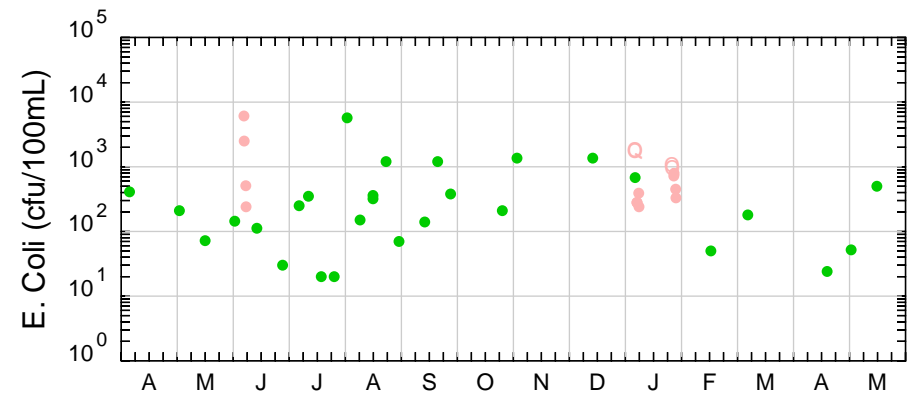
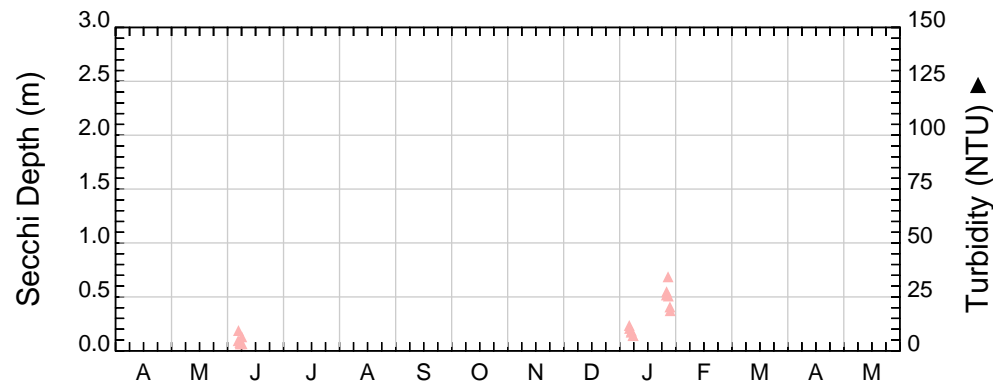
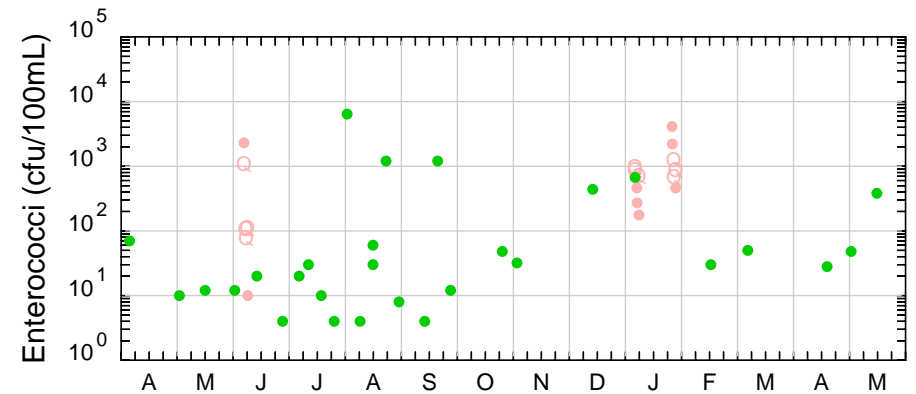
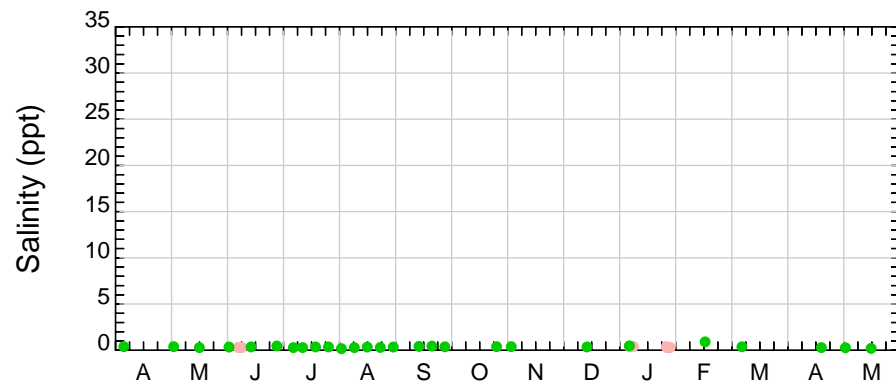
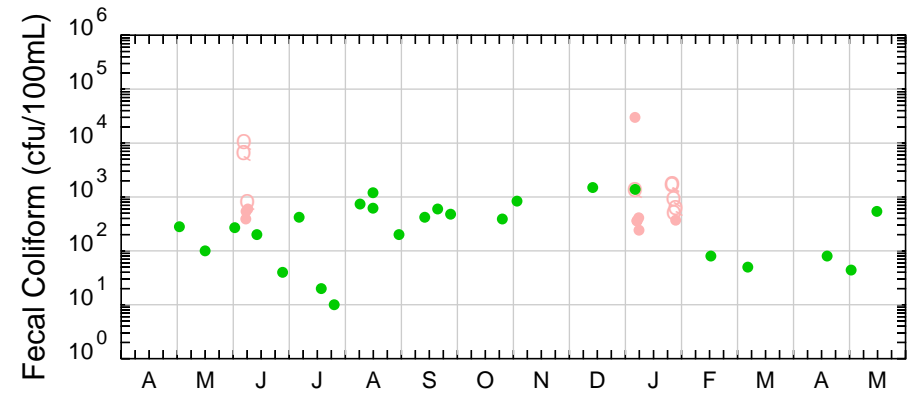
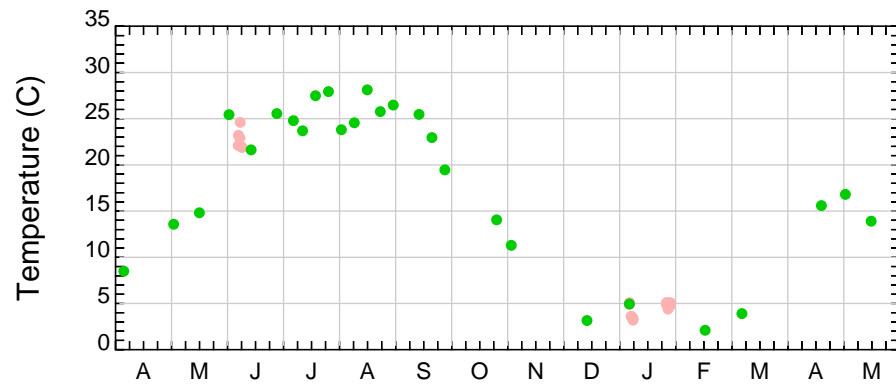
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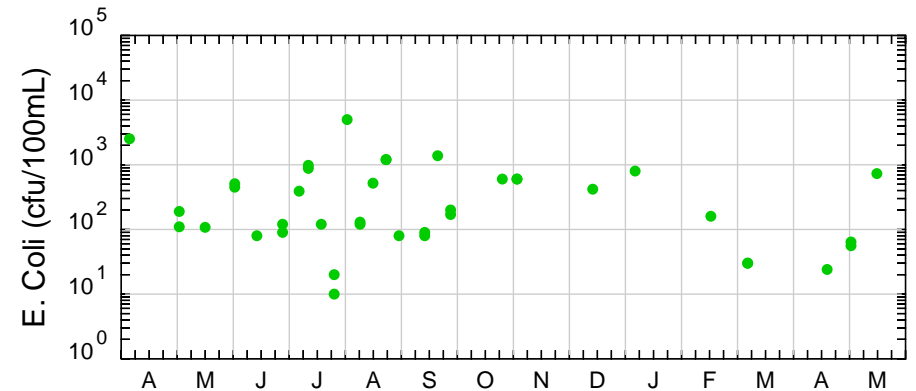
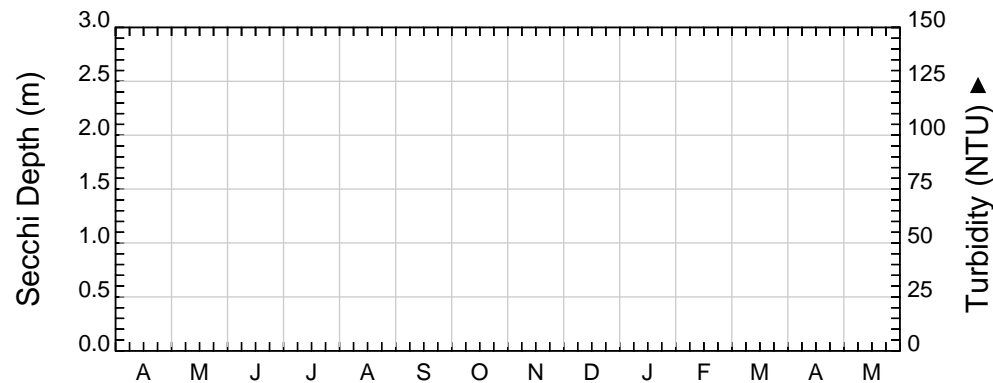
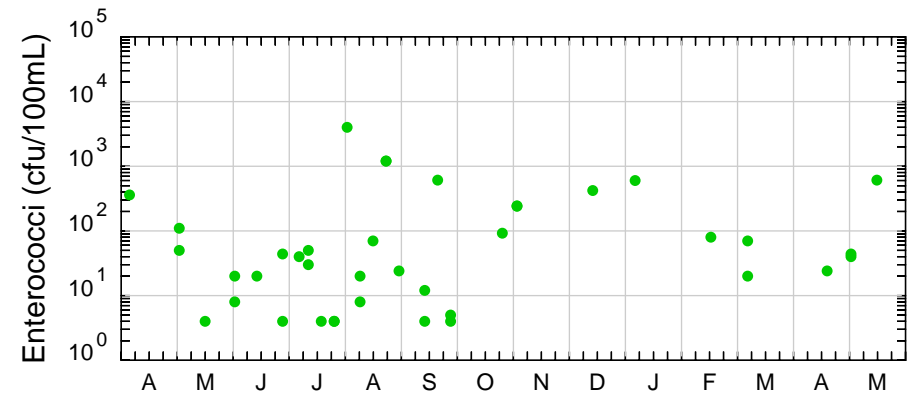
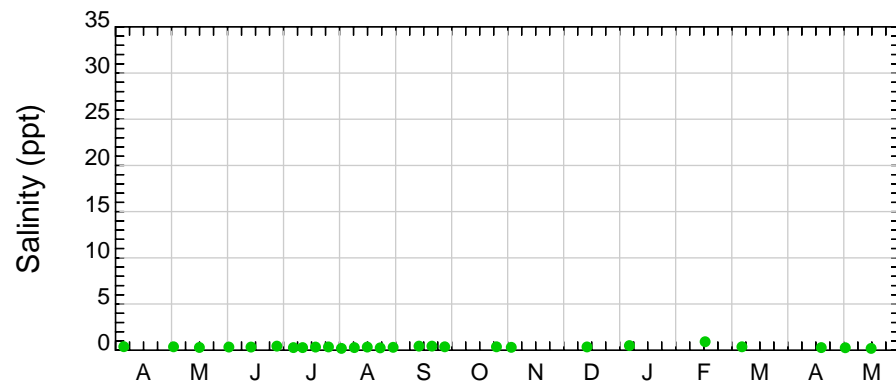
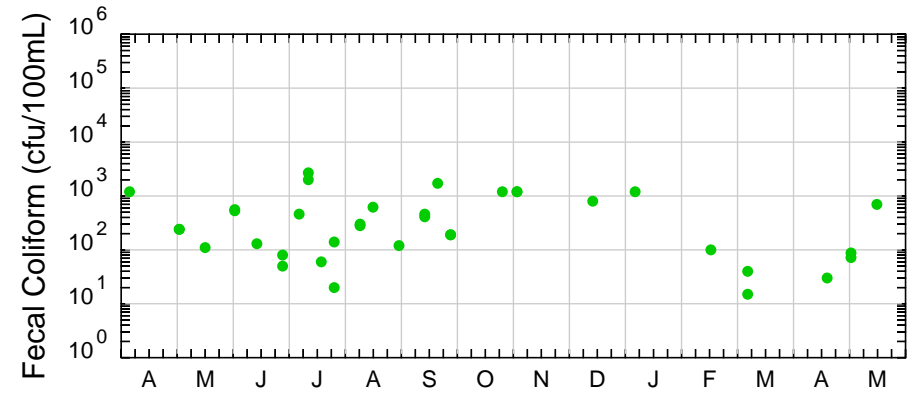
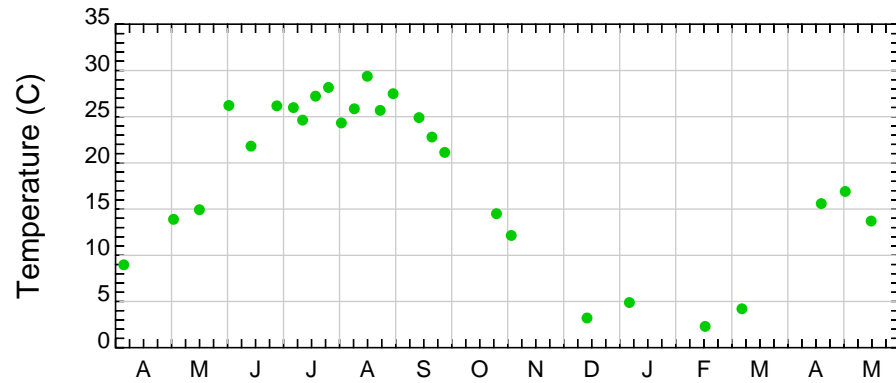
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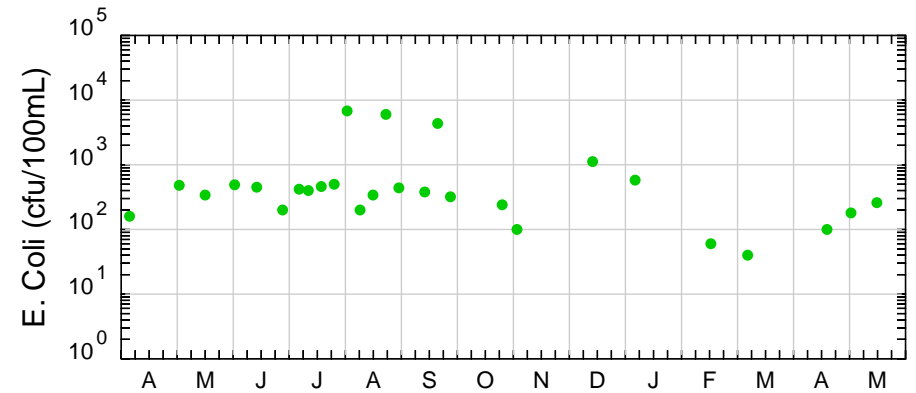
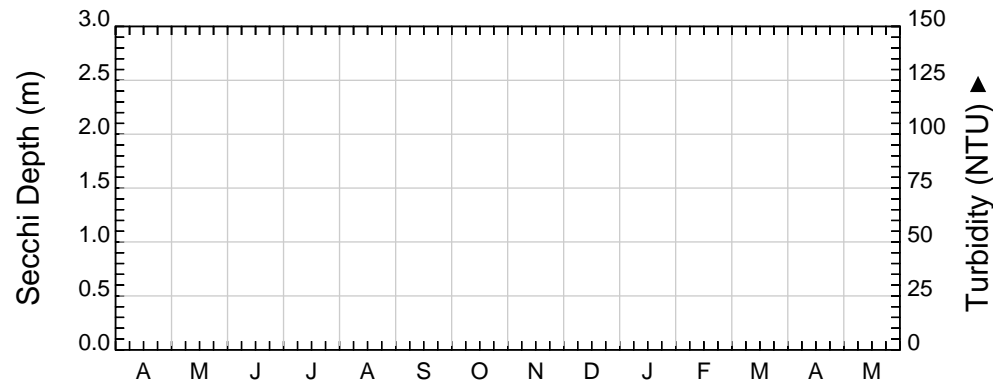
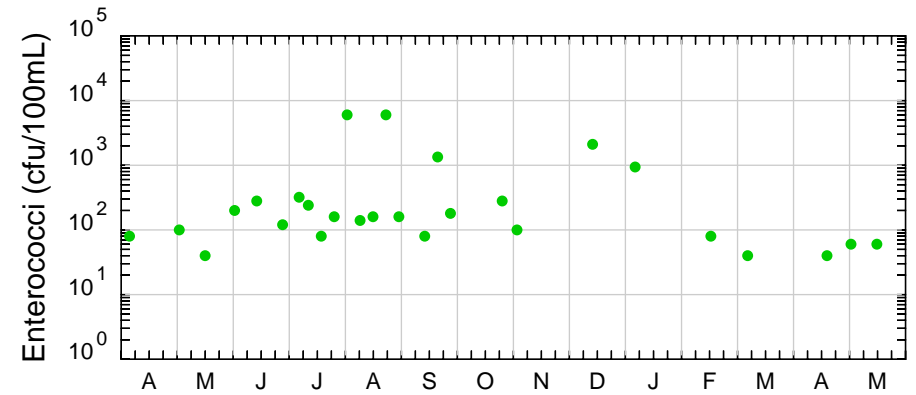
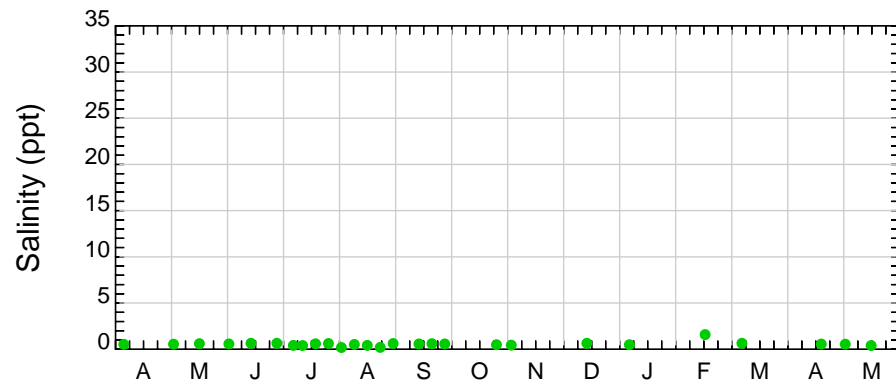
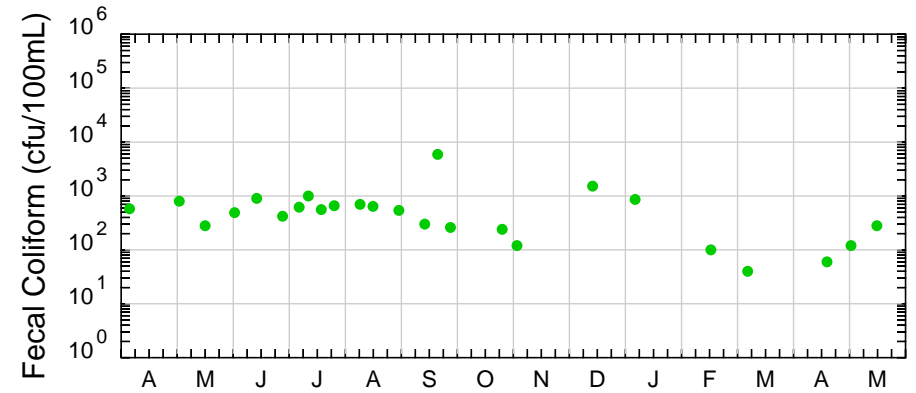
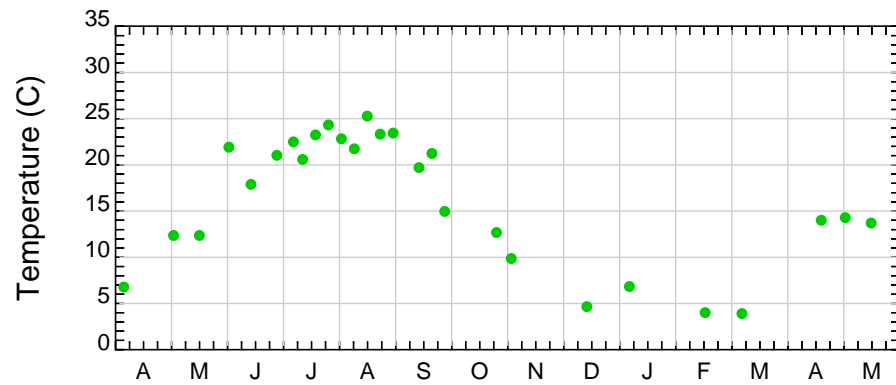
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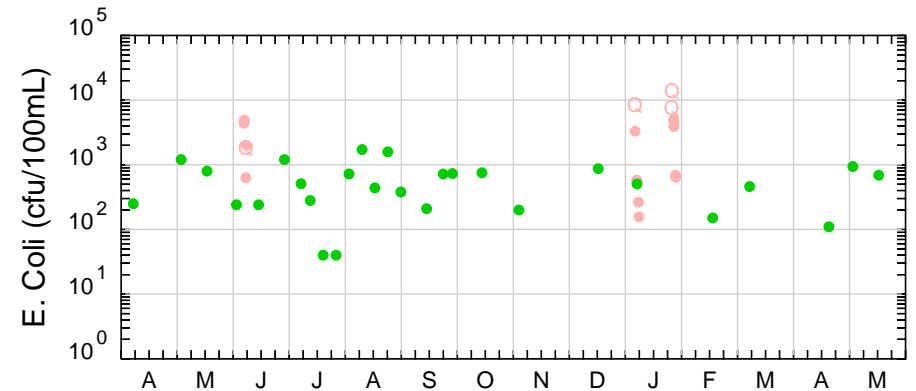
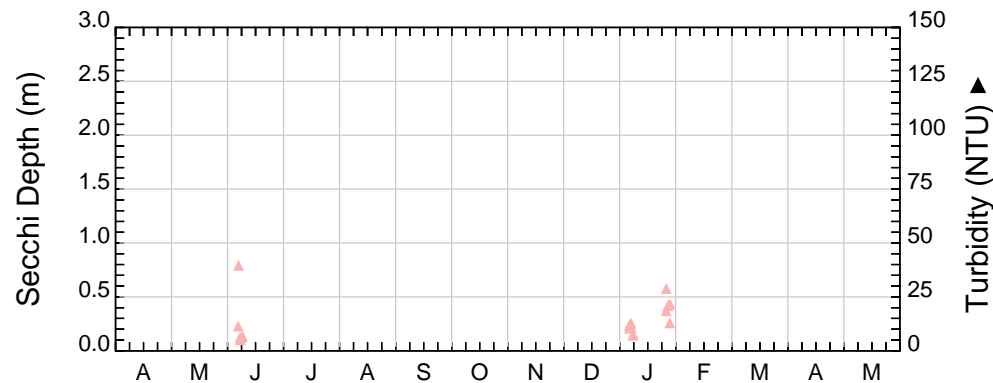
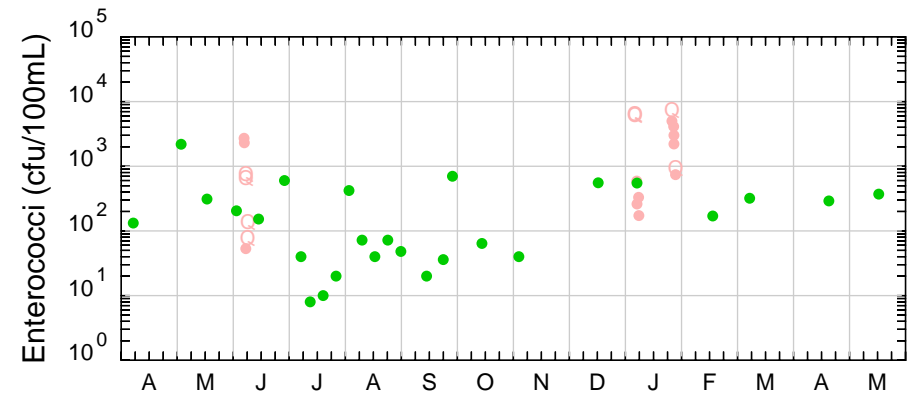
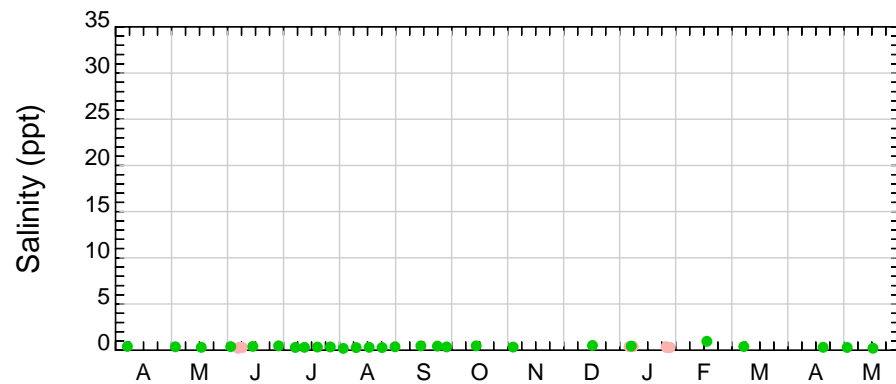
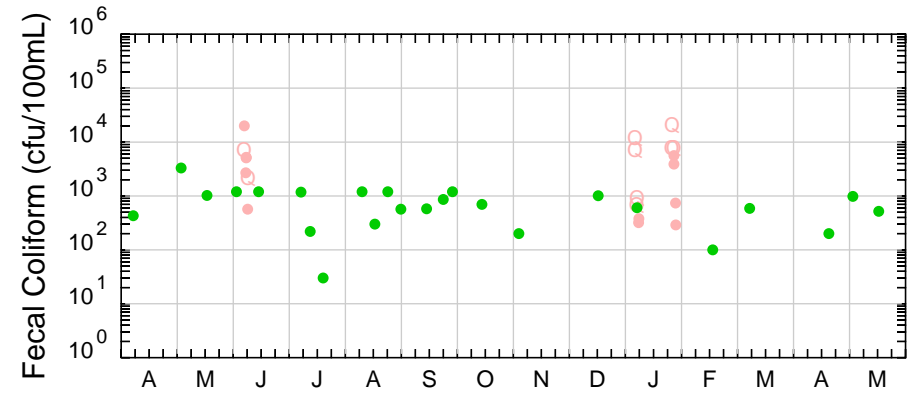
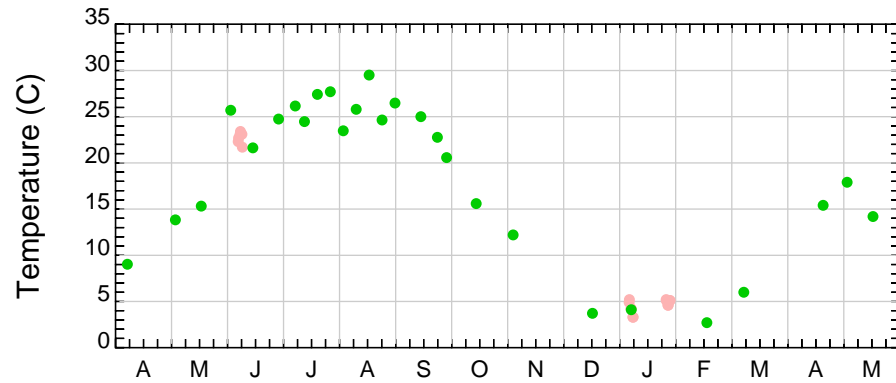
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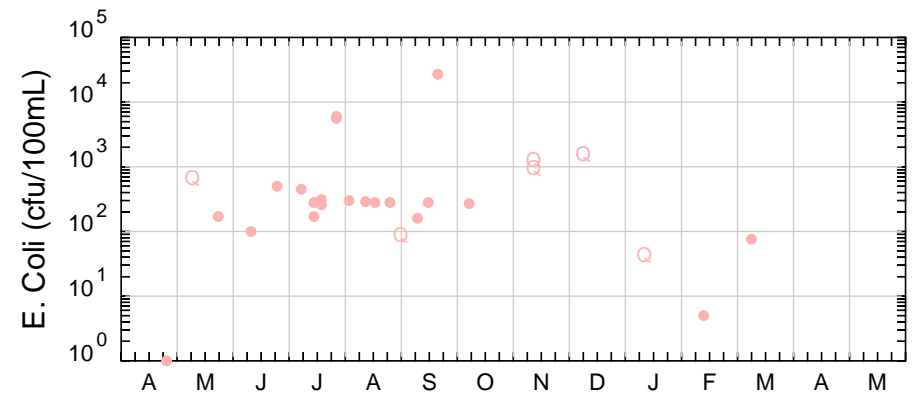
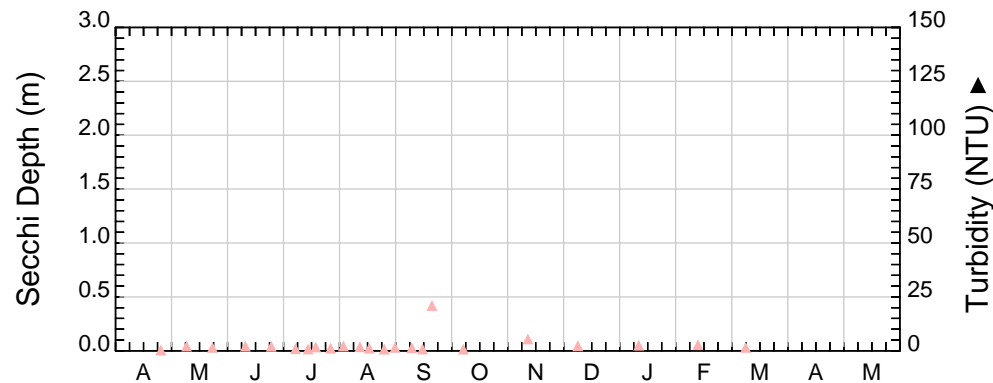
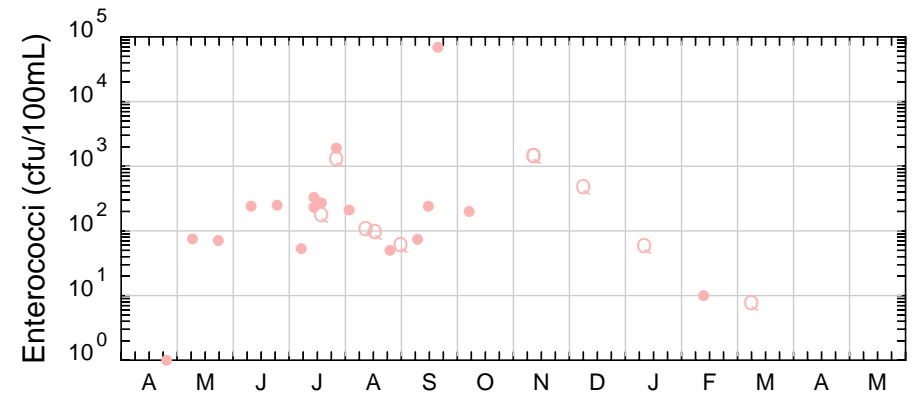
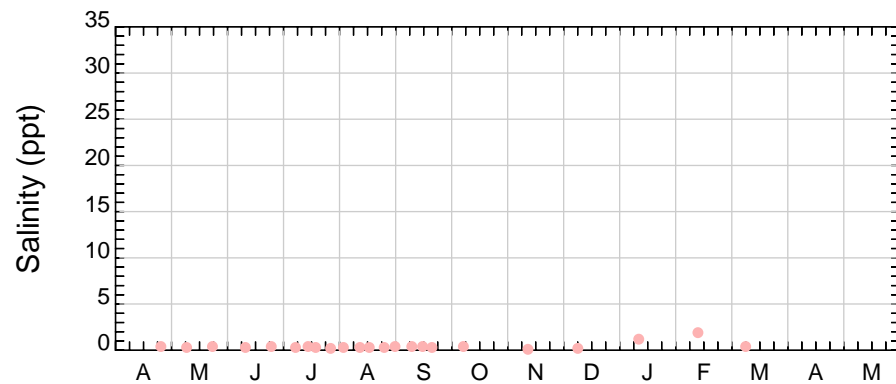
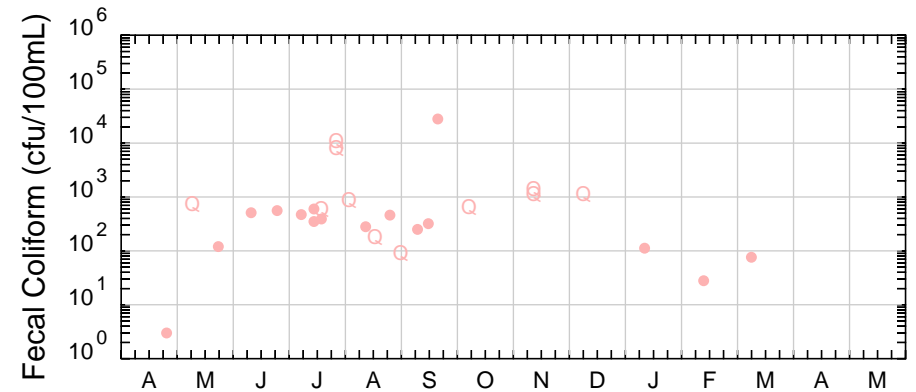
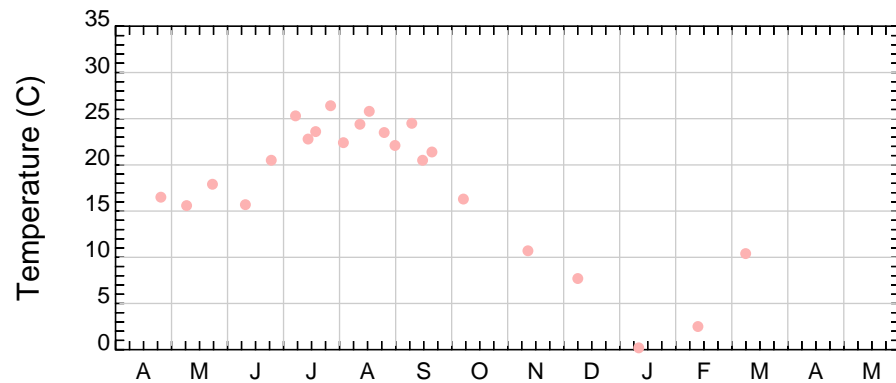
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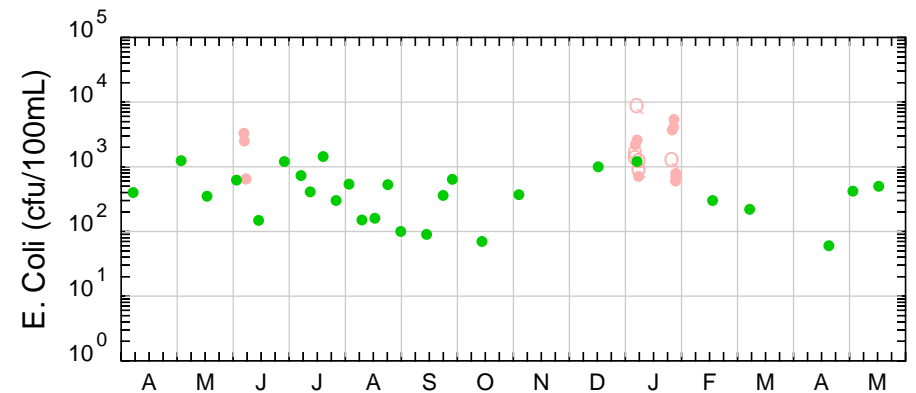
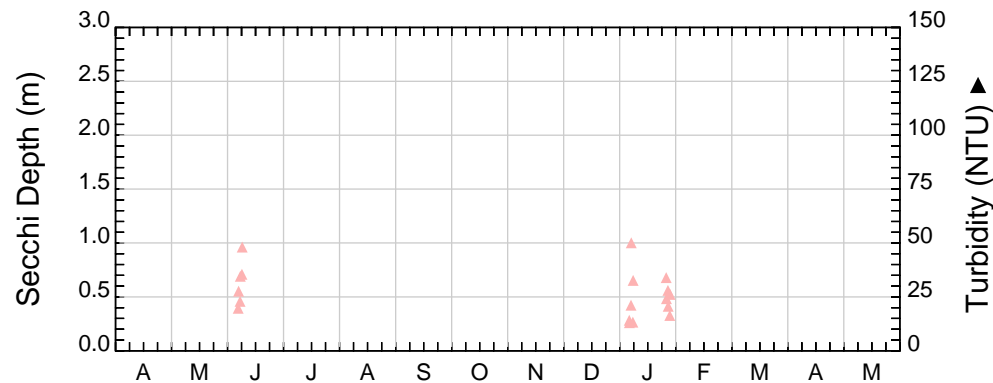
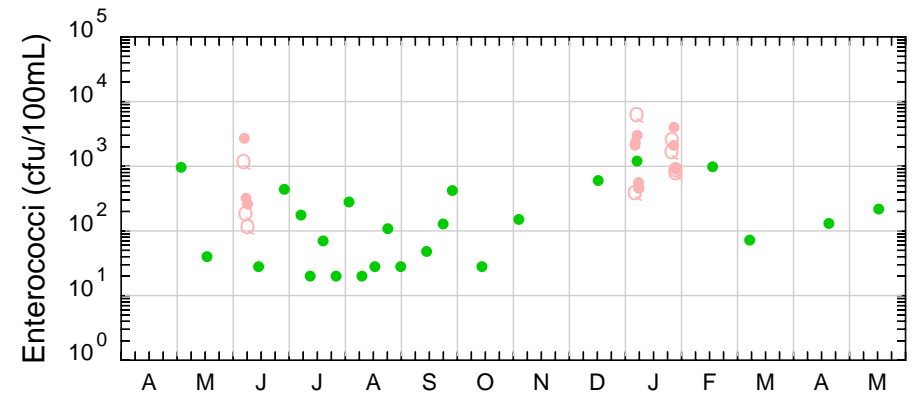
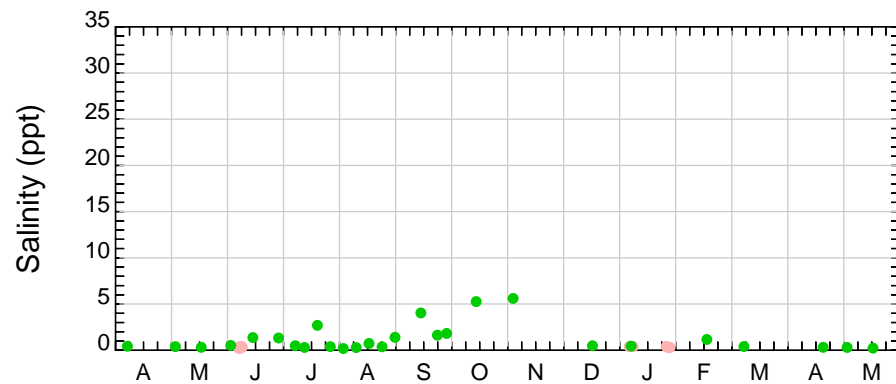
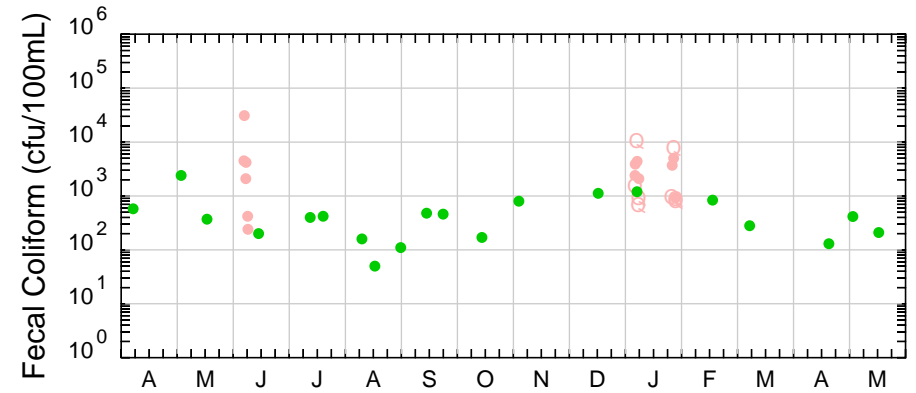
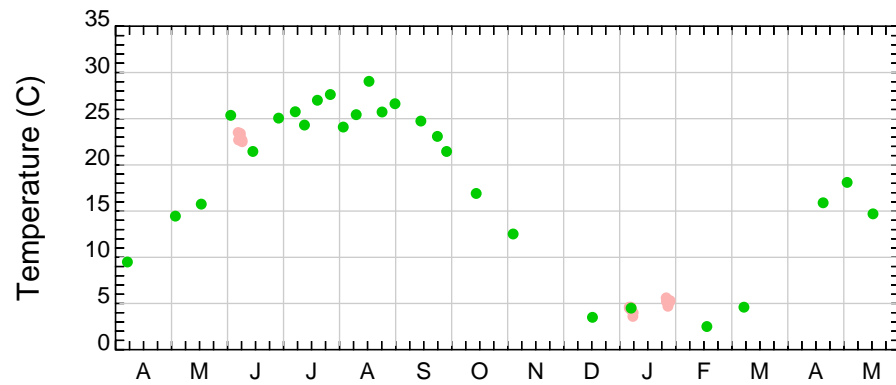
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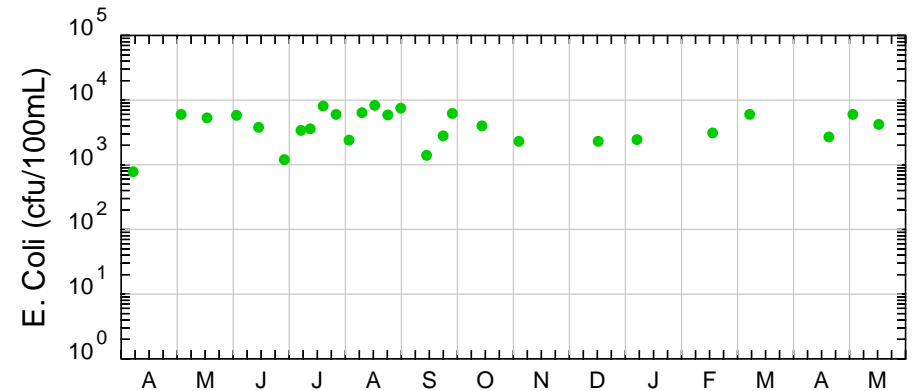
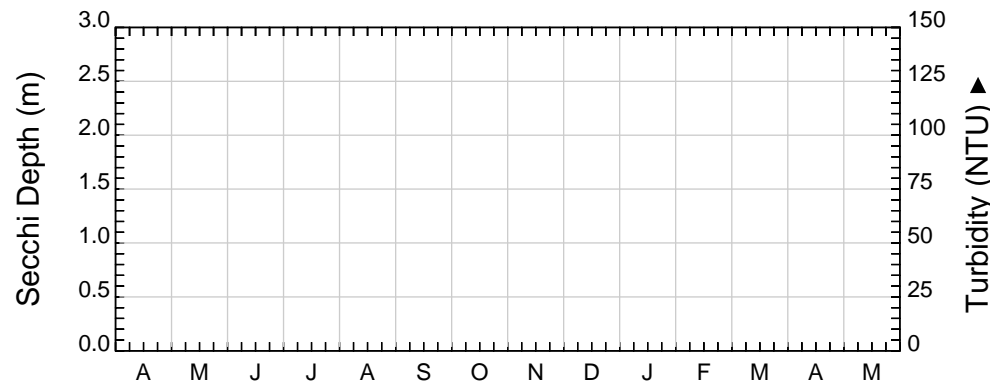
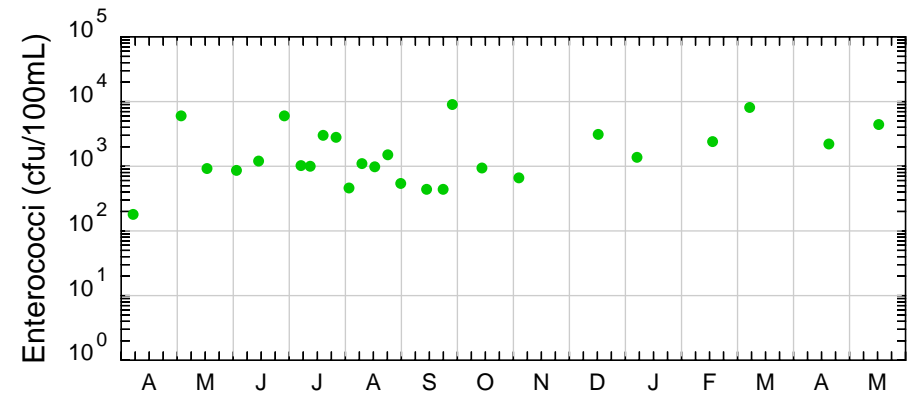
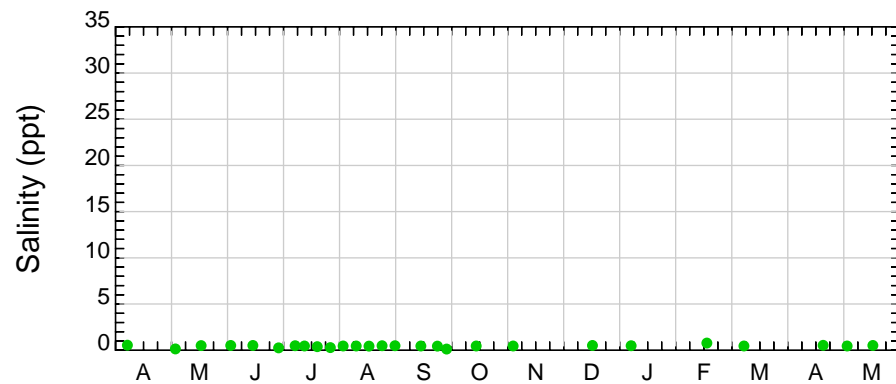
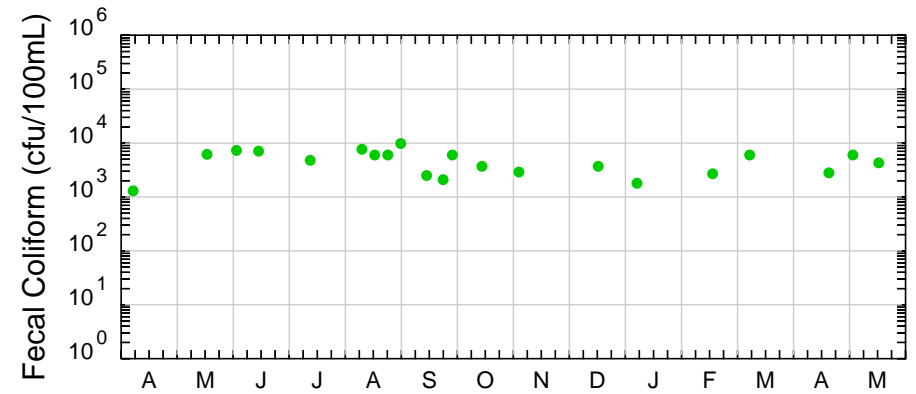
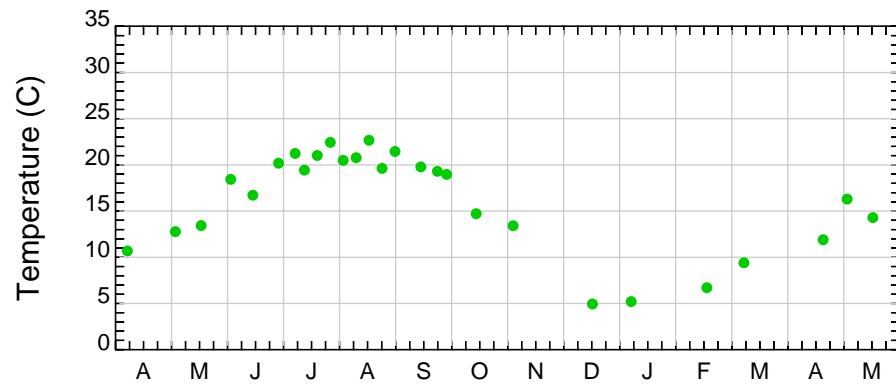
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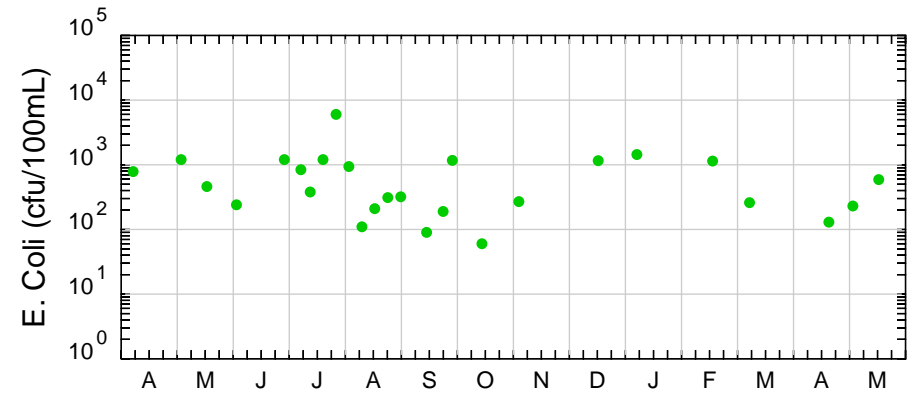
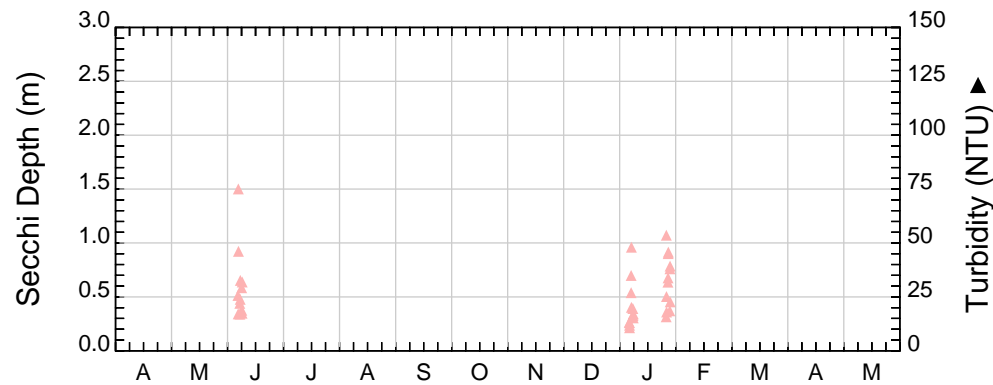
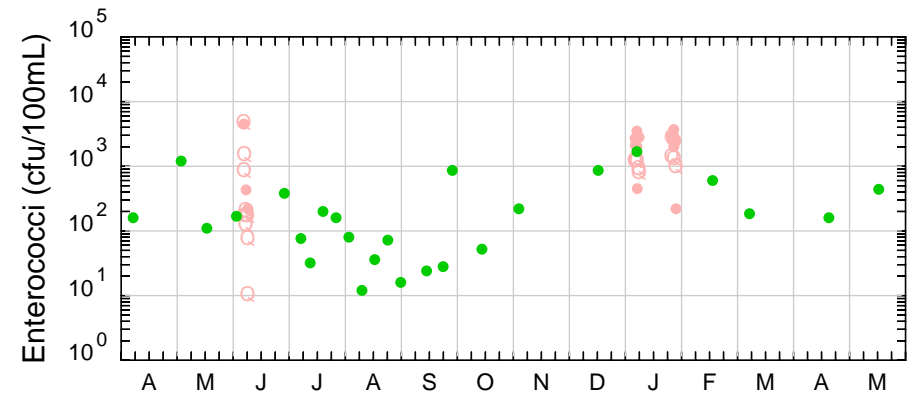
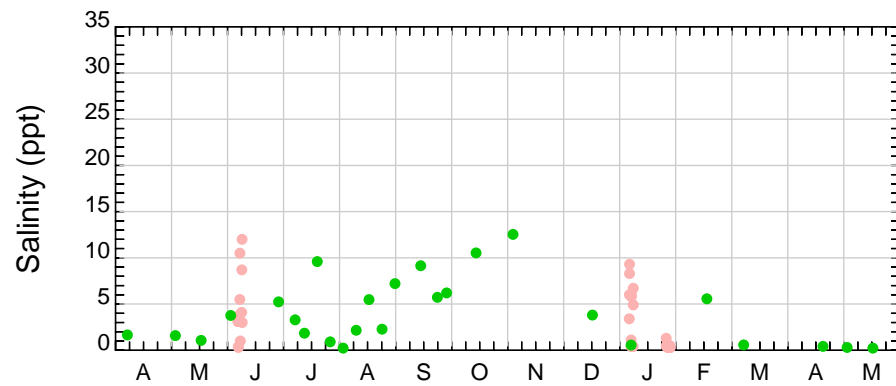
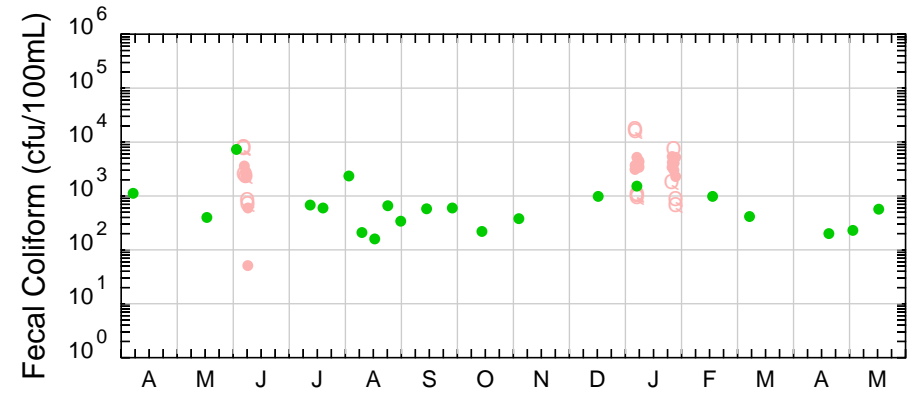
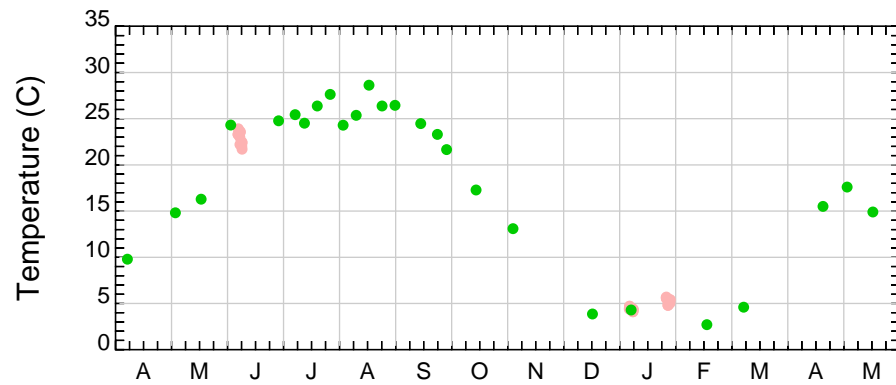


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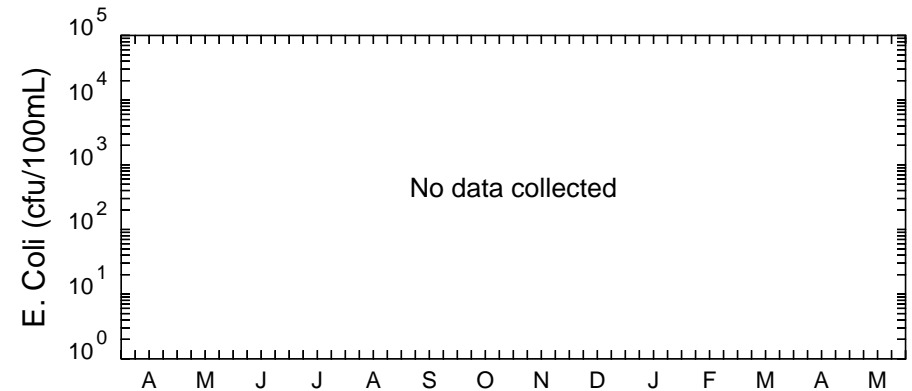
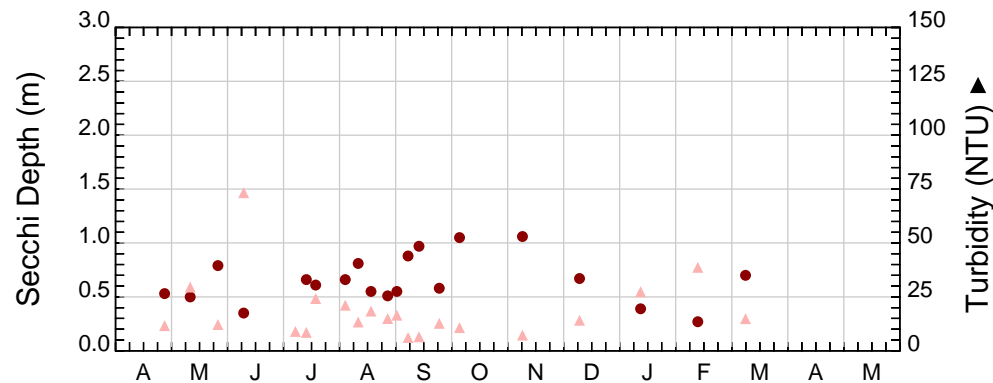
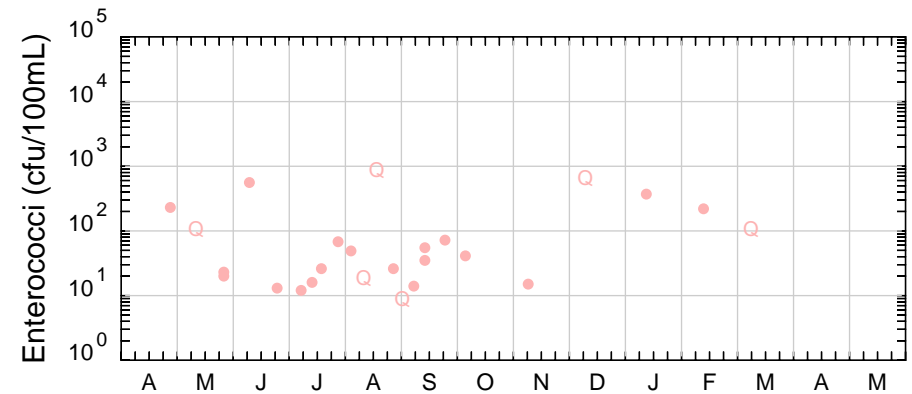
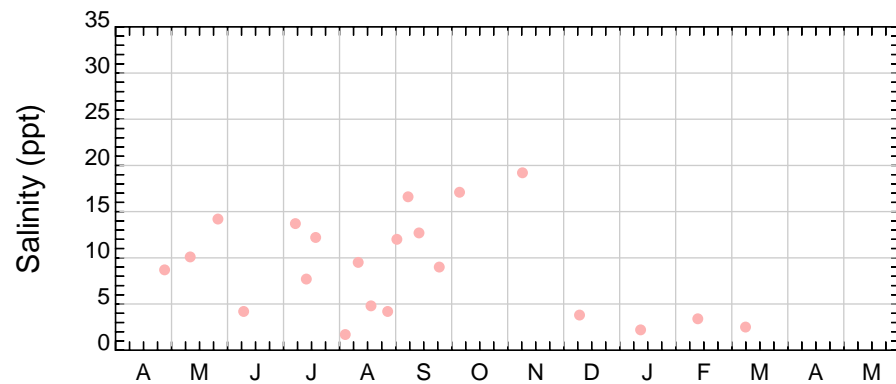
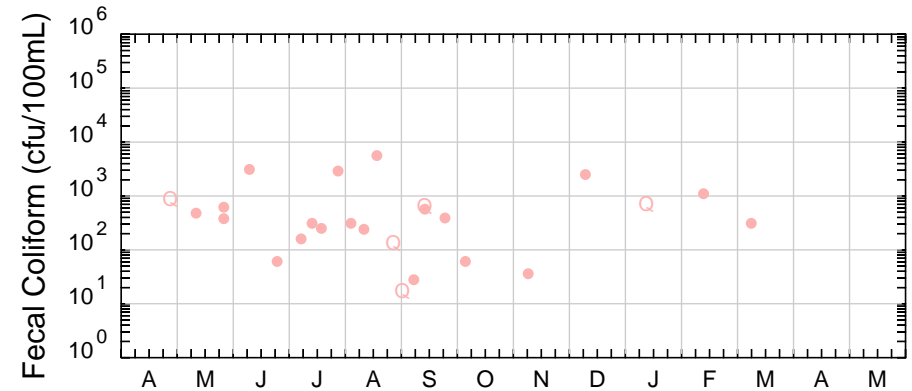
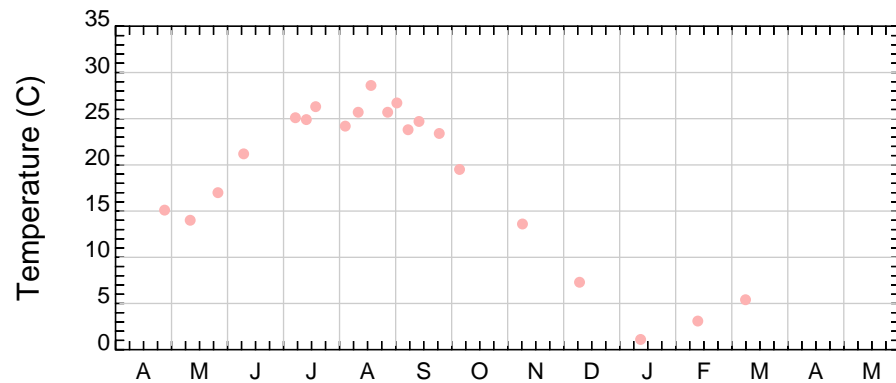
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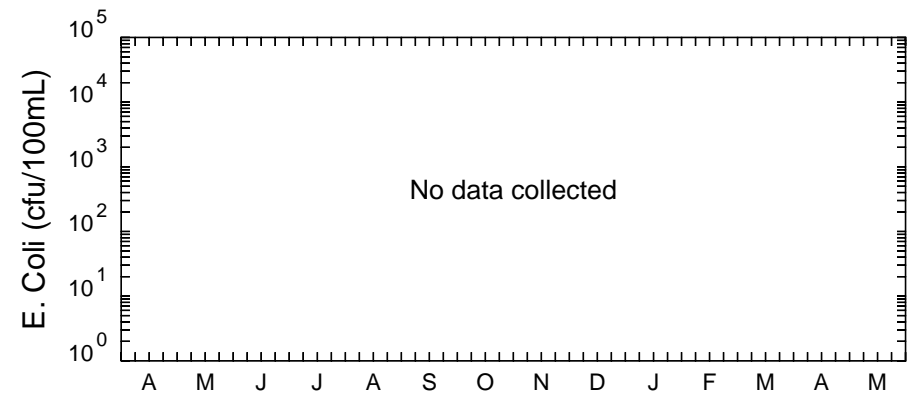
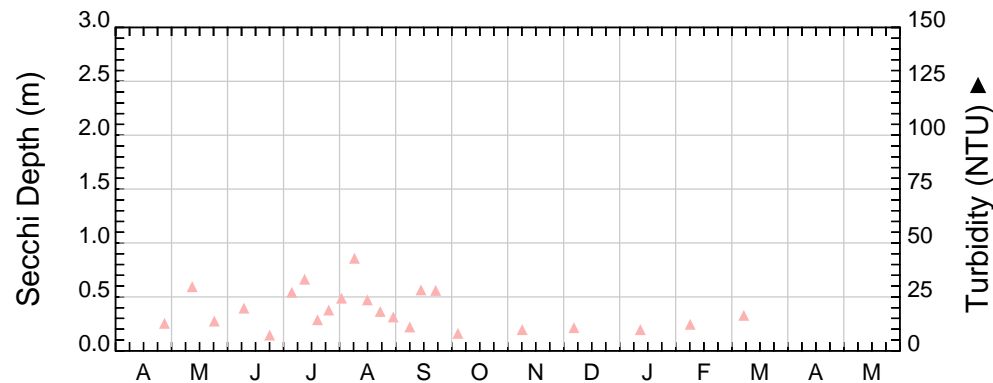
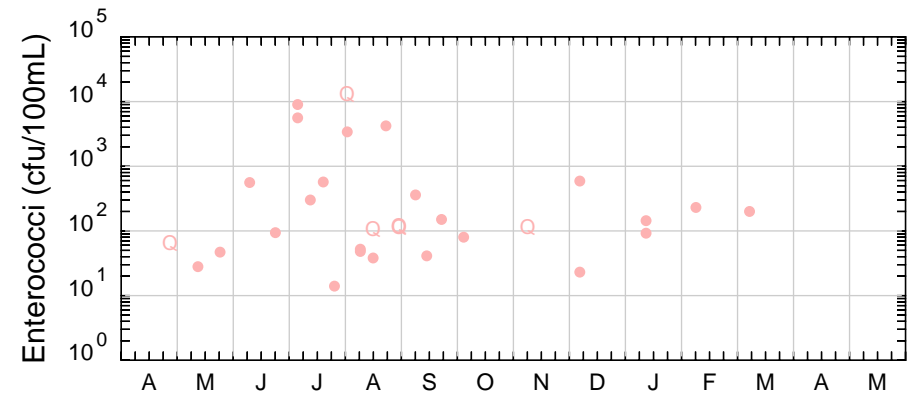
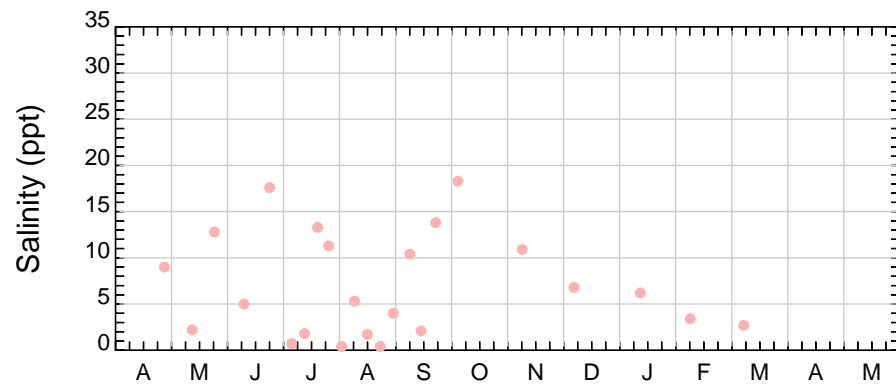
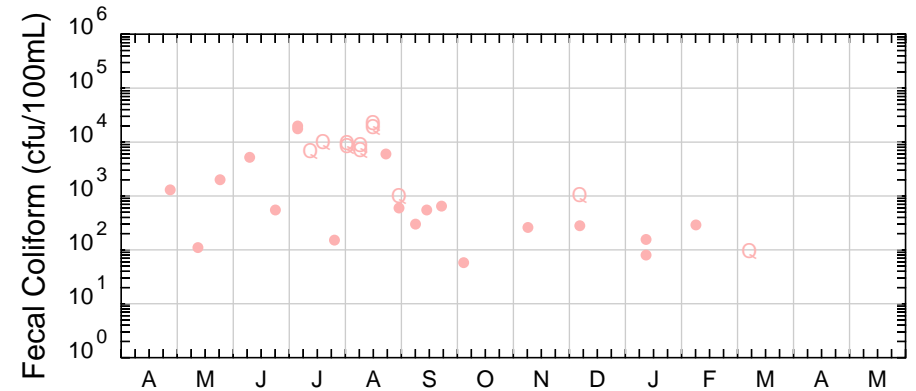
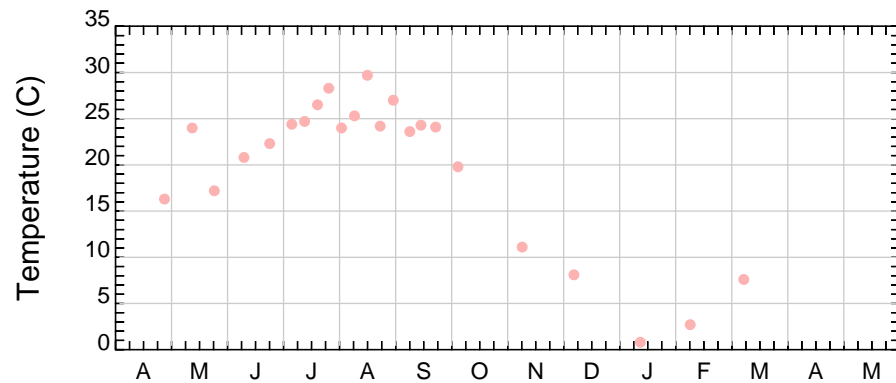
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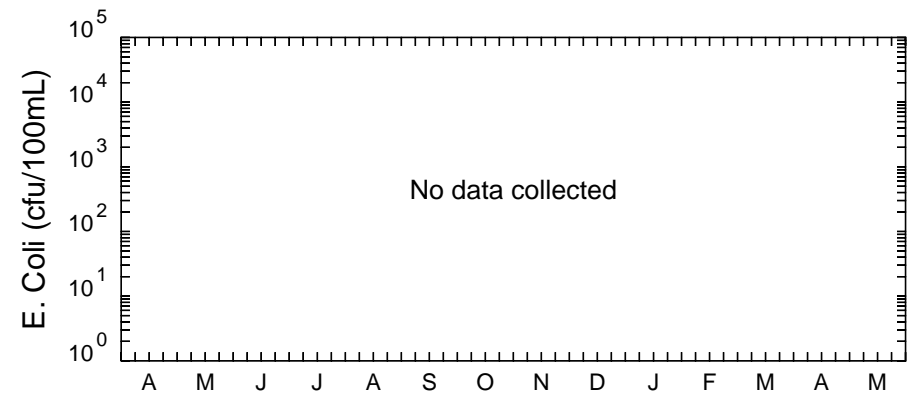
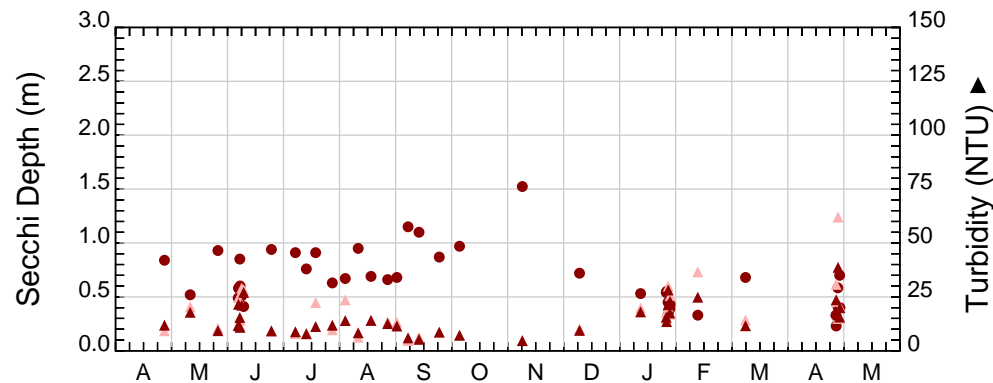
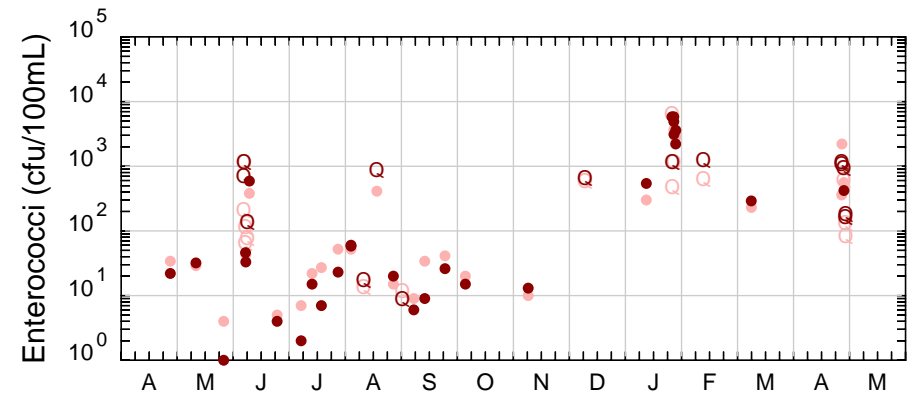
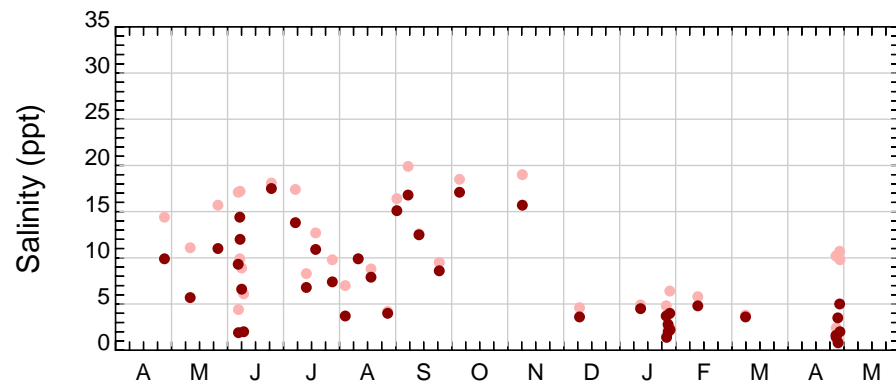
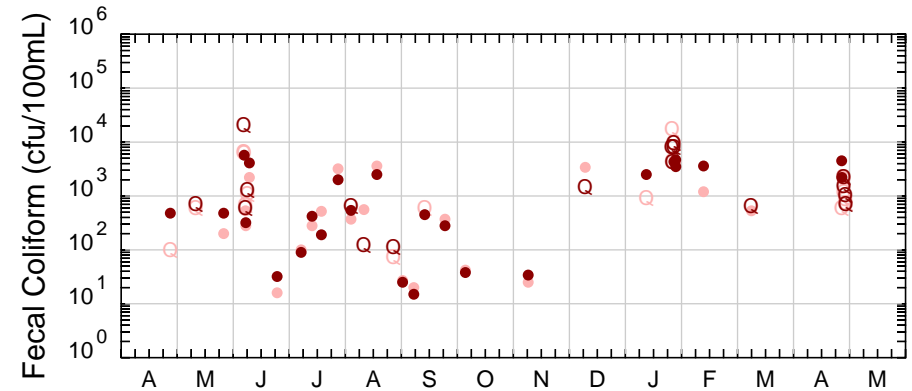
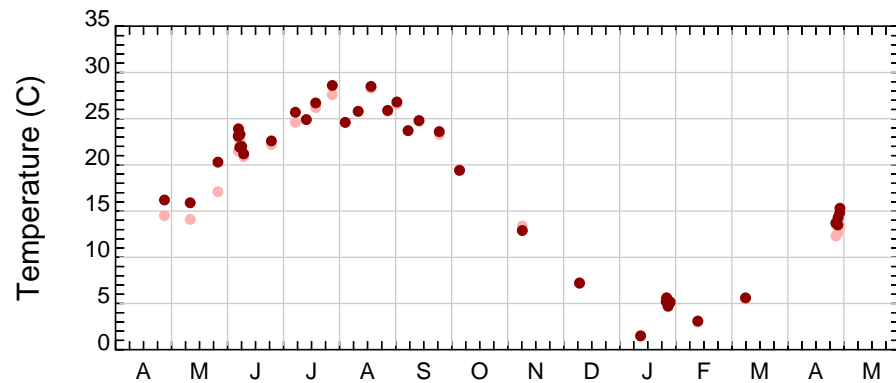
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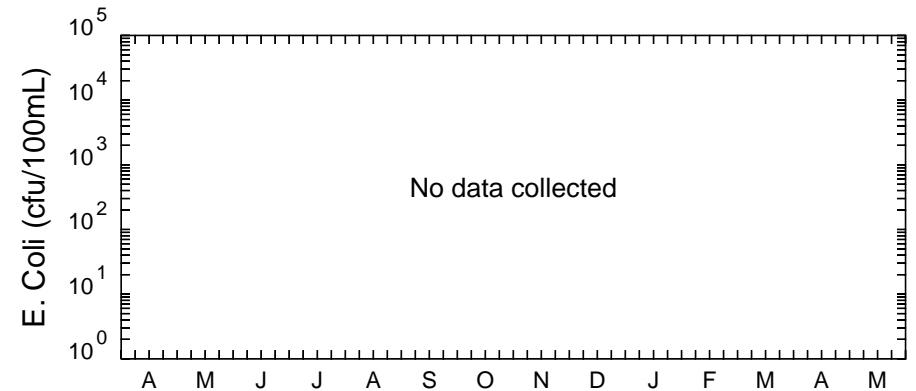
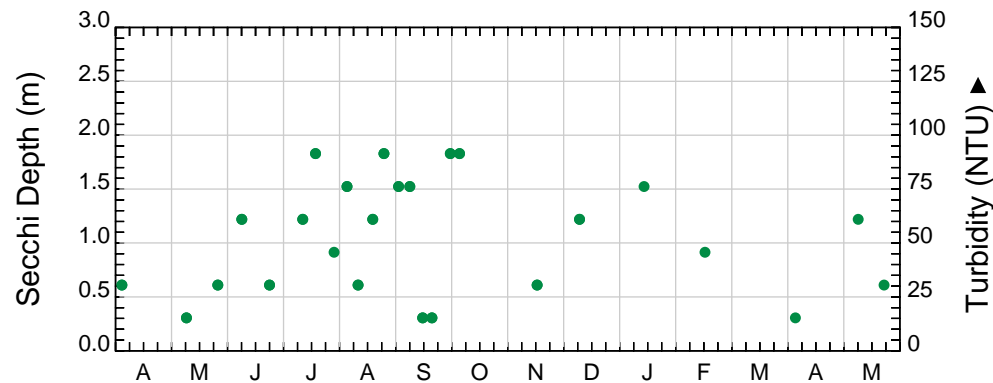
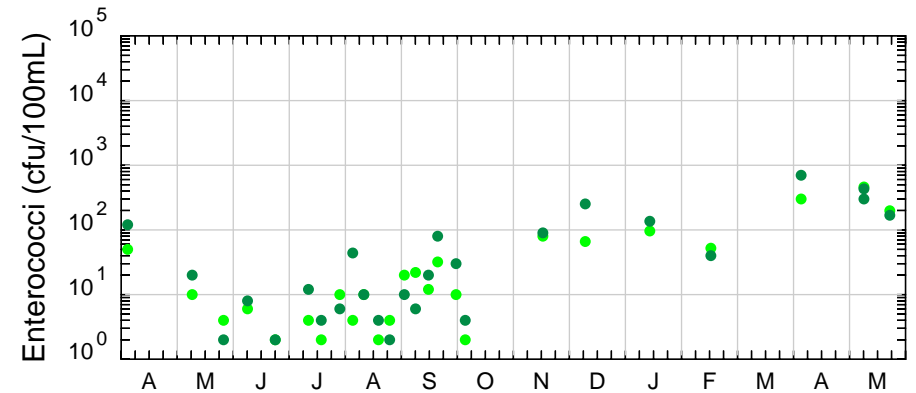
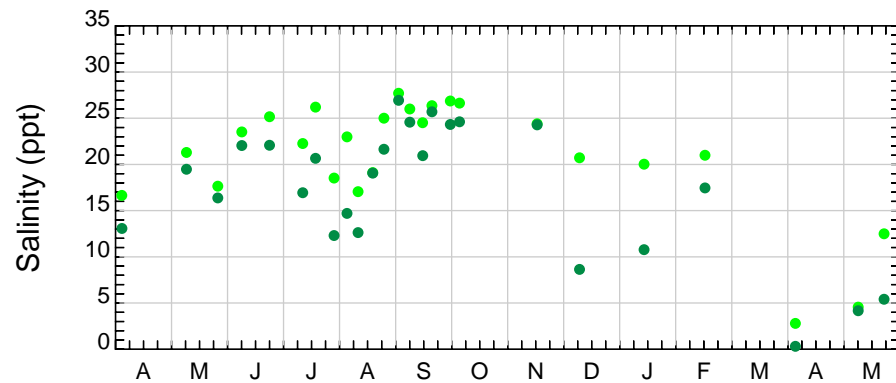
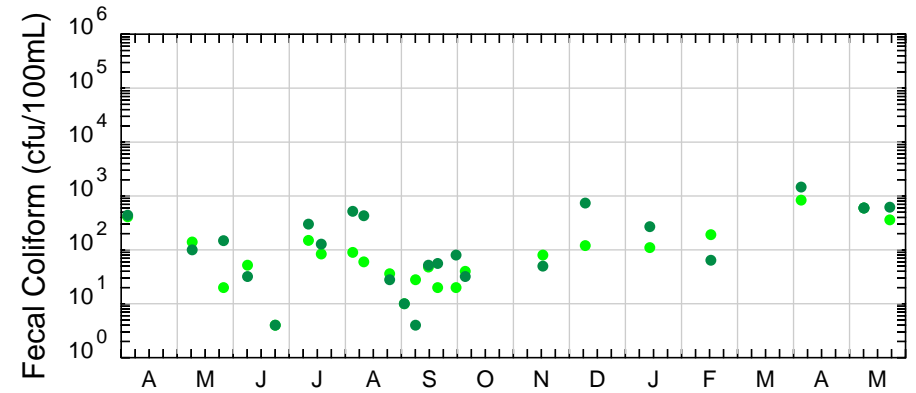
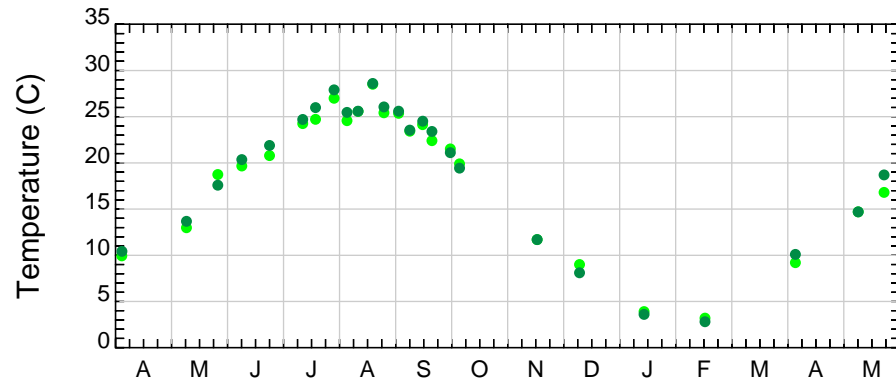


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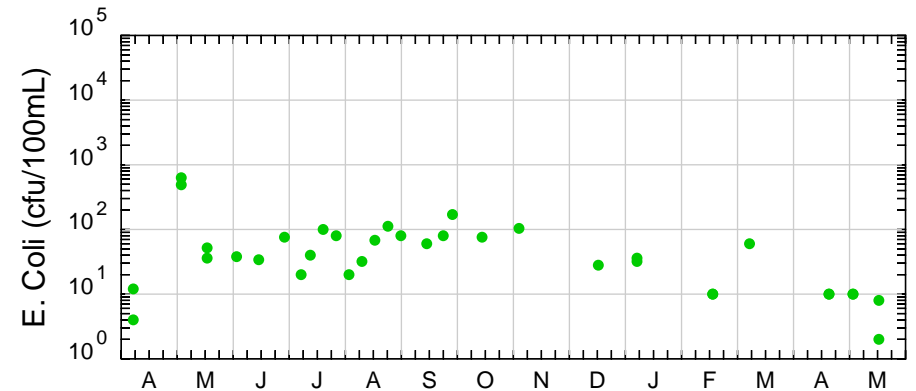
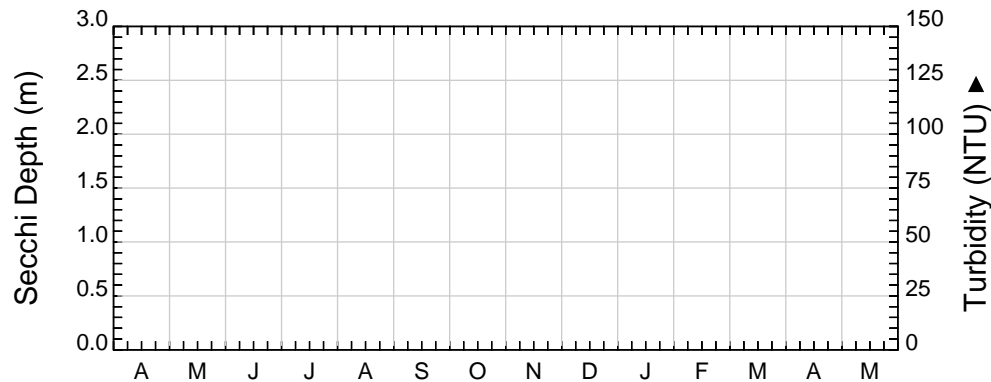
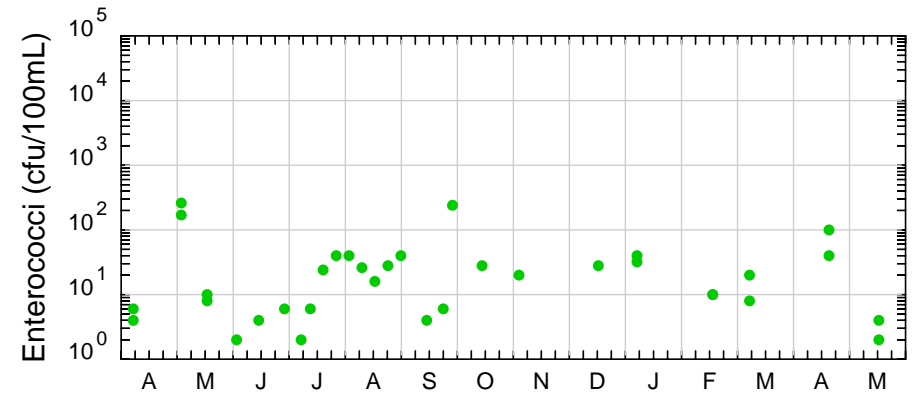
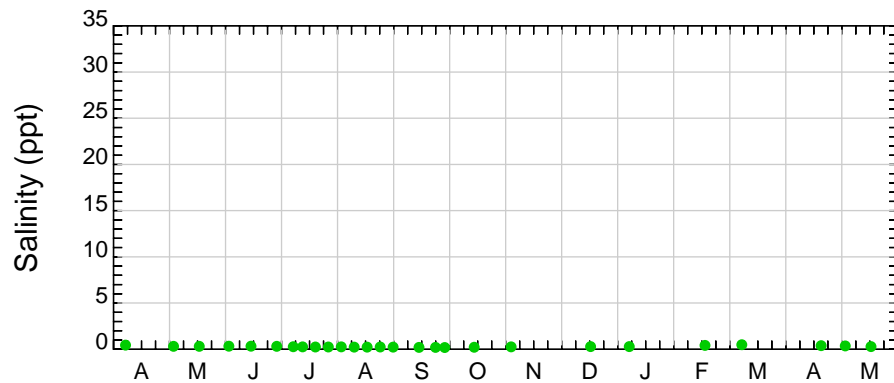
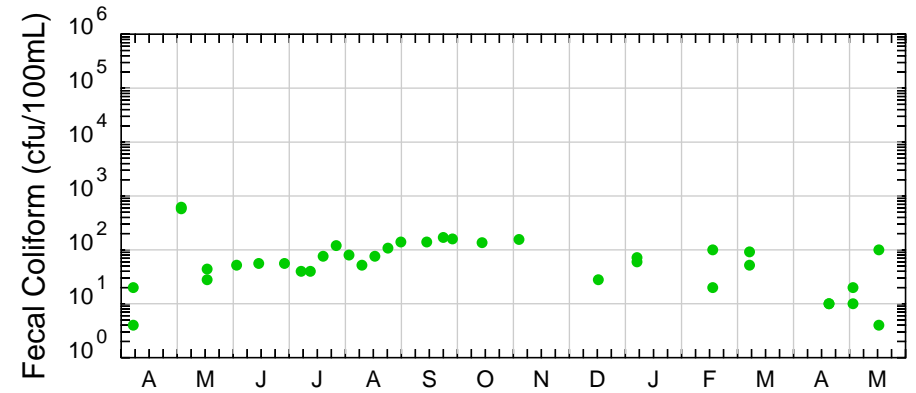
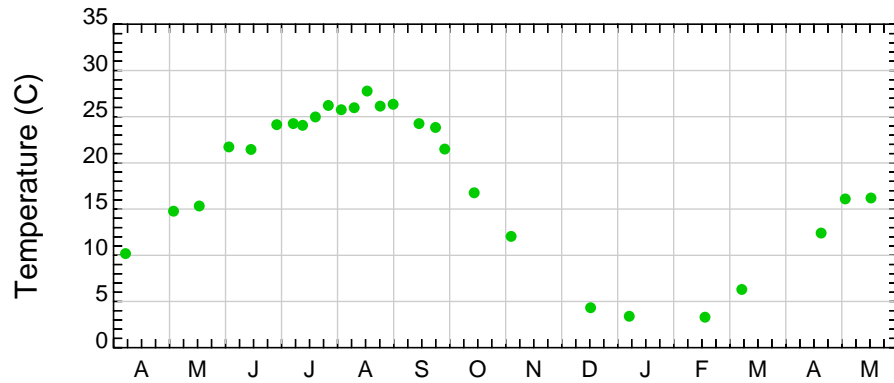
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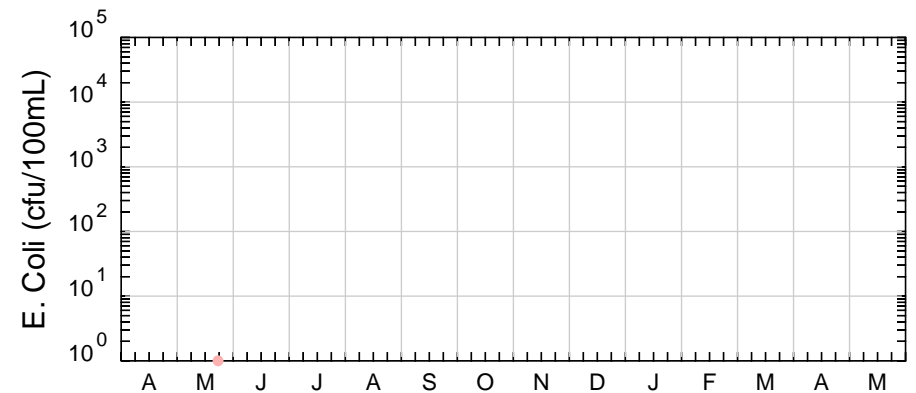
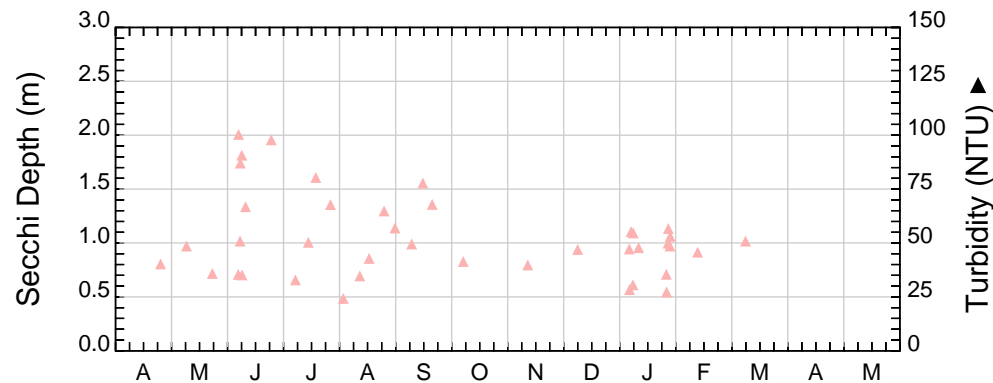
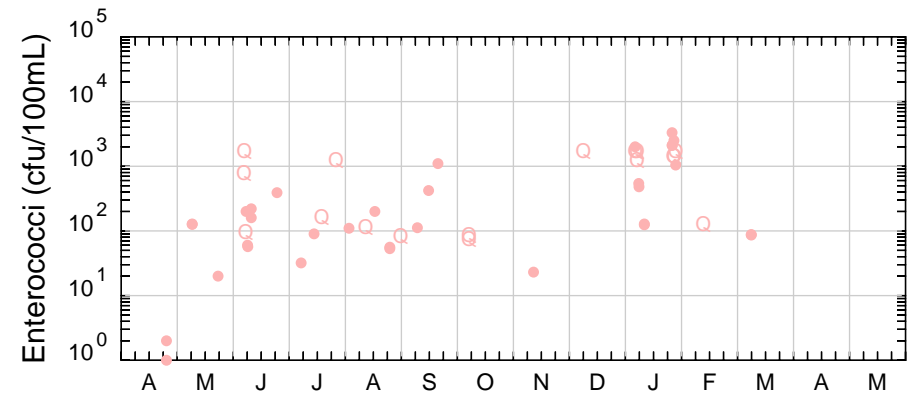
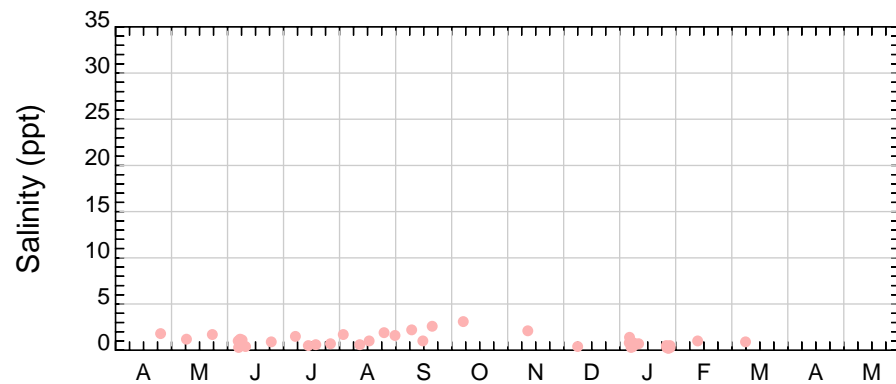
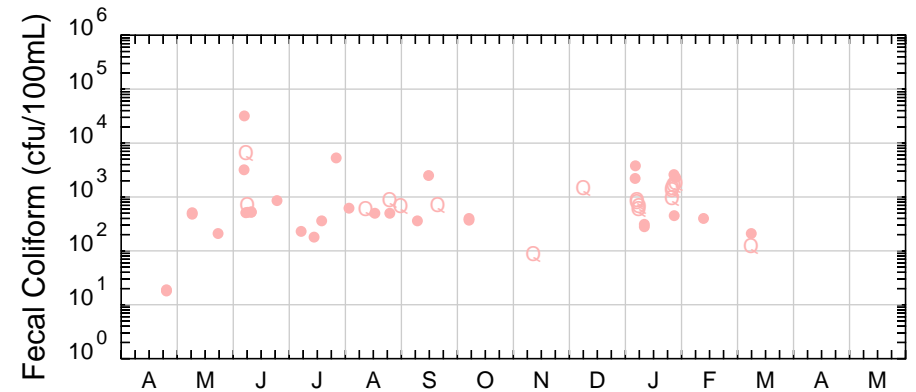
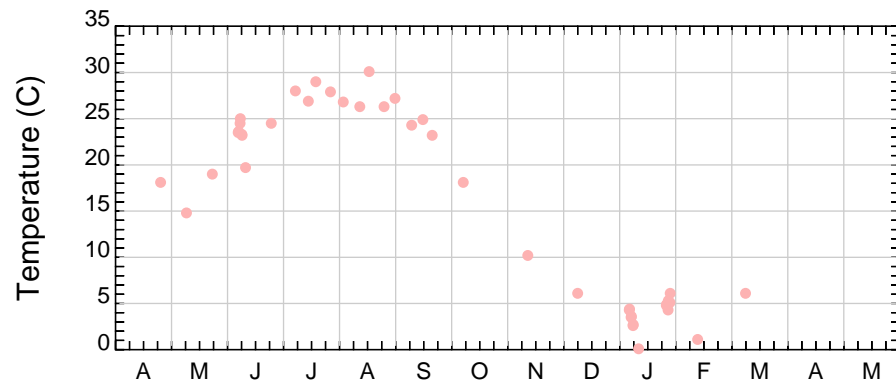


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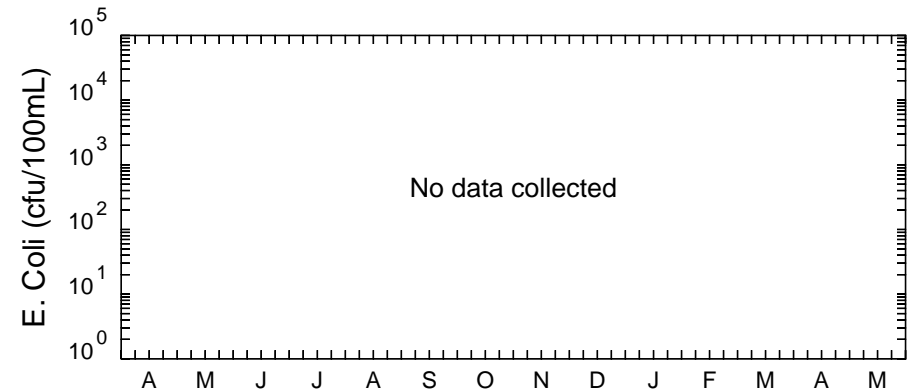
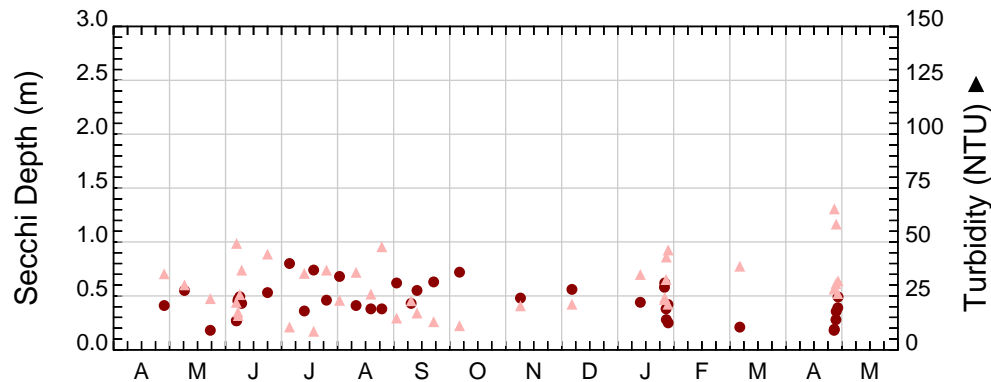
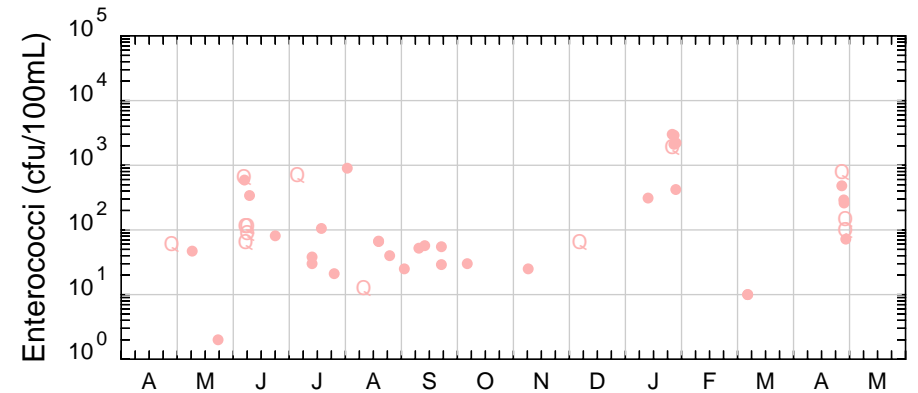
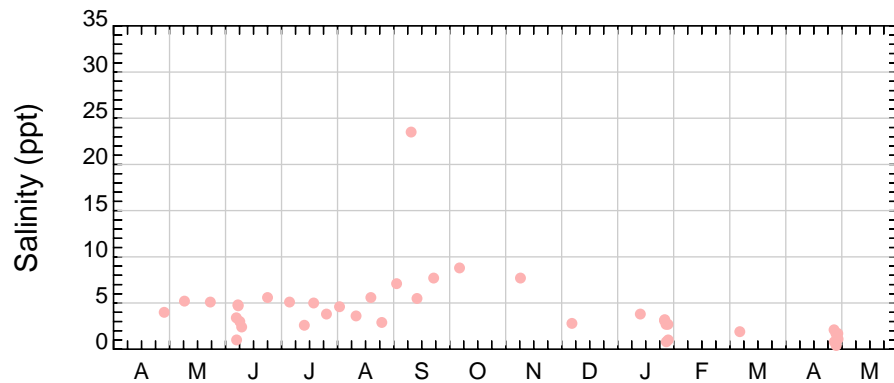
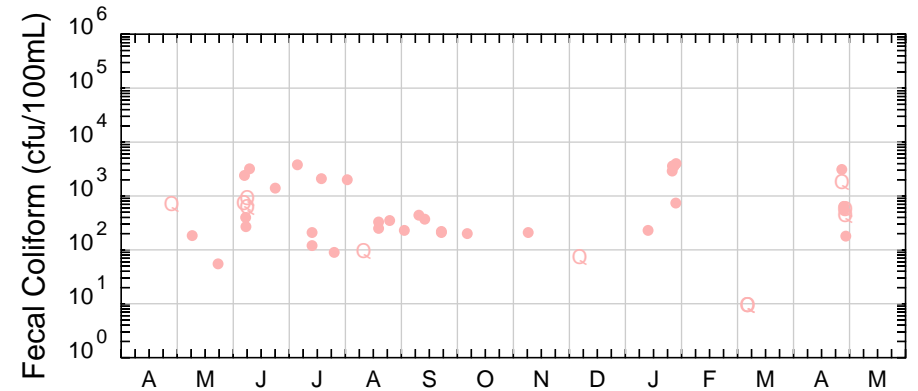
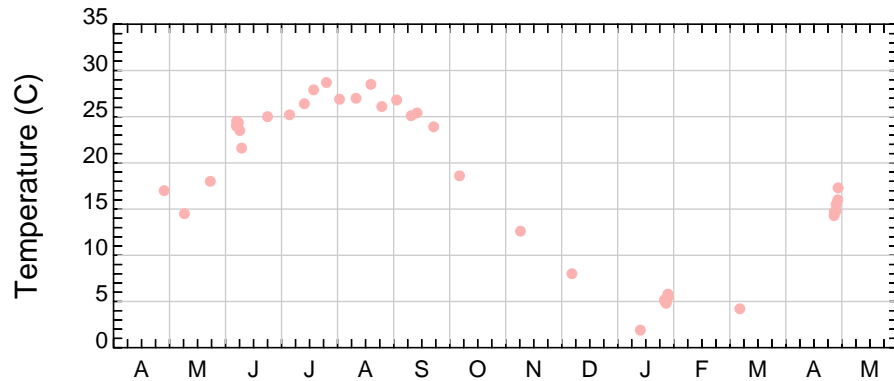


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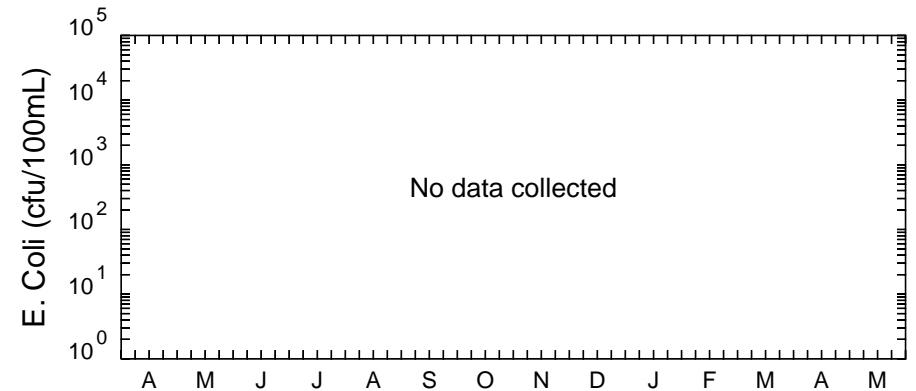
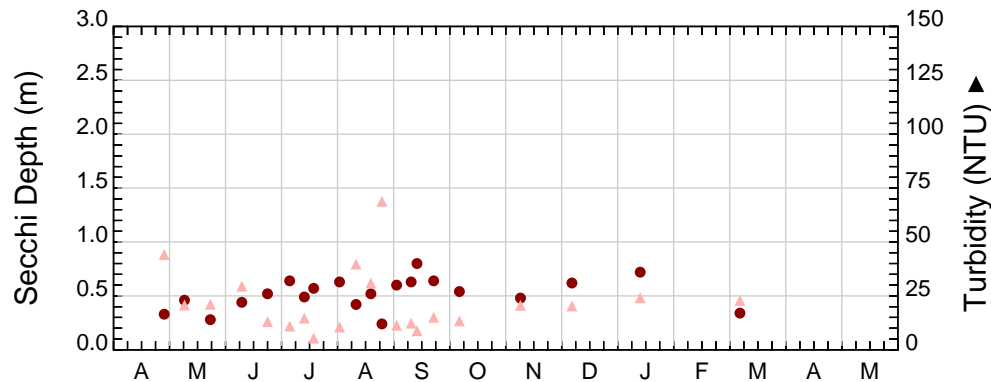
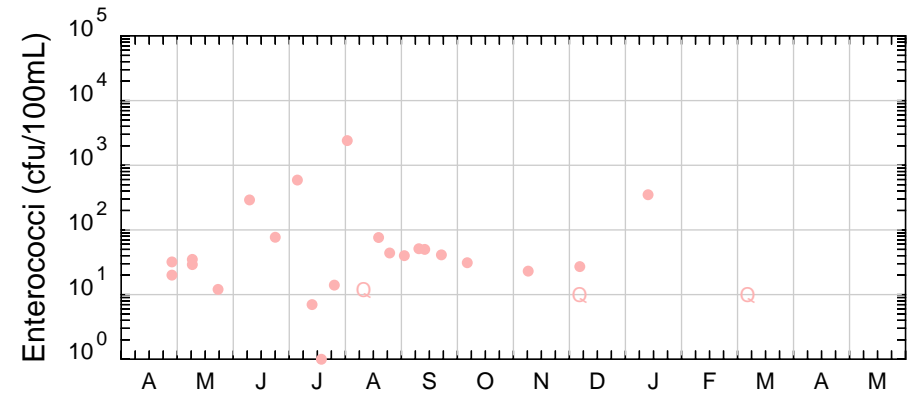
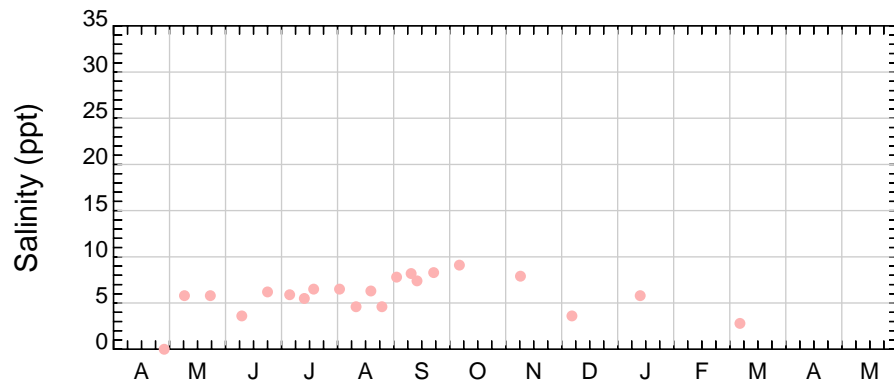
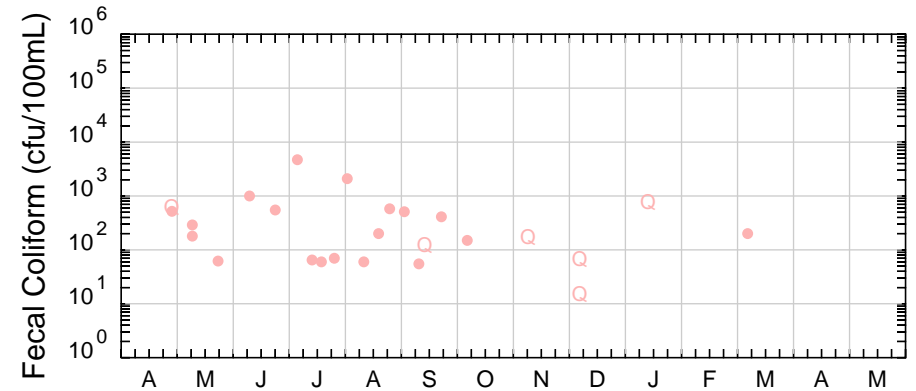
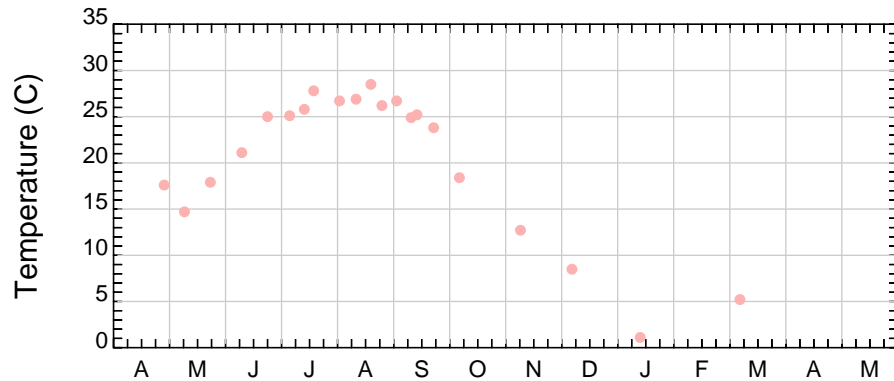


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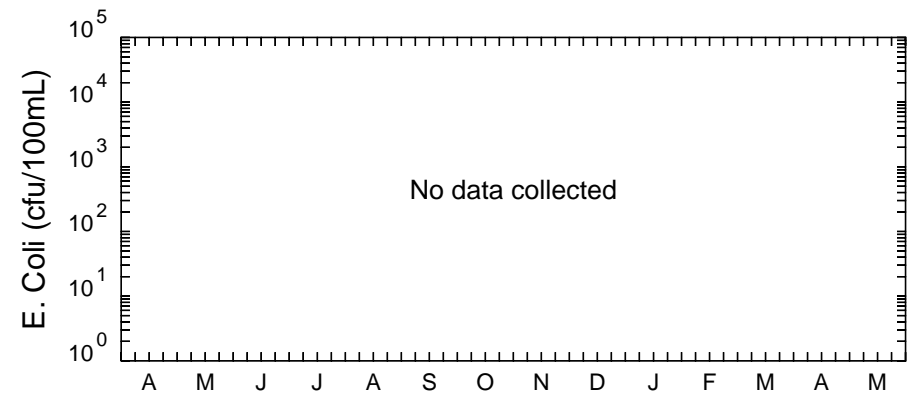
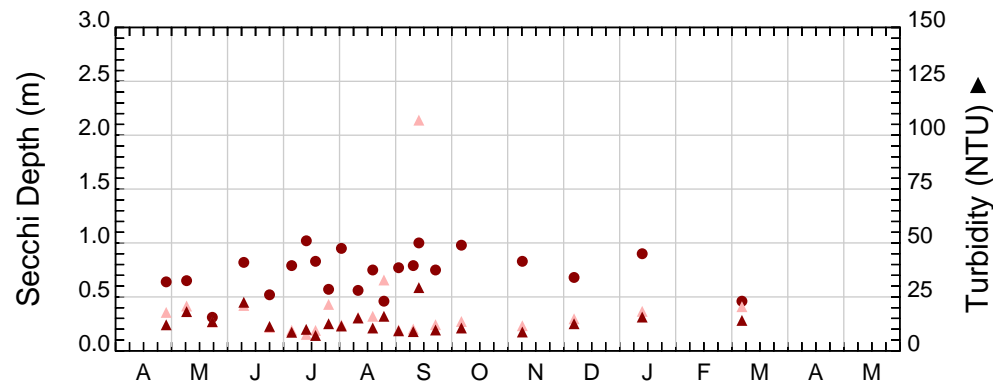
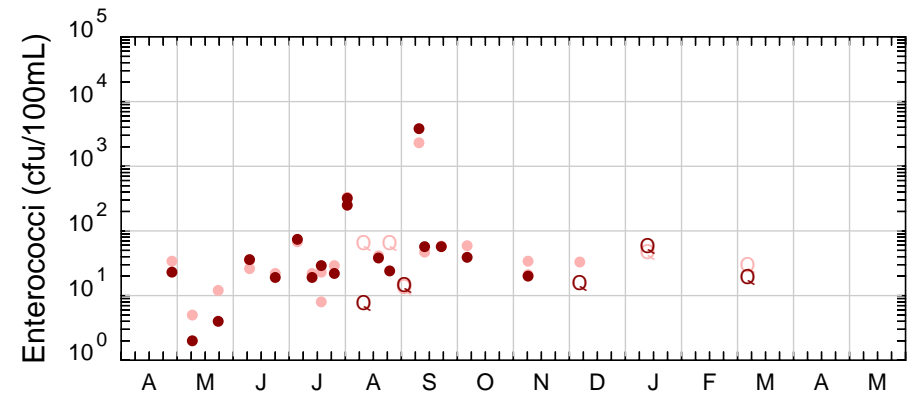
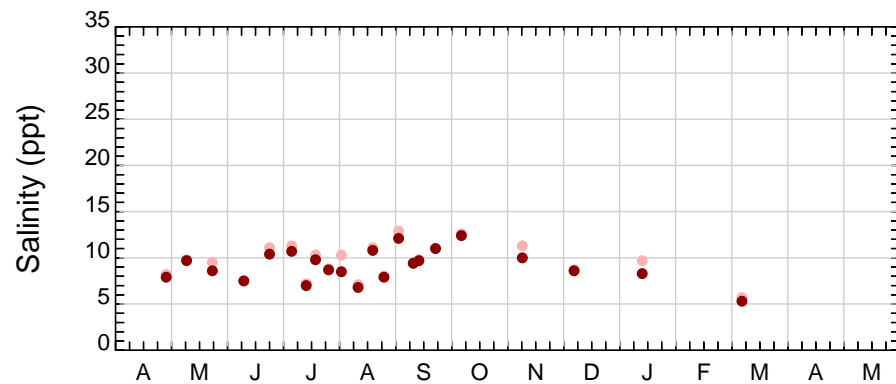
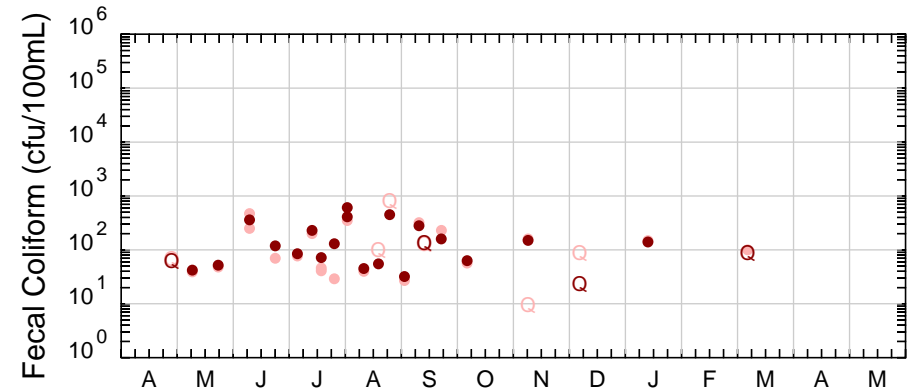
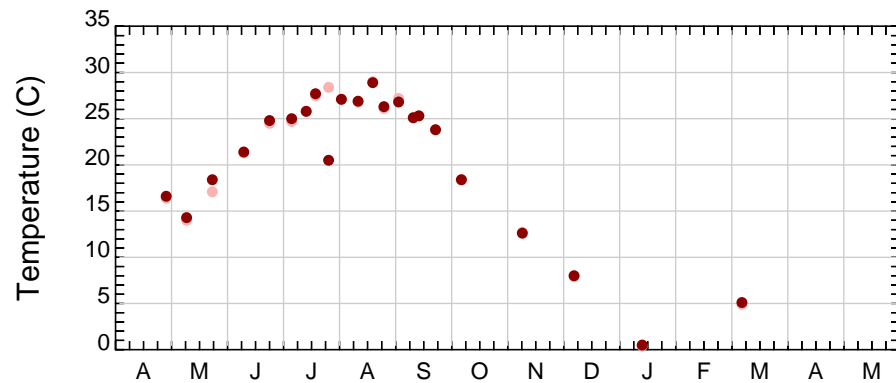


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● ● Surface/Mid-depth HDR
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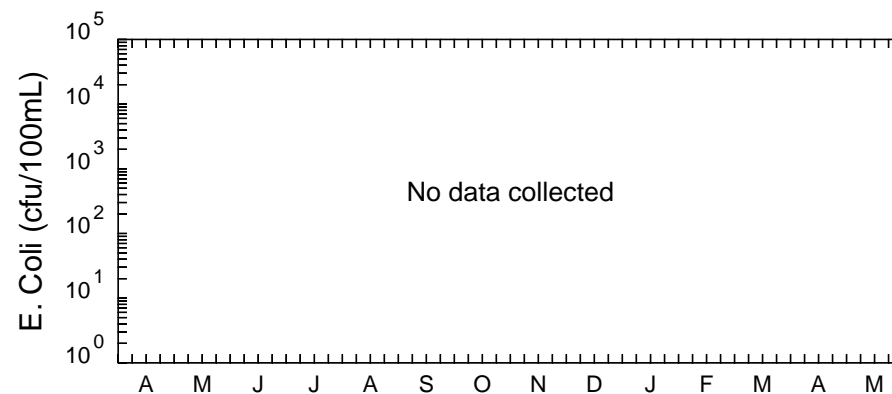
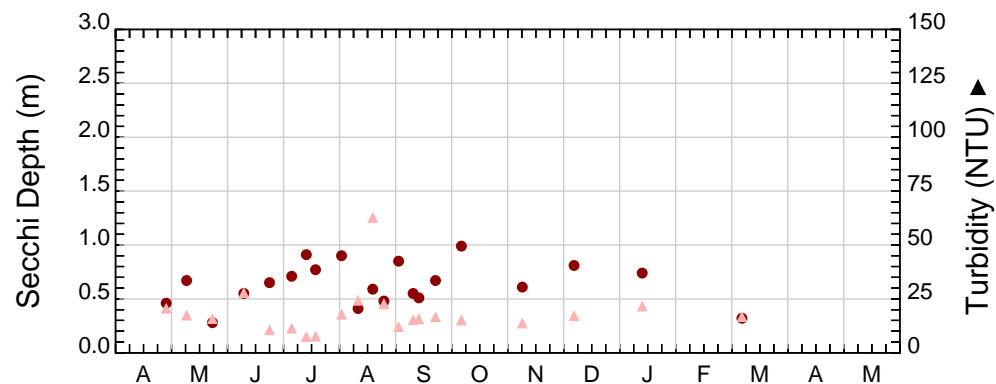
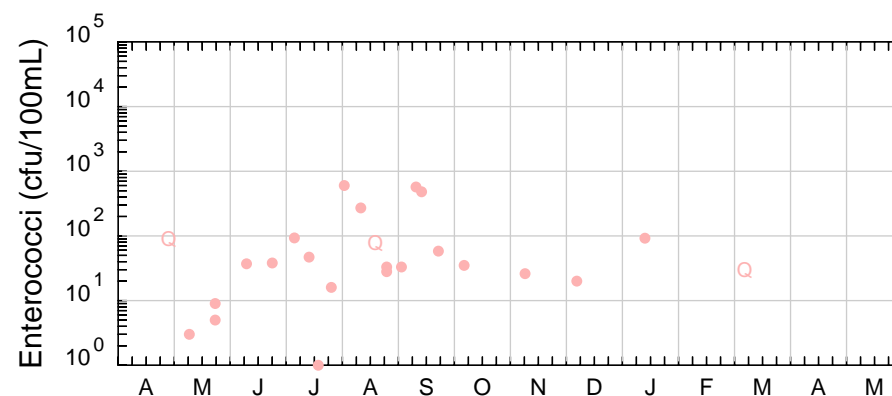
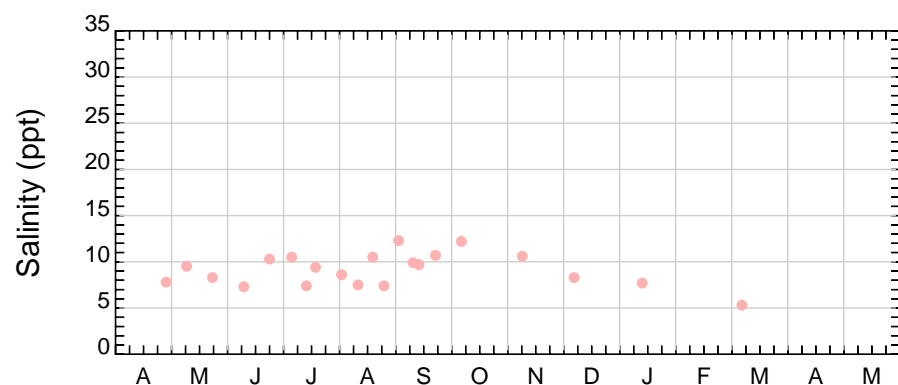
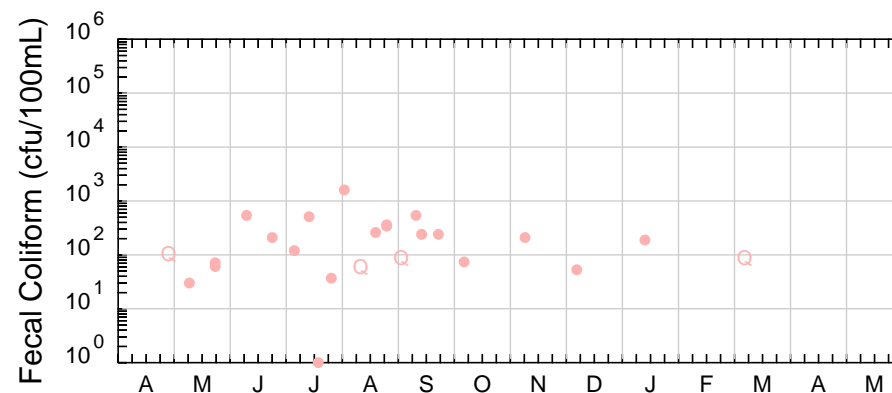
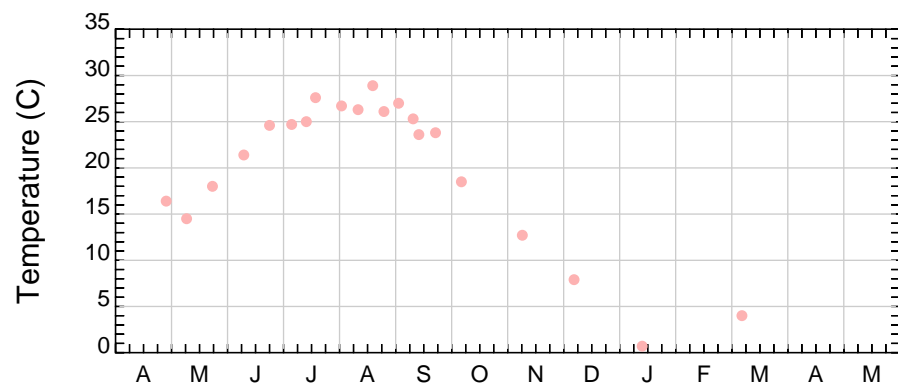


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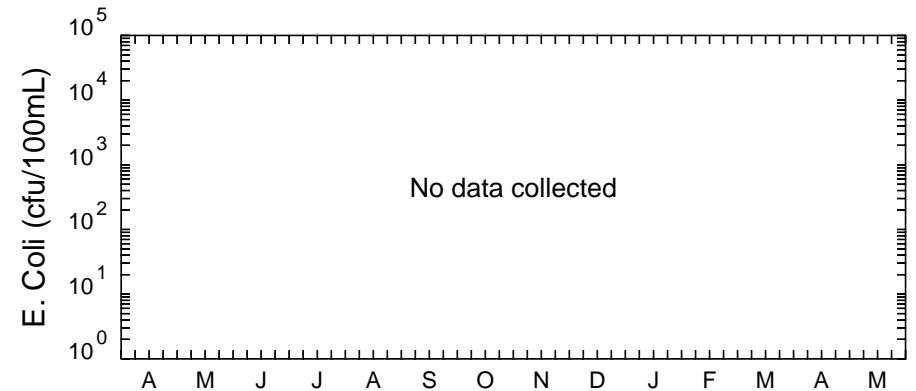
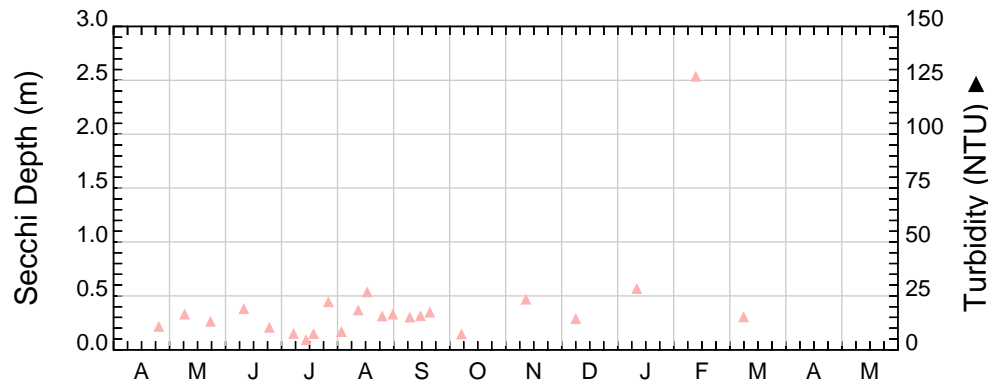
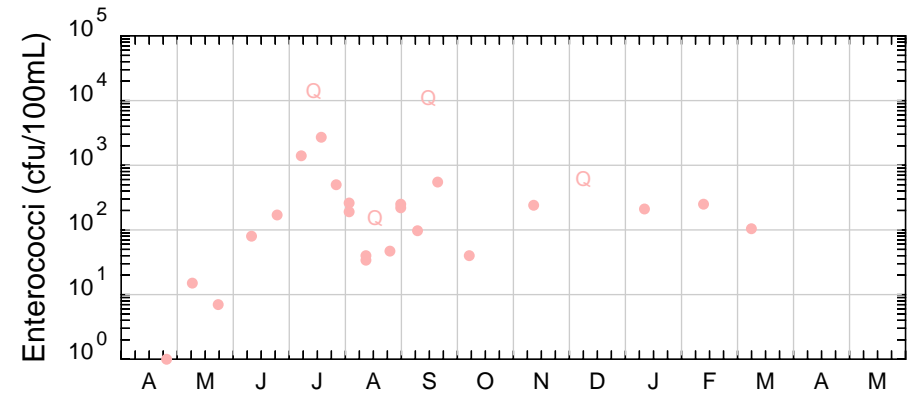
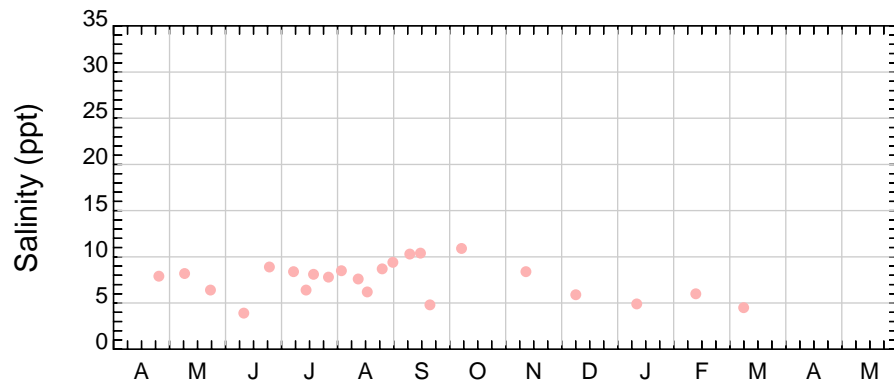
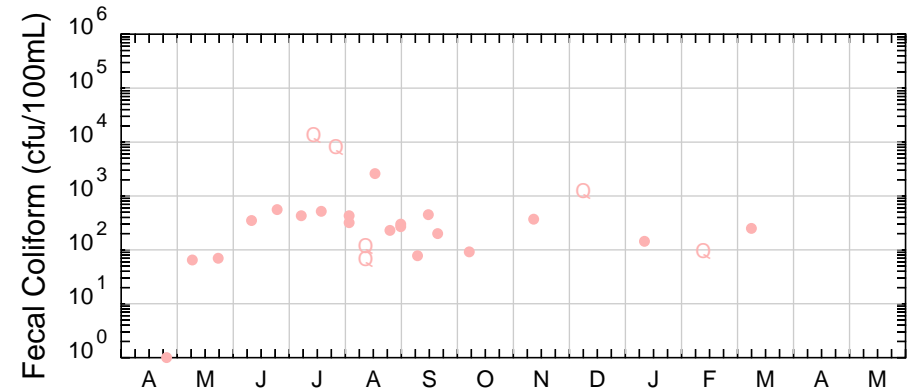
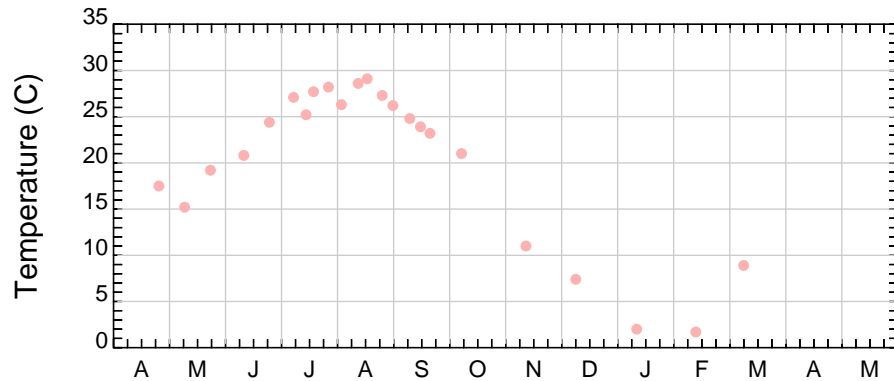
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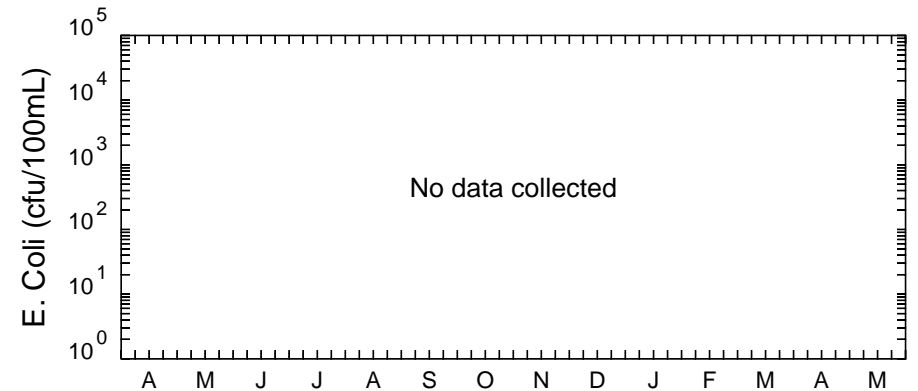
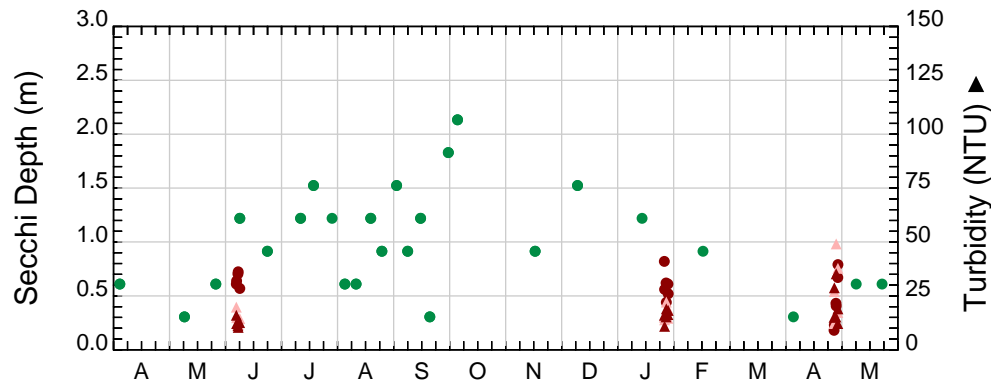
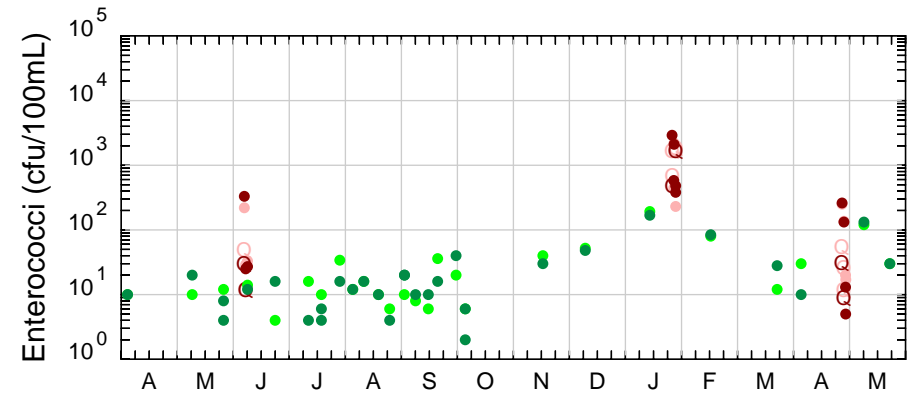
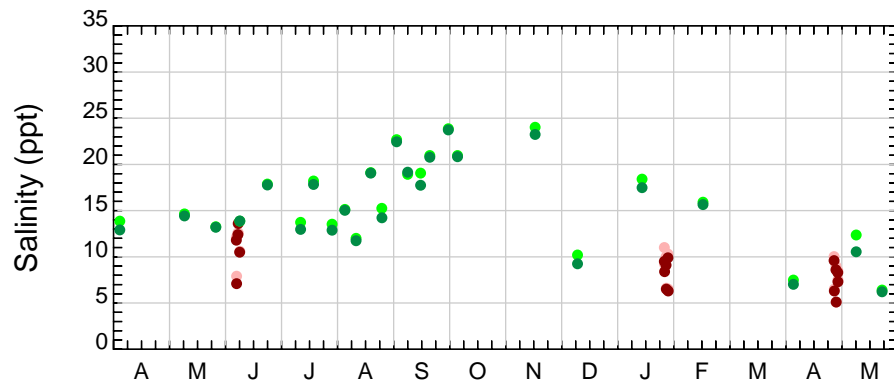
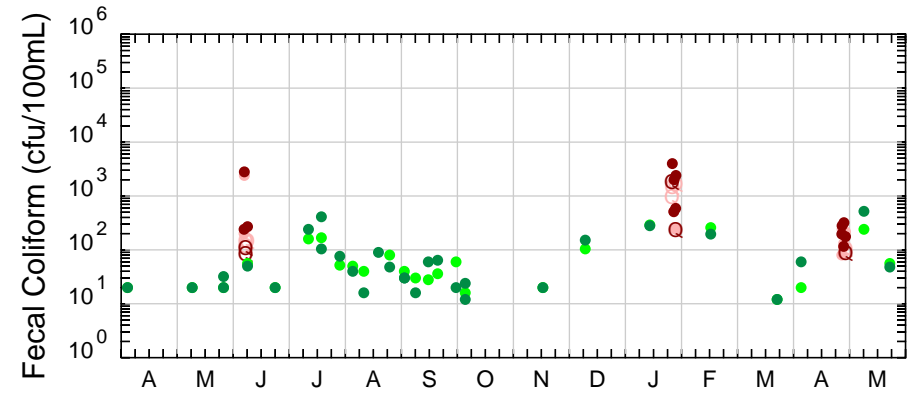
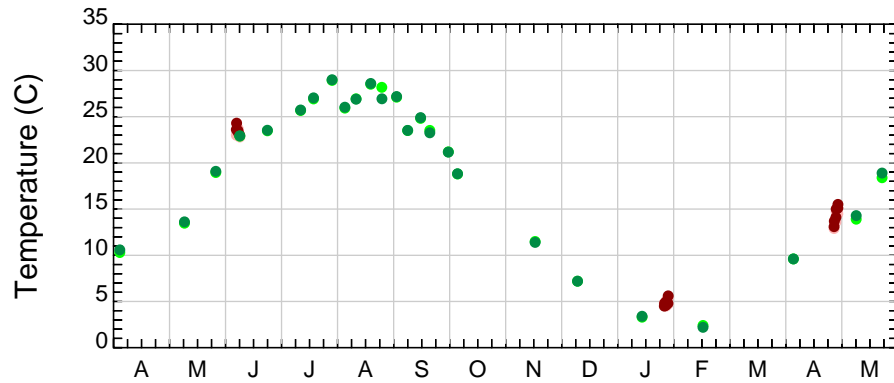


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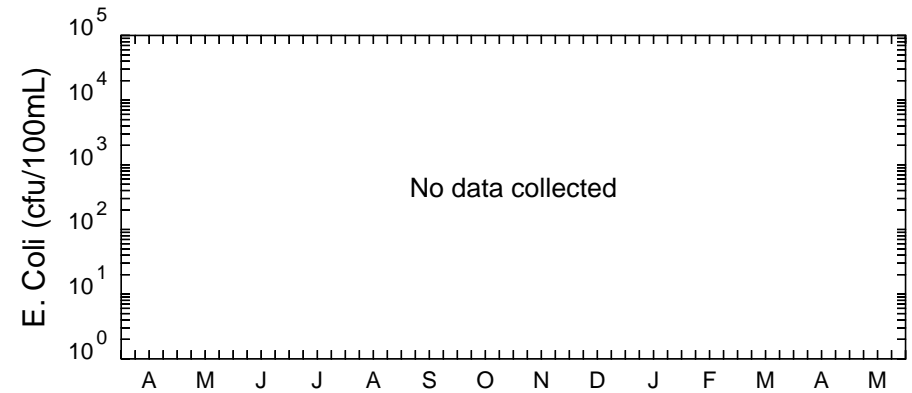
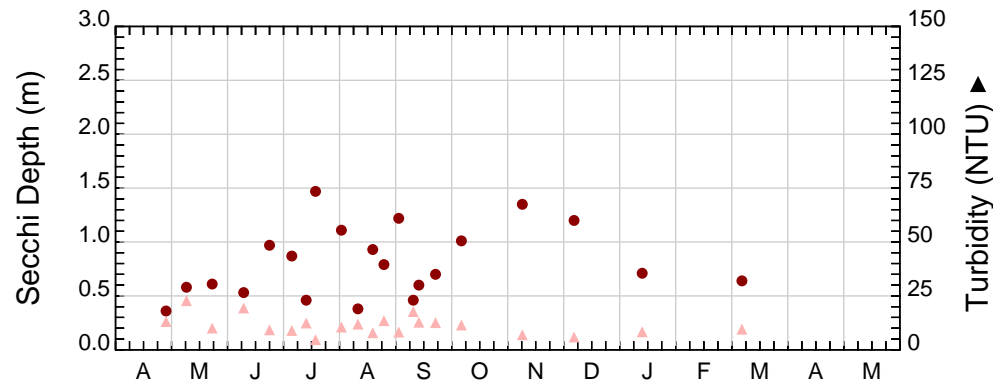
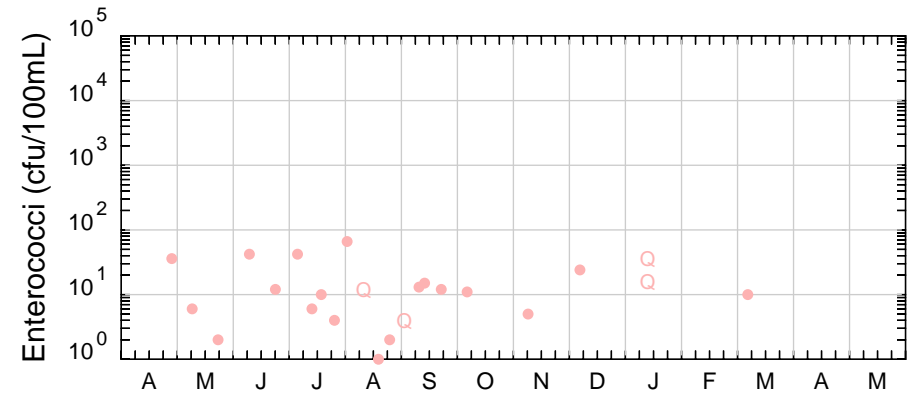
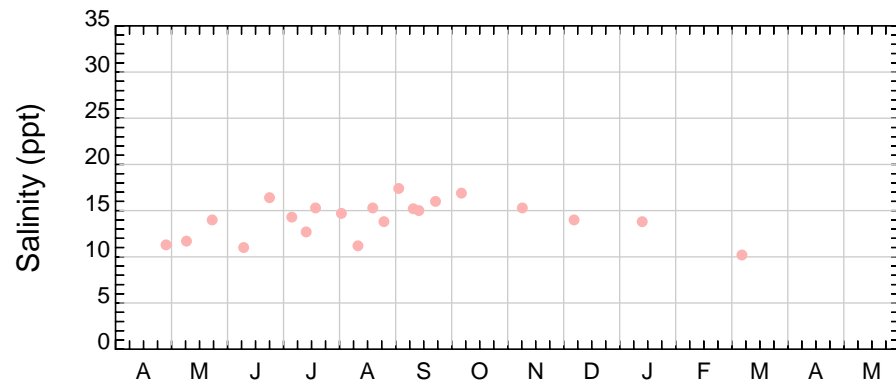
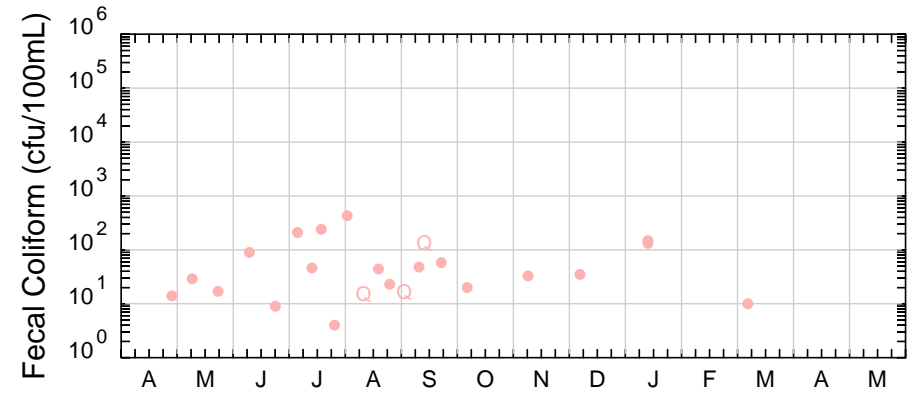
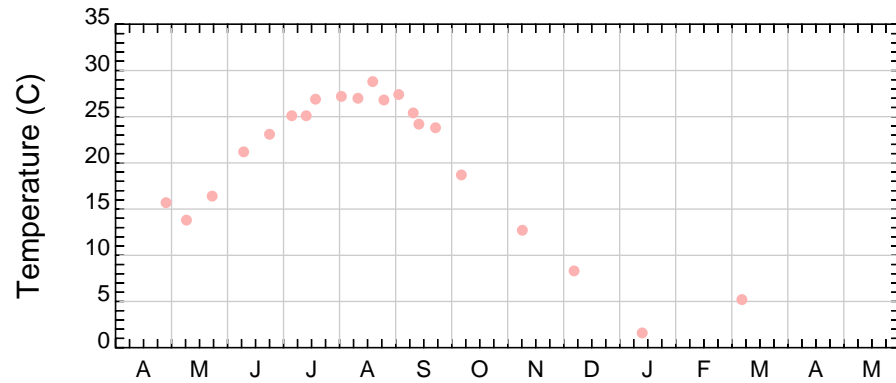


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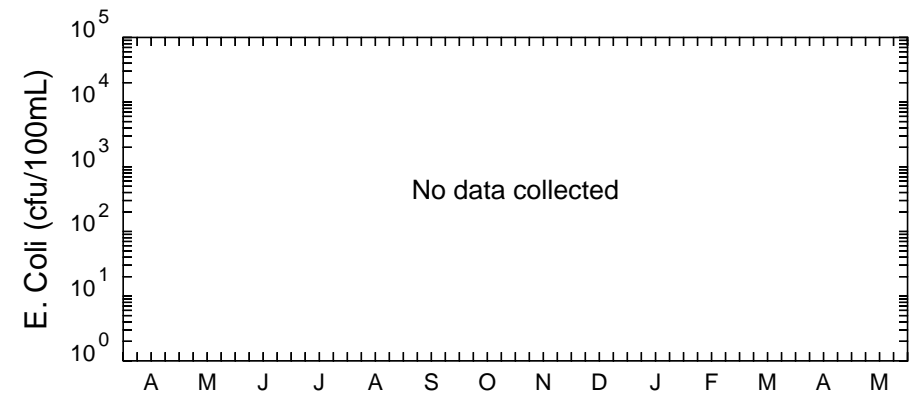
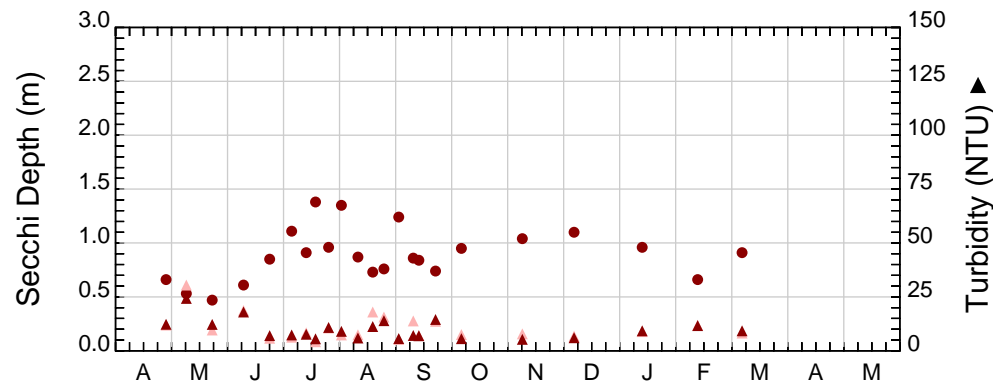
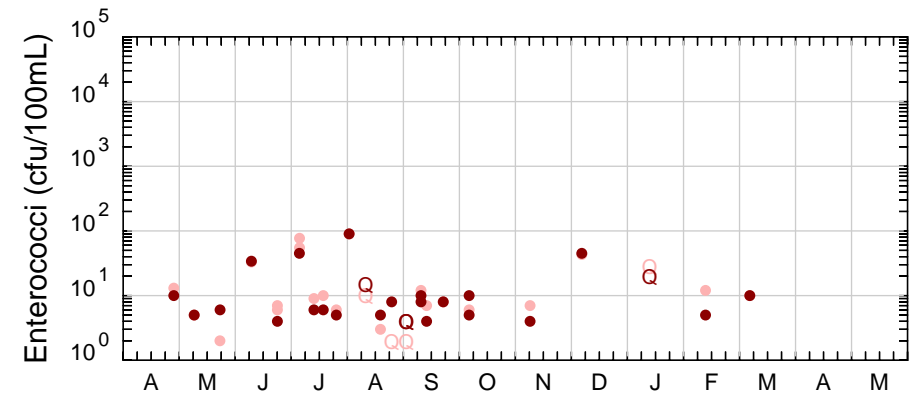
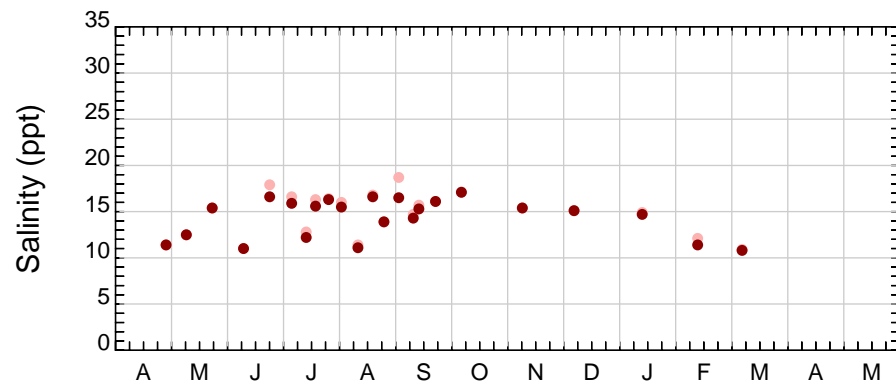
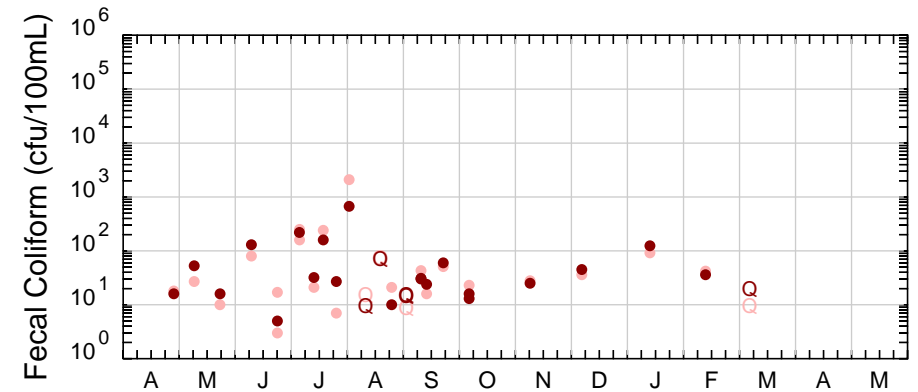
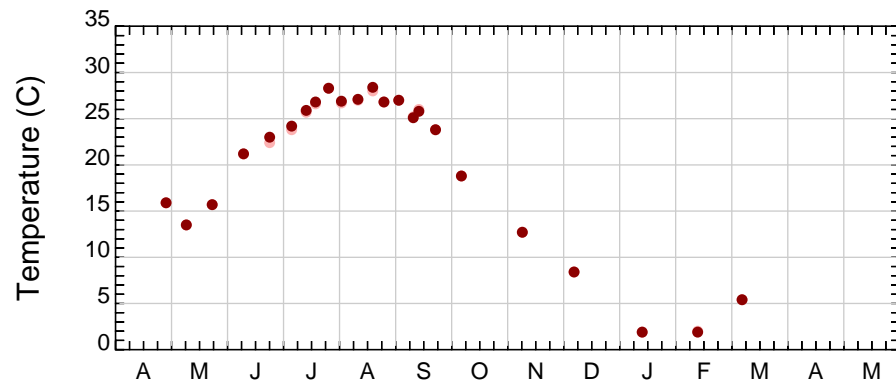
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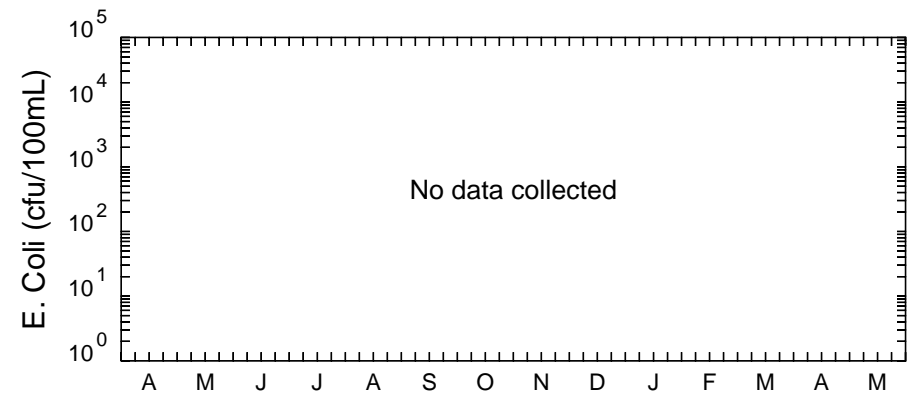
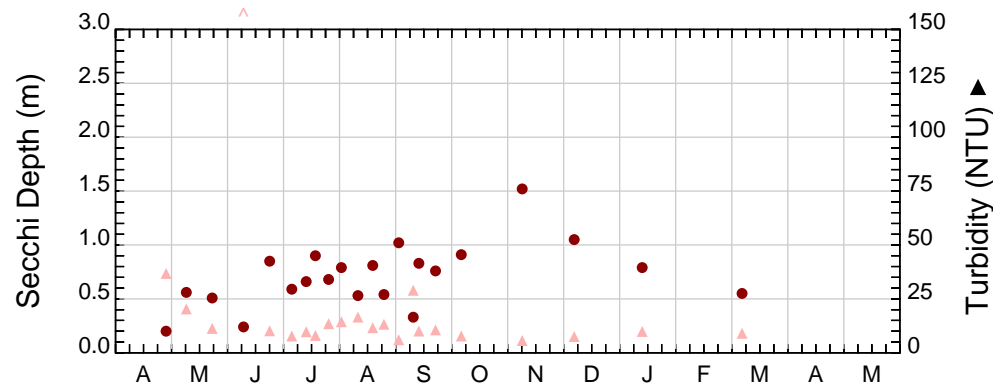
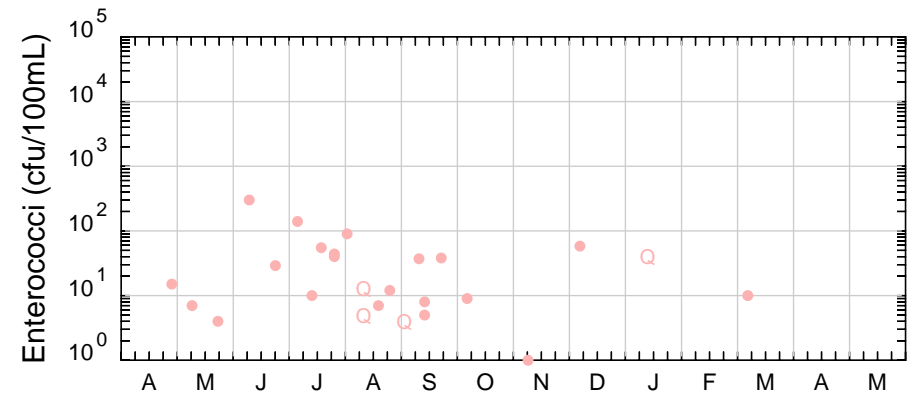
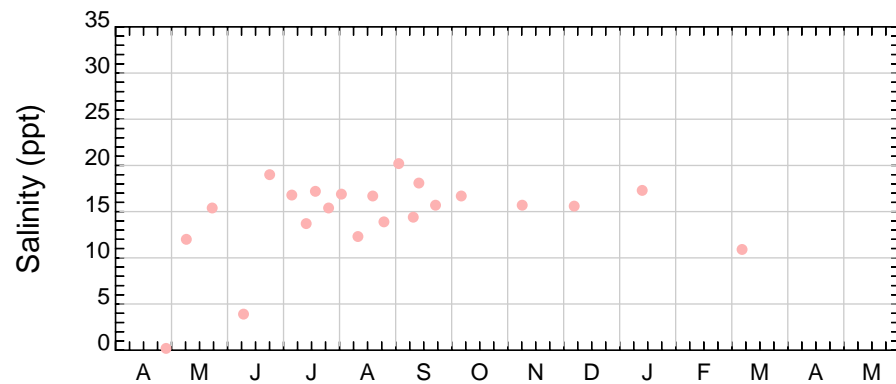
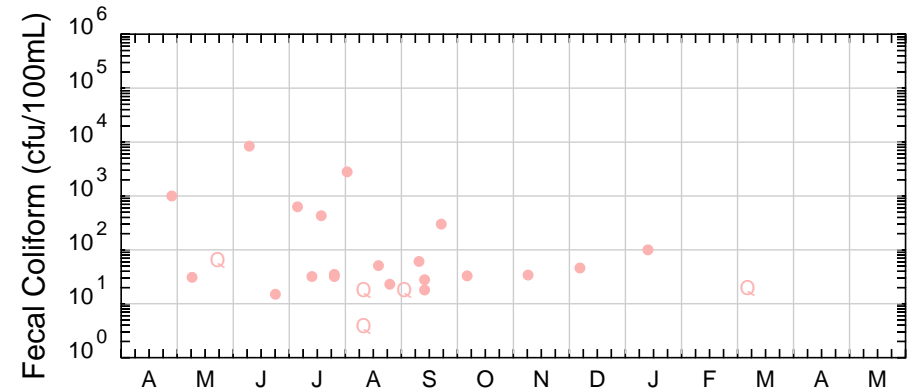
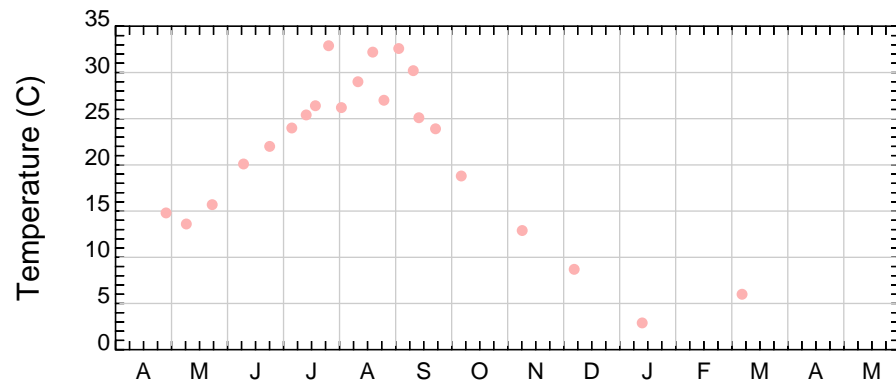


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● ● Surface/Mid-depth HDR
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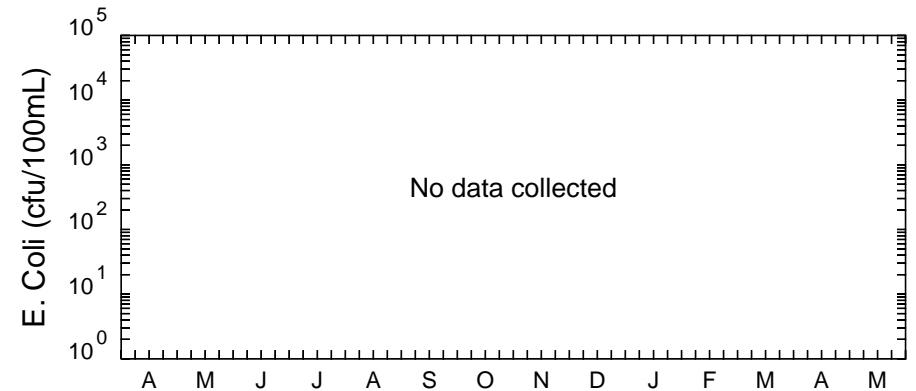
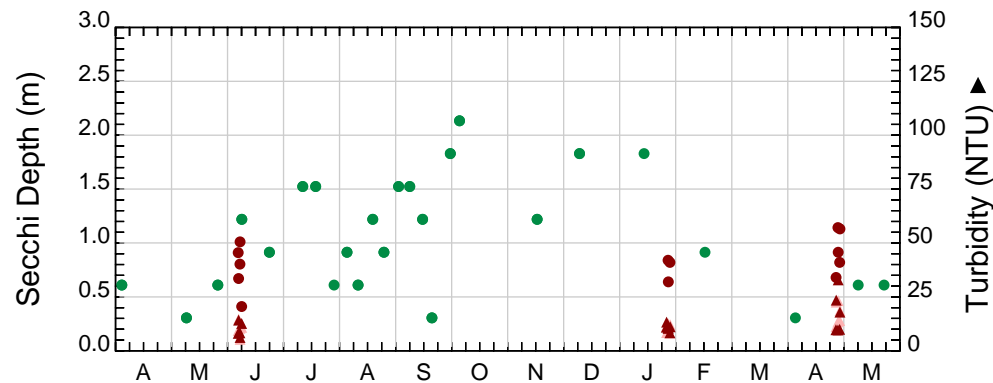
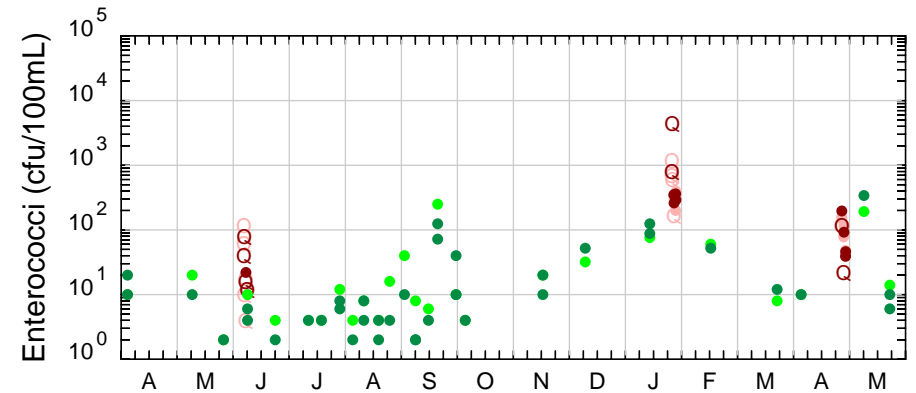
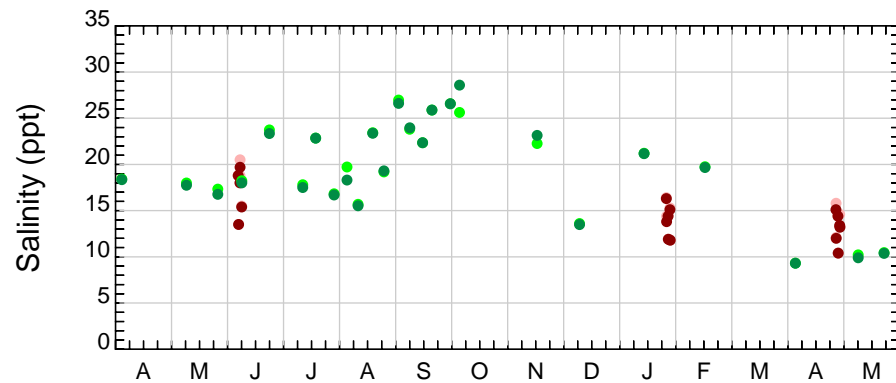
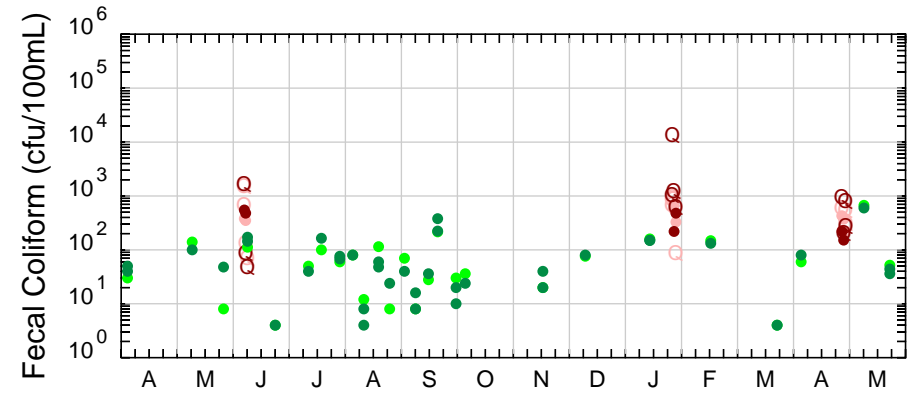
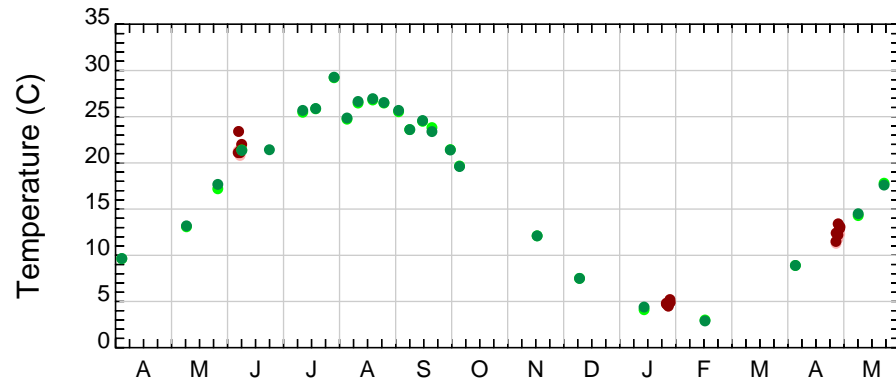


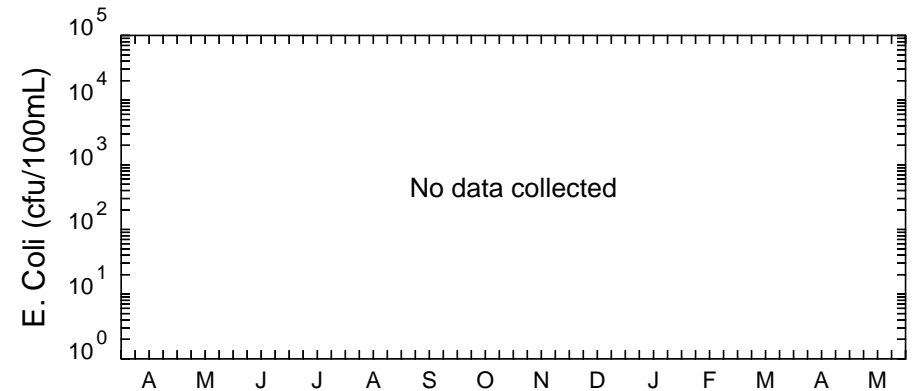
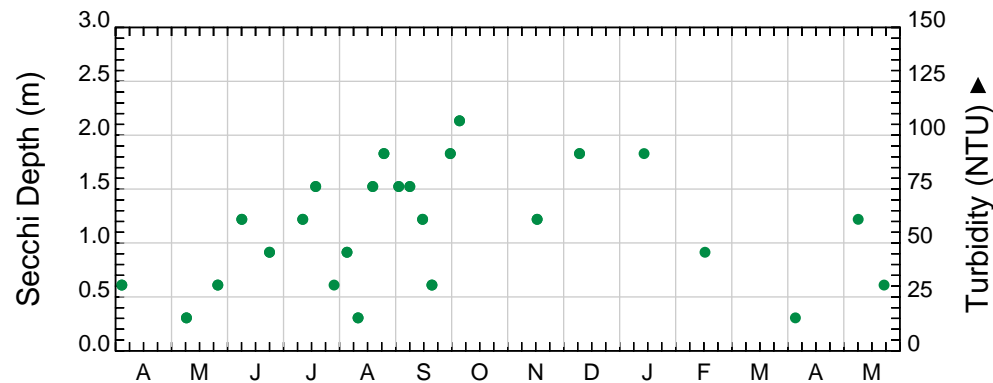
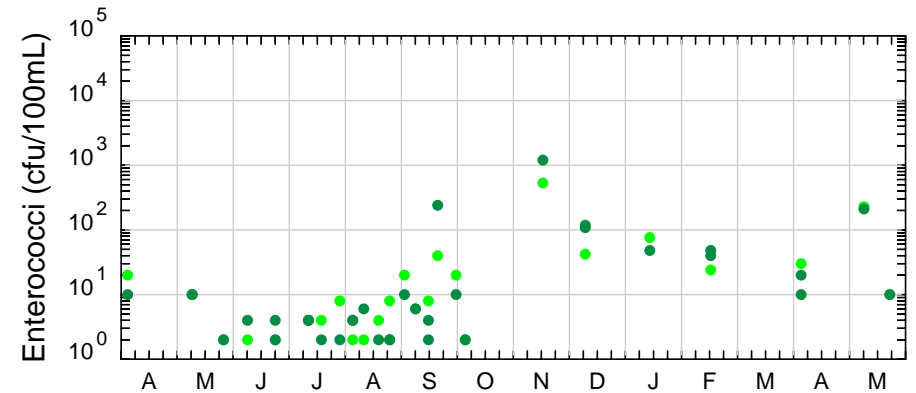
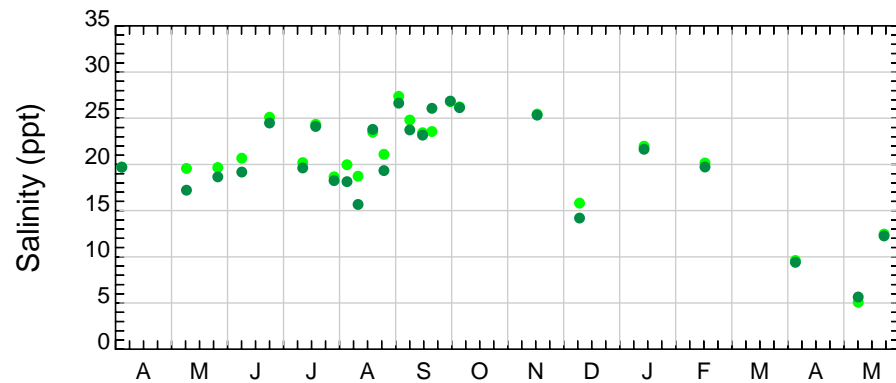
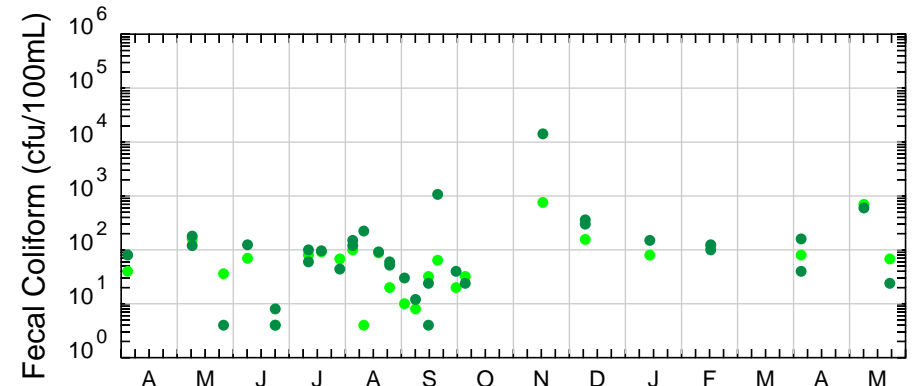
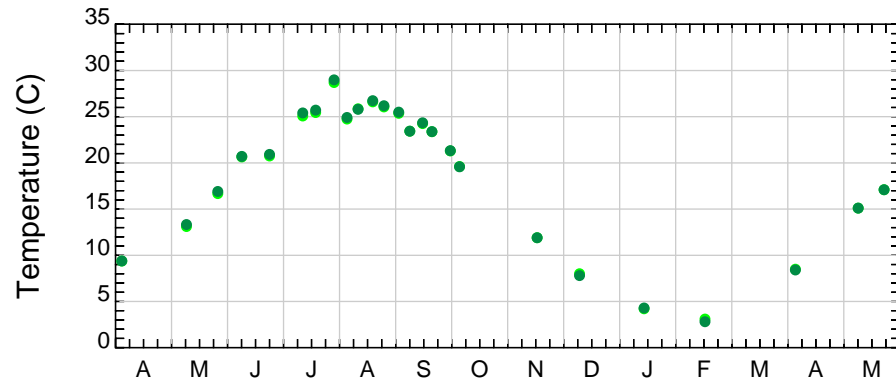
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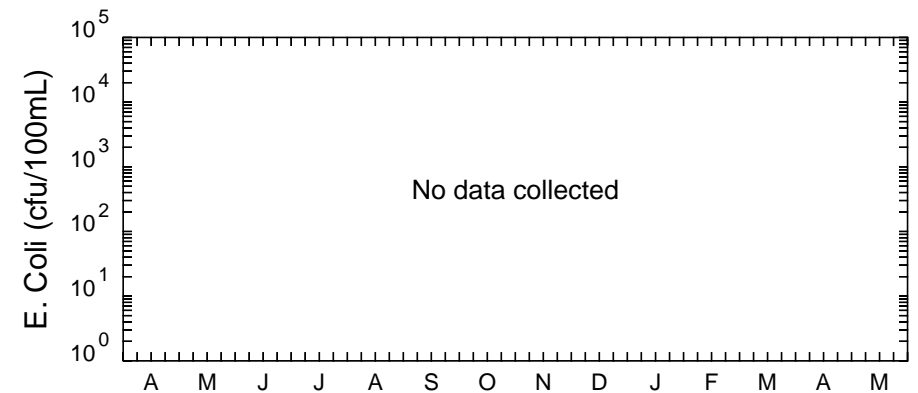
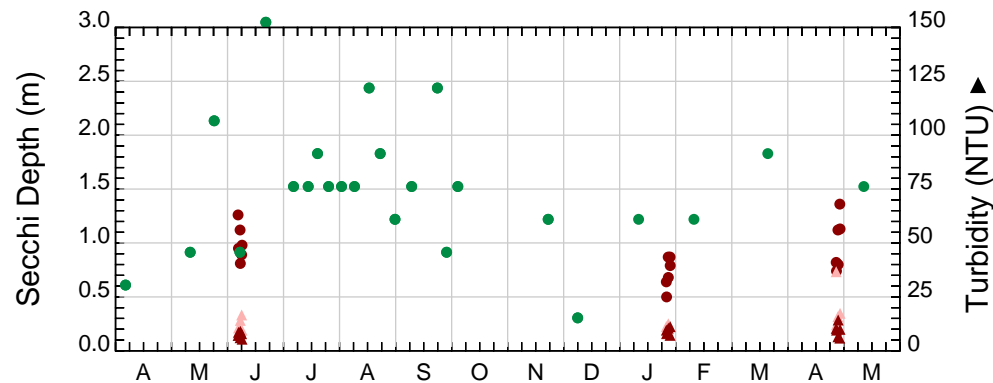
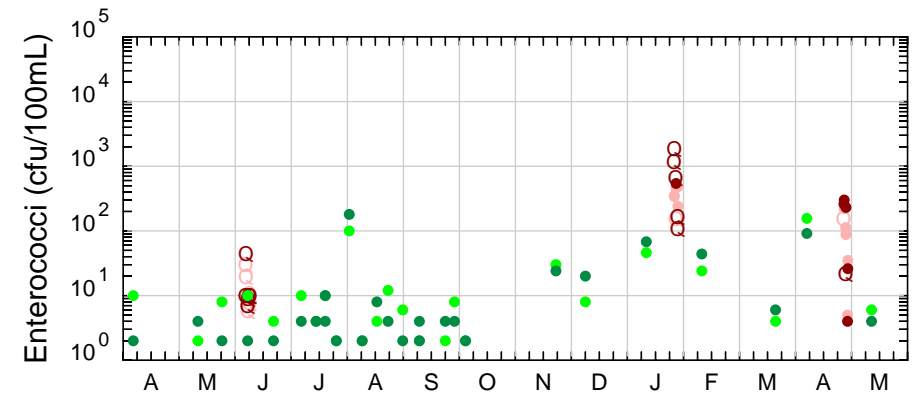
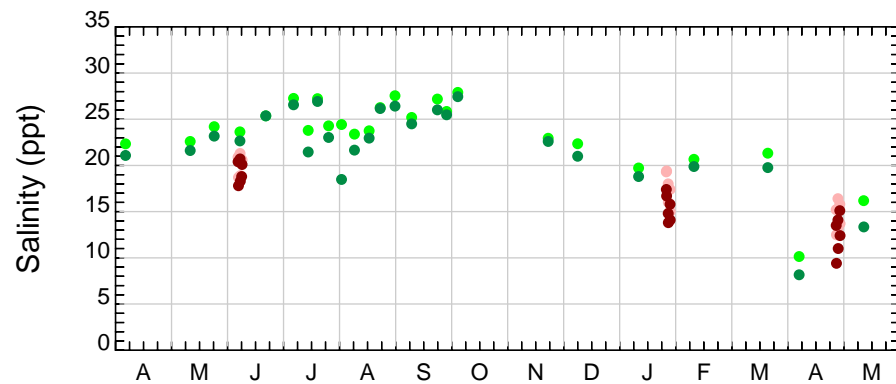
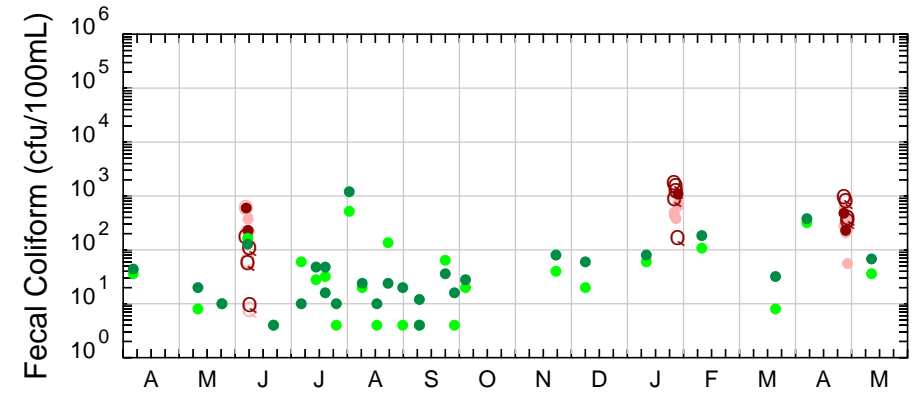
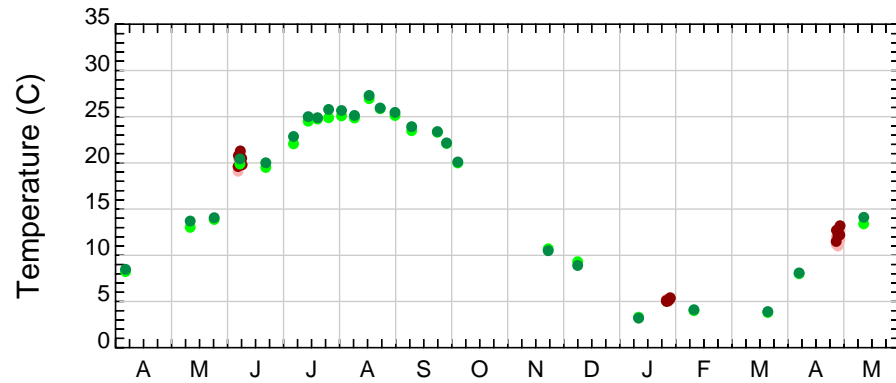


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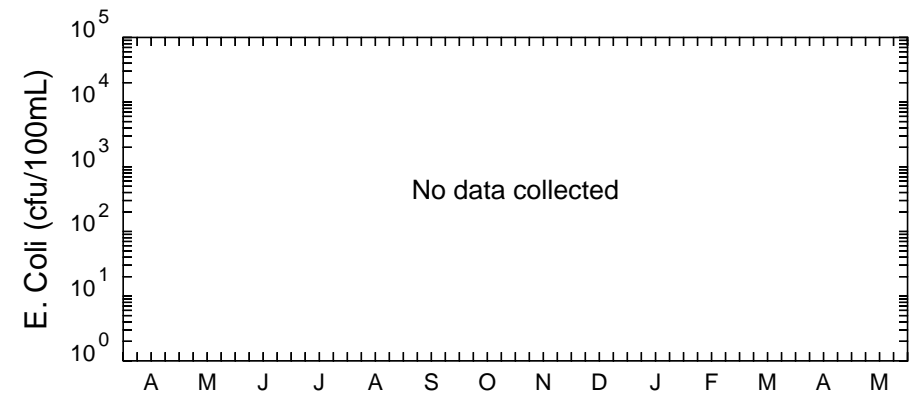
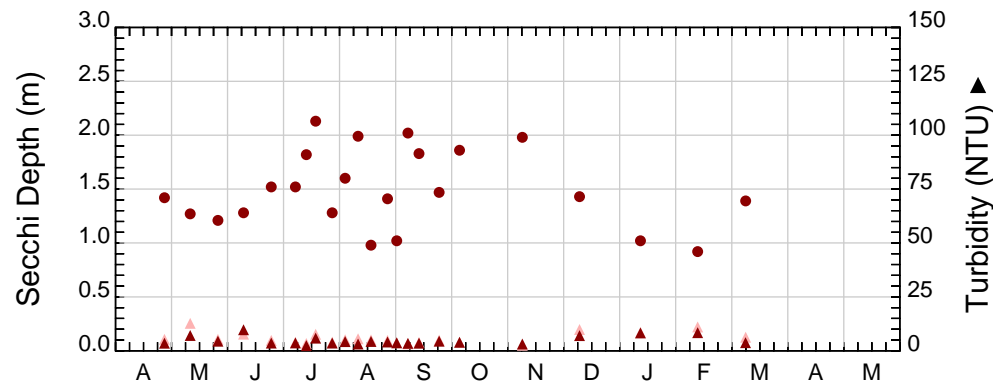
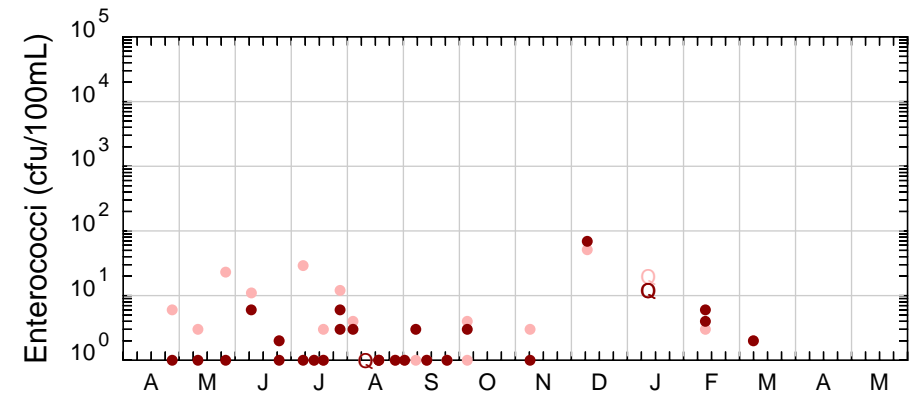
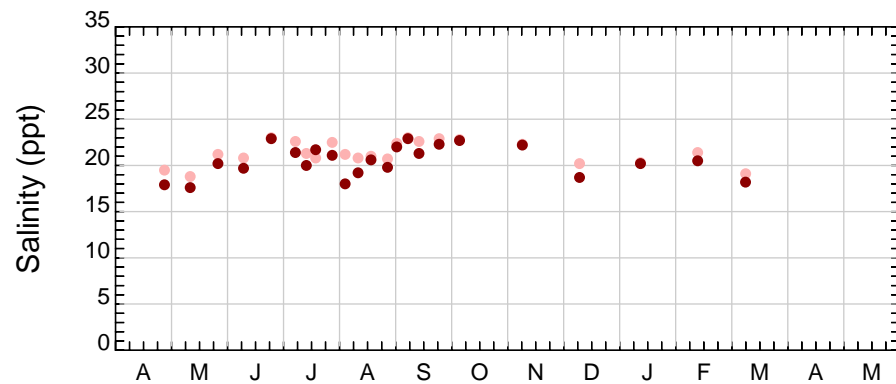
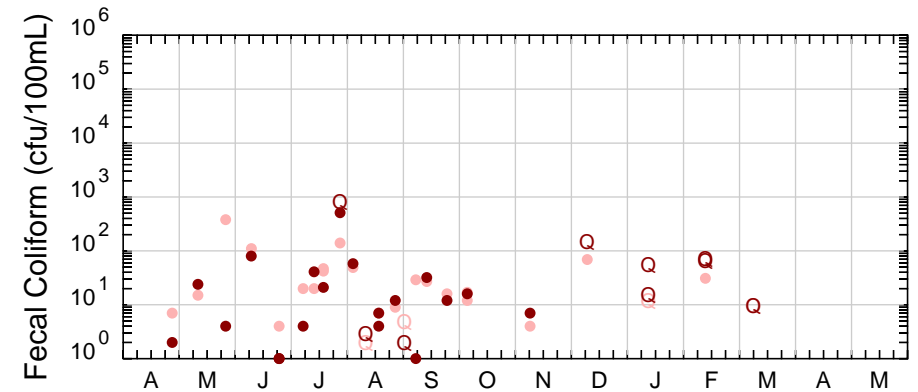
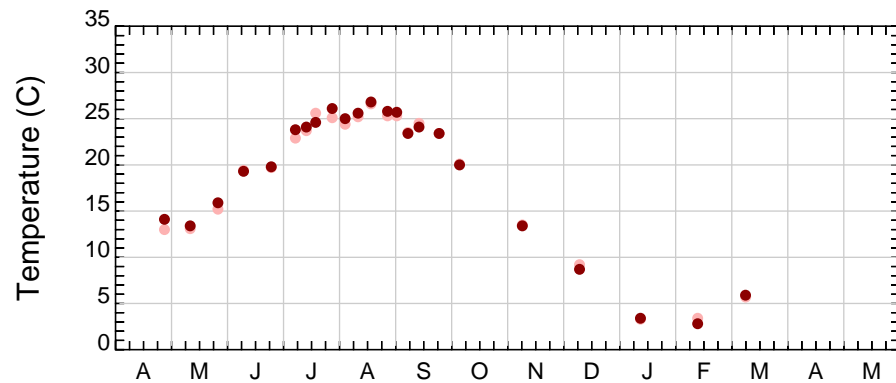
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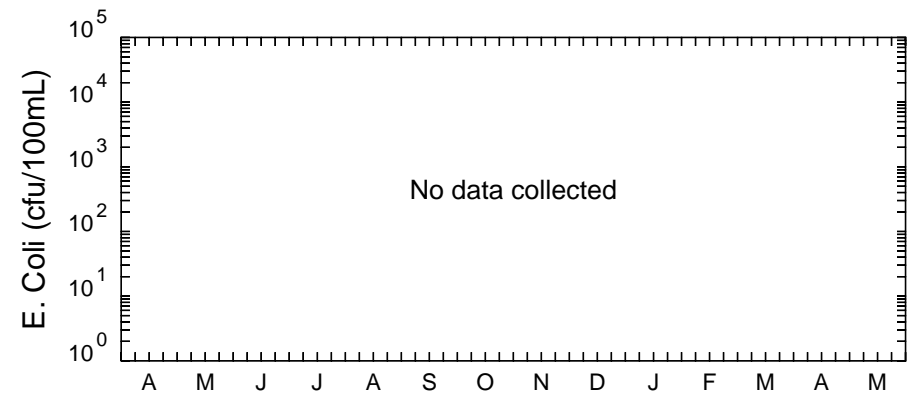
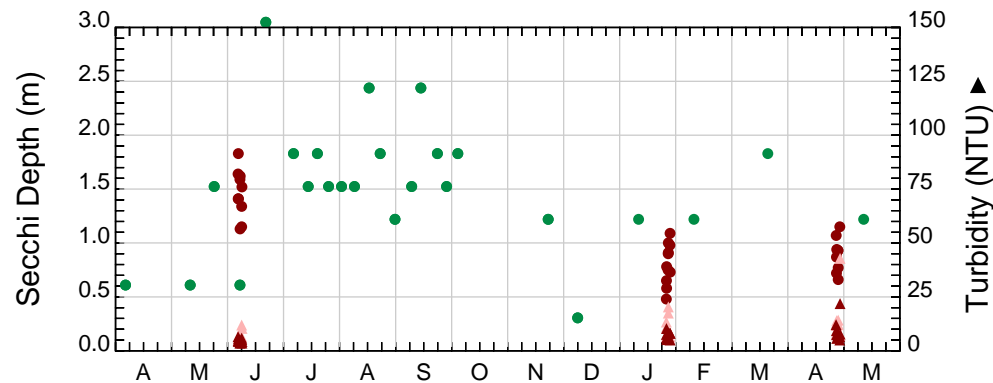
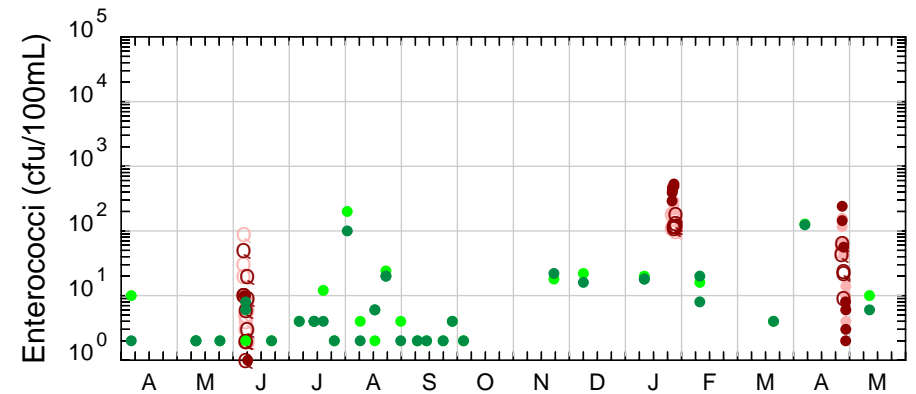
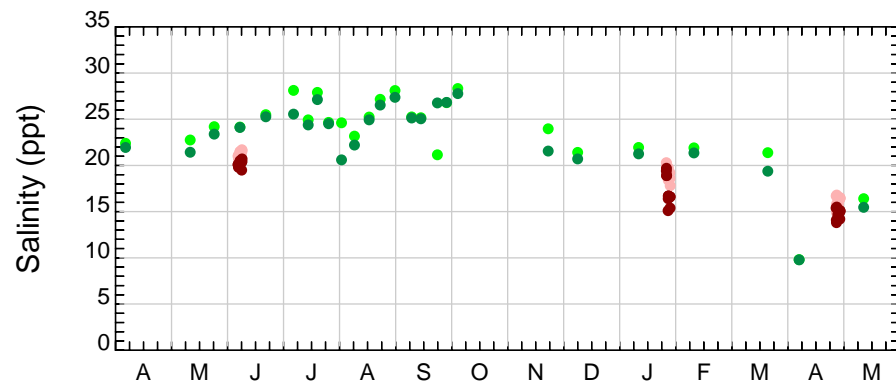
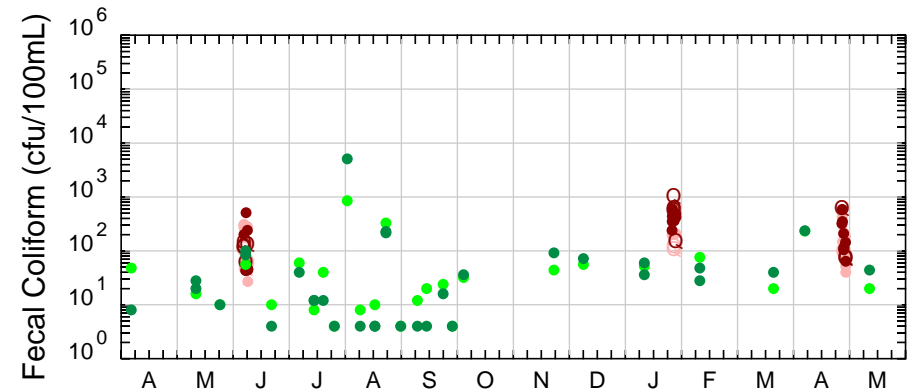
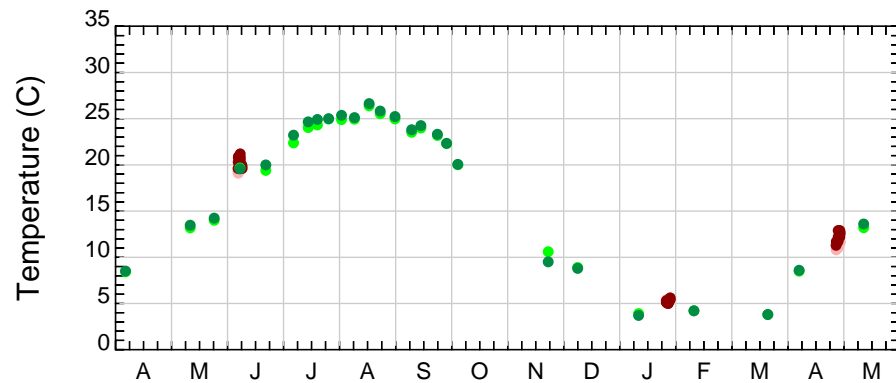


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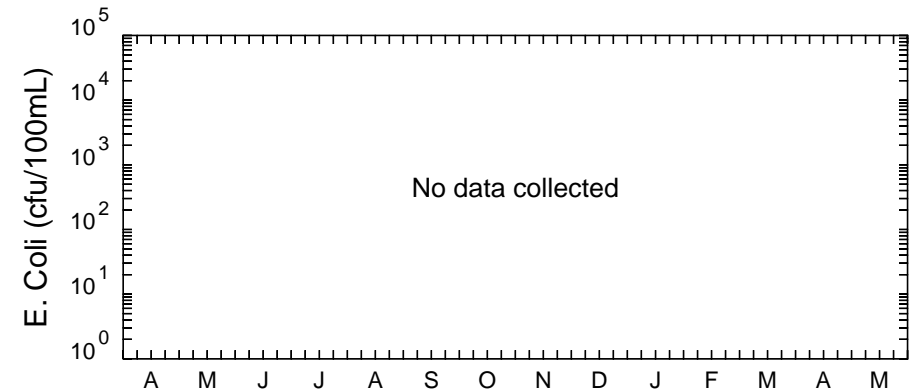
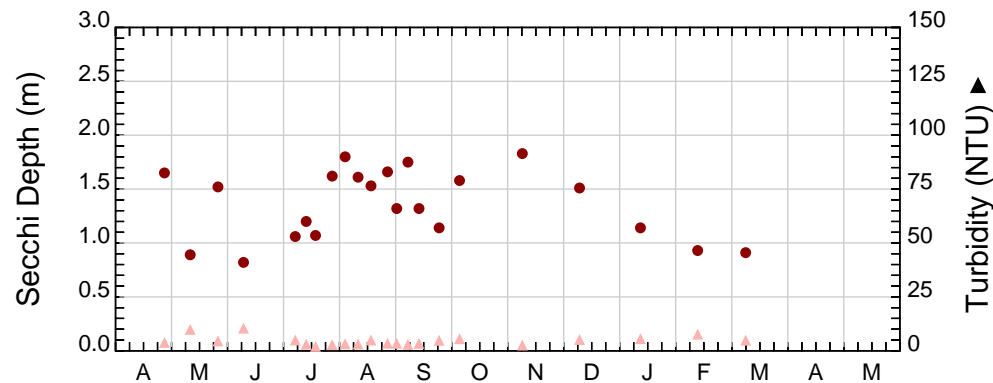
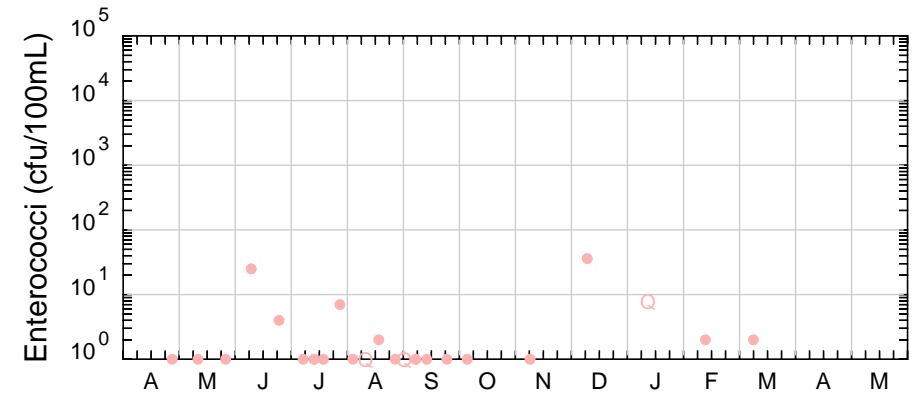
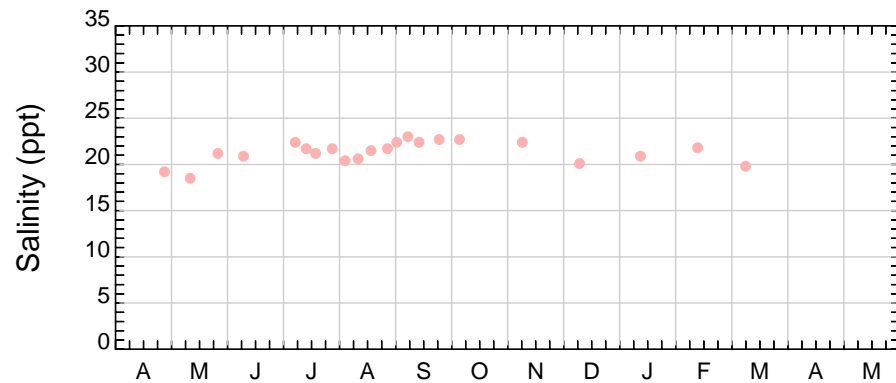
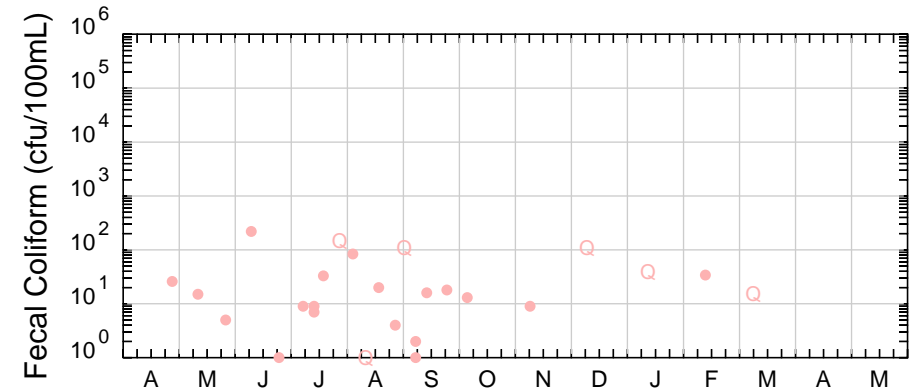
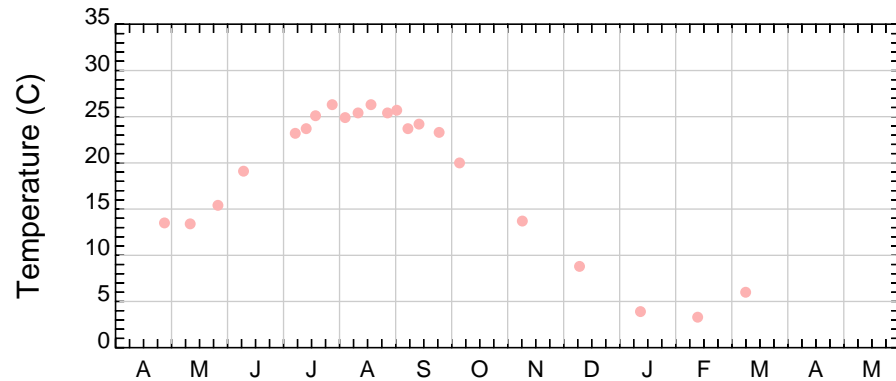
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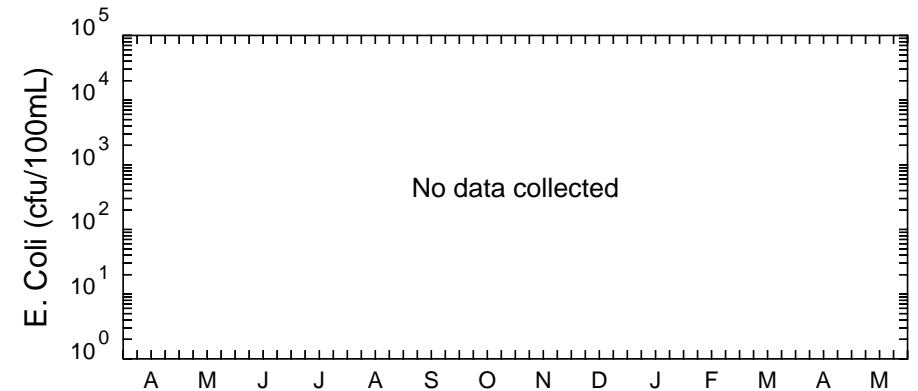
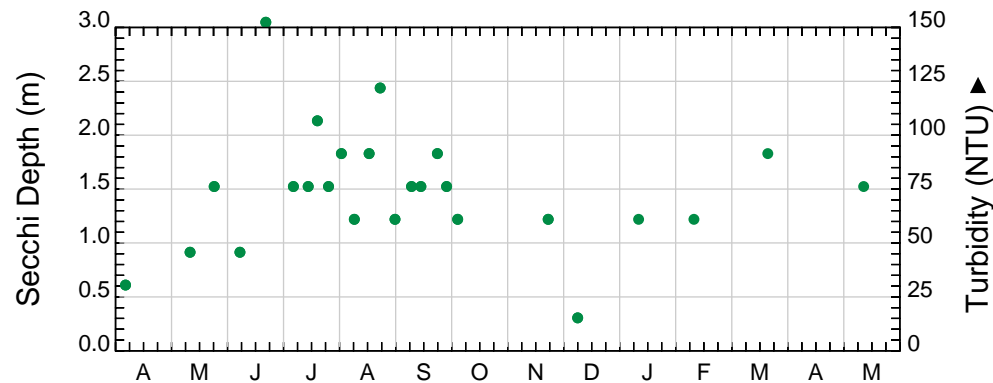
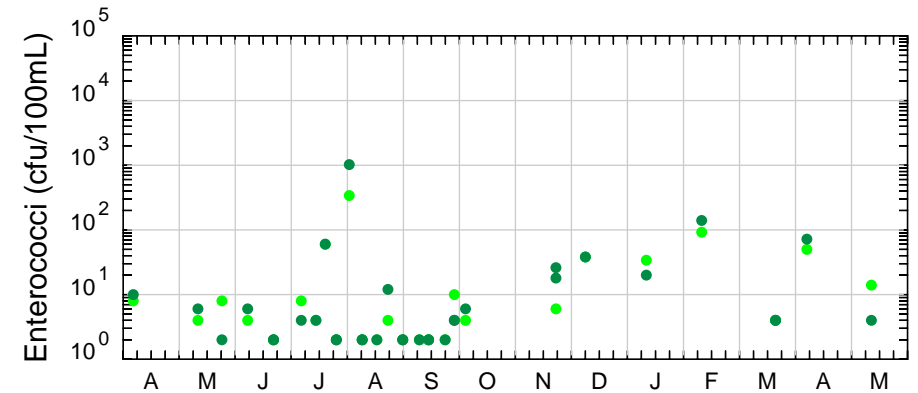
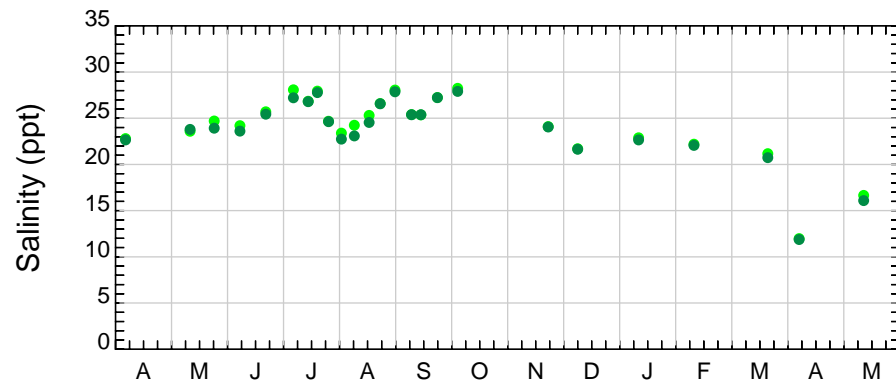
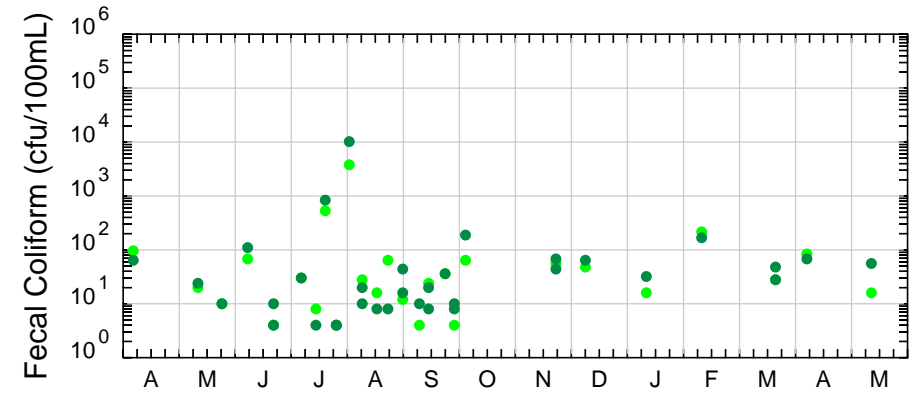
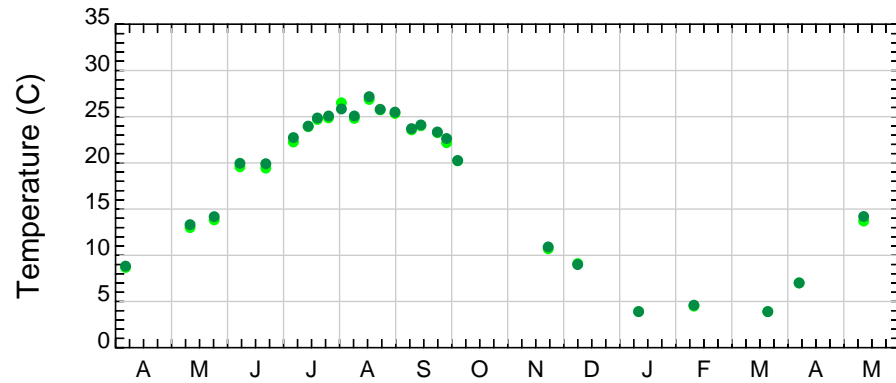
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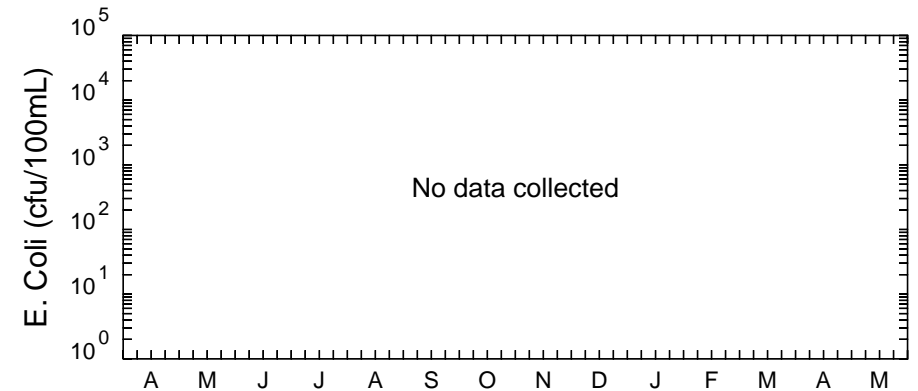
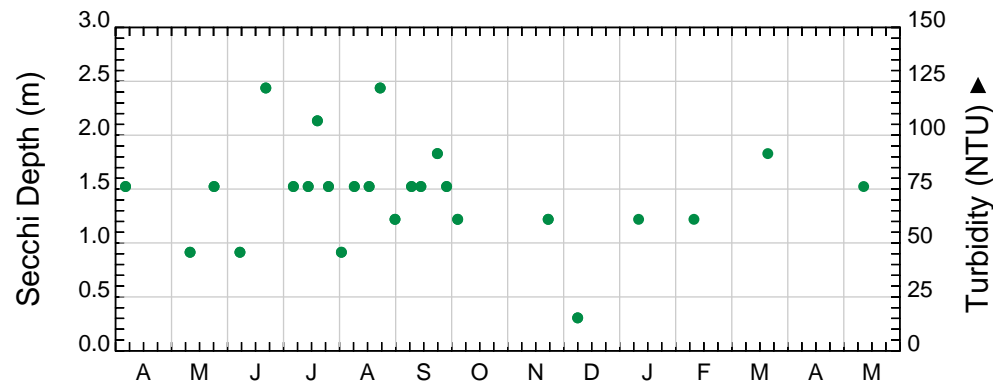
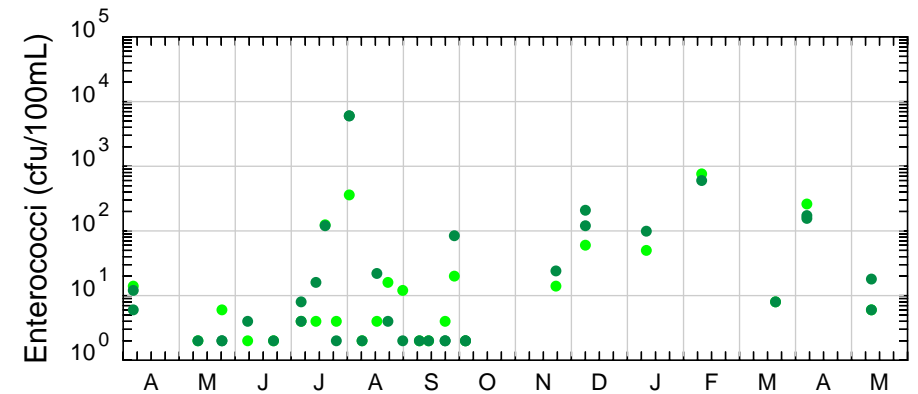
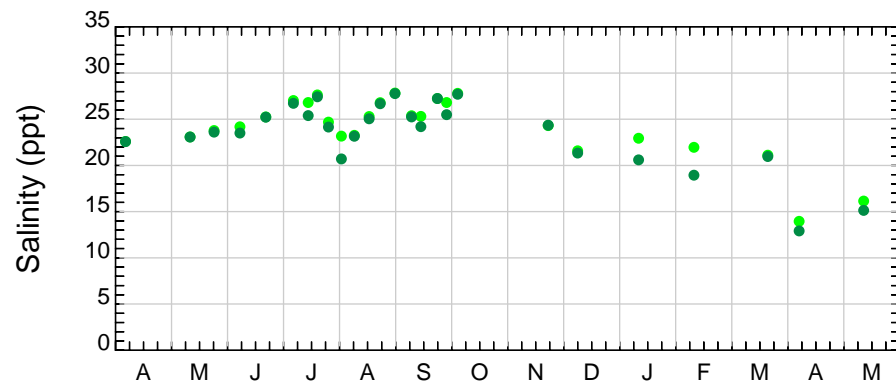
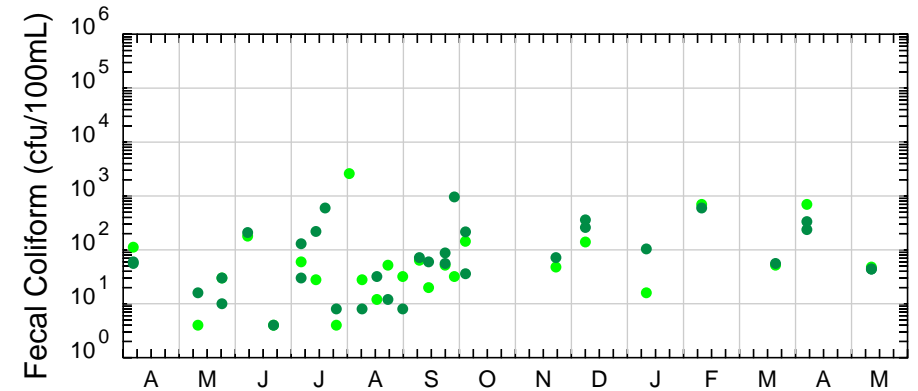
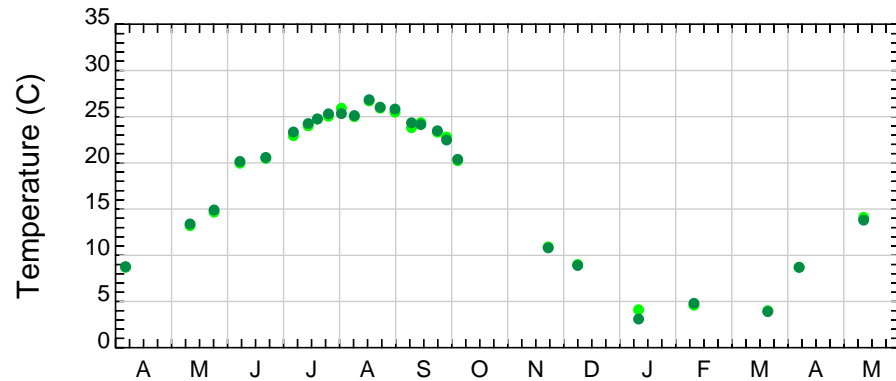
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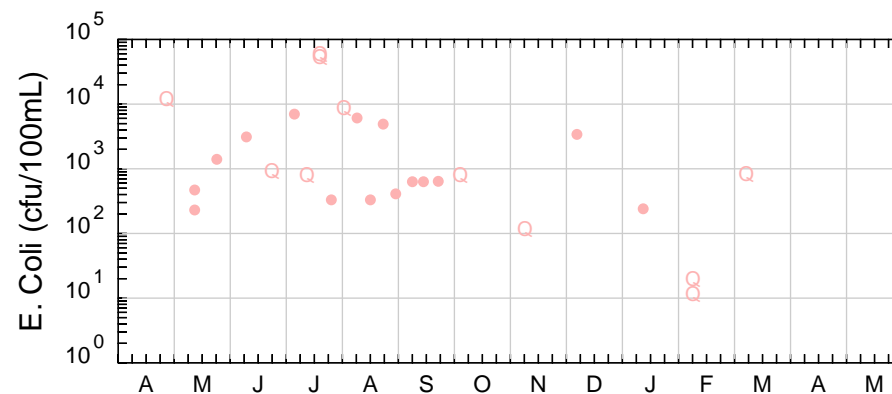
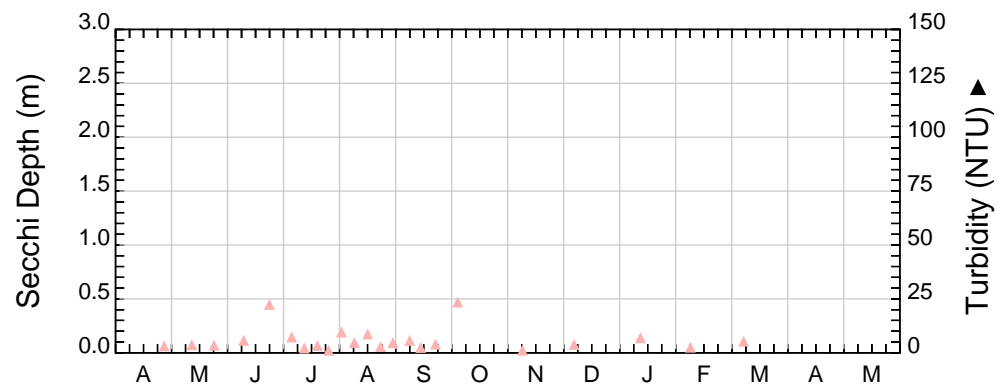
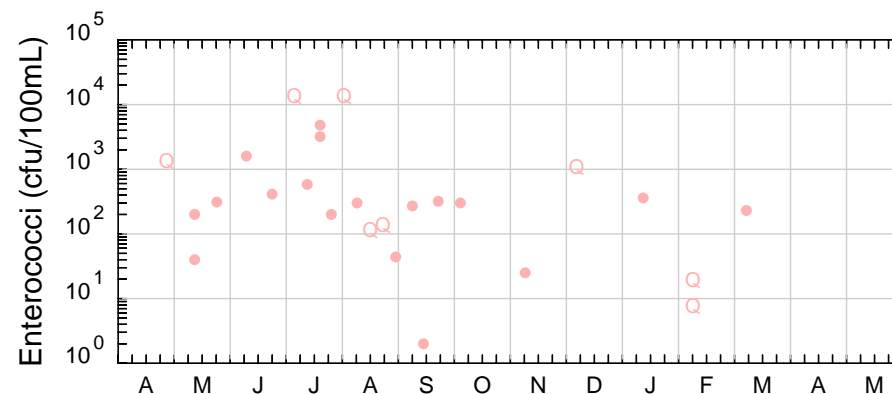
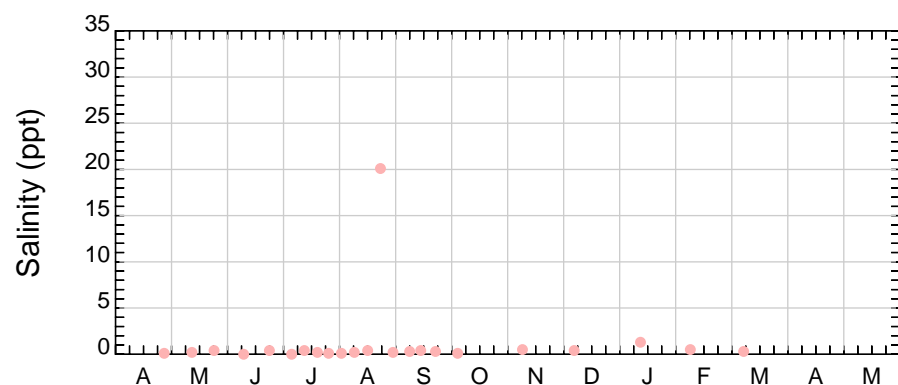
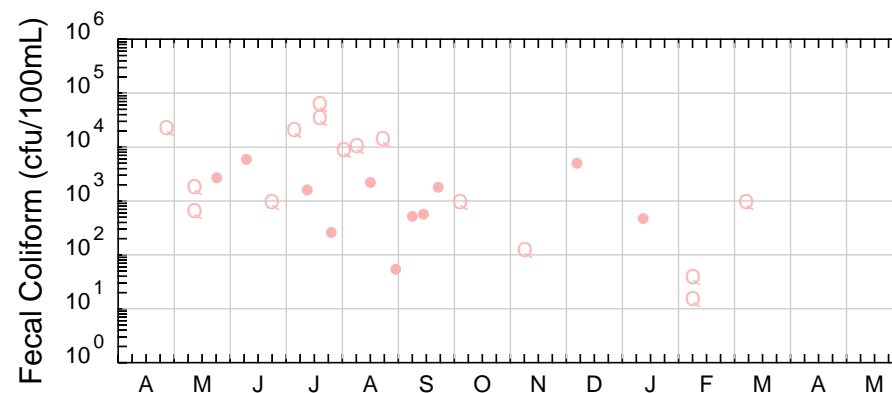
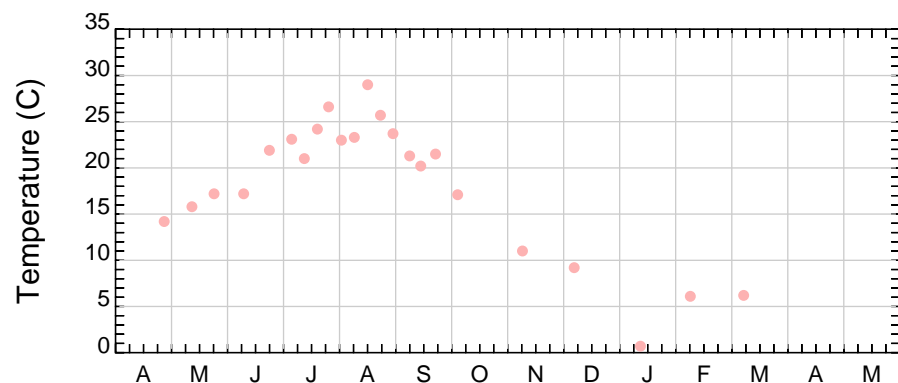
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● ● ● Surface/Mid-depth HDR
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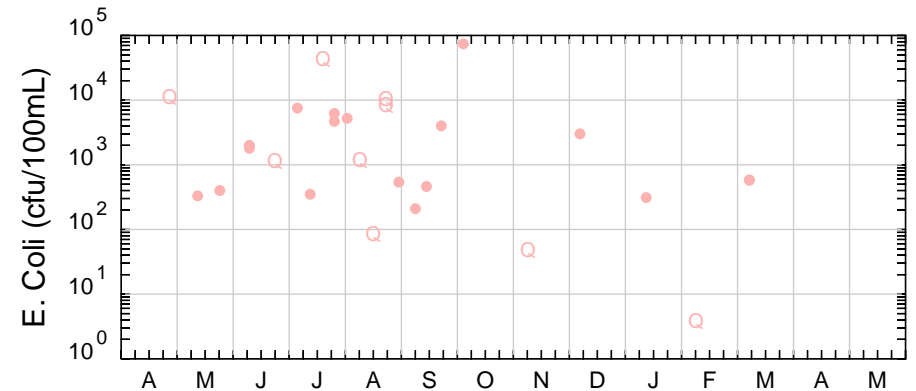
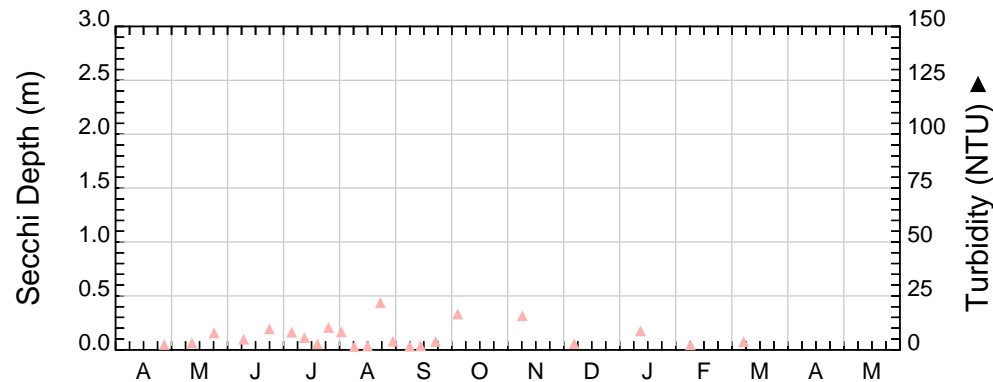
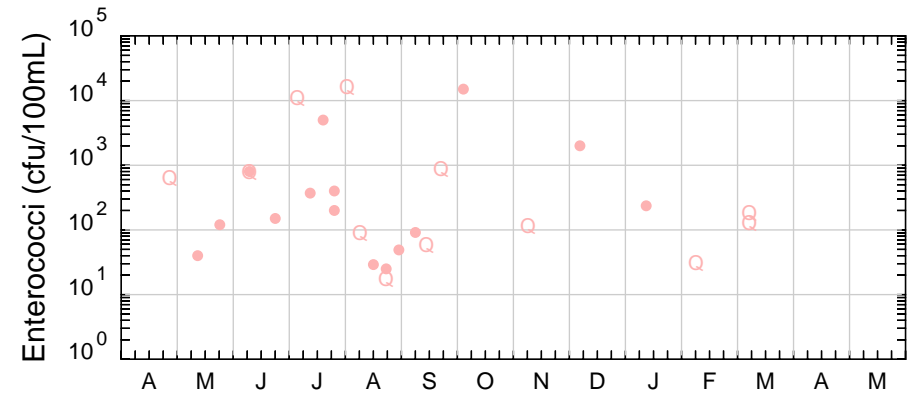
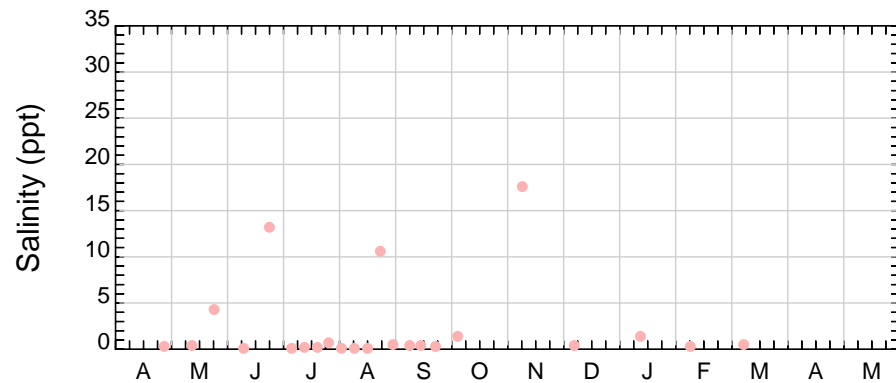
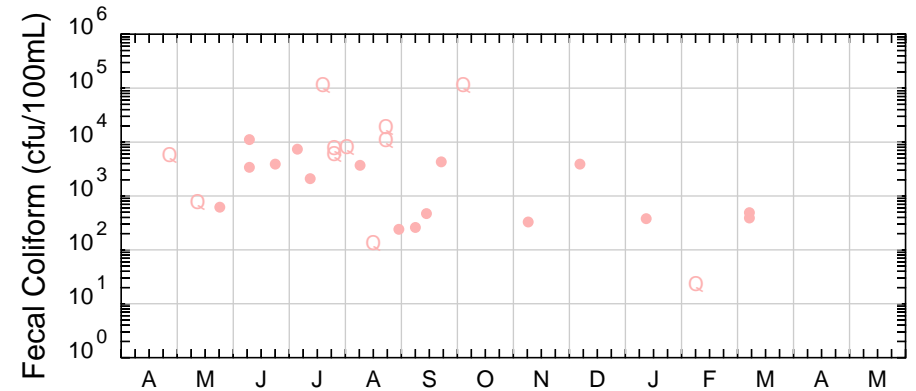
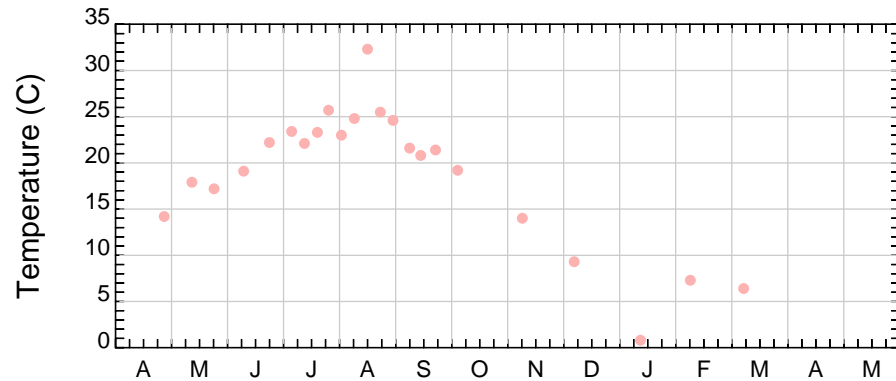
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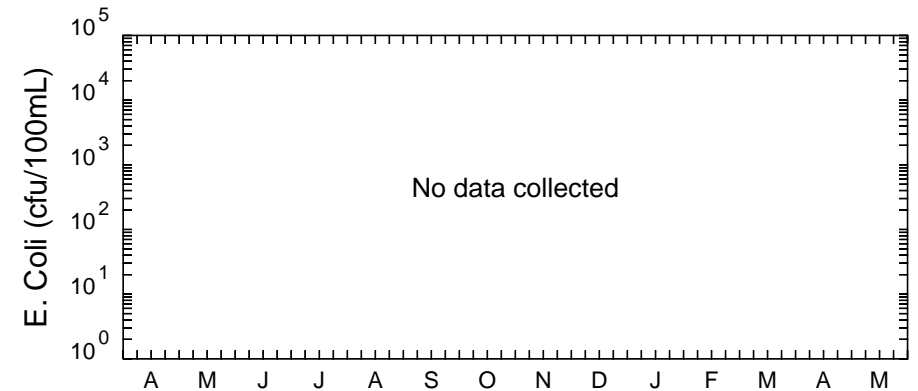
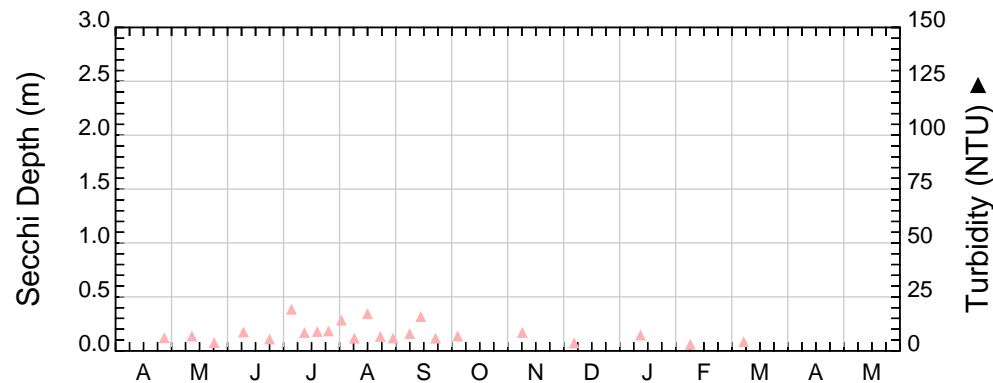
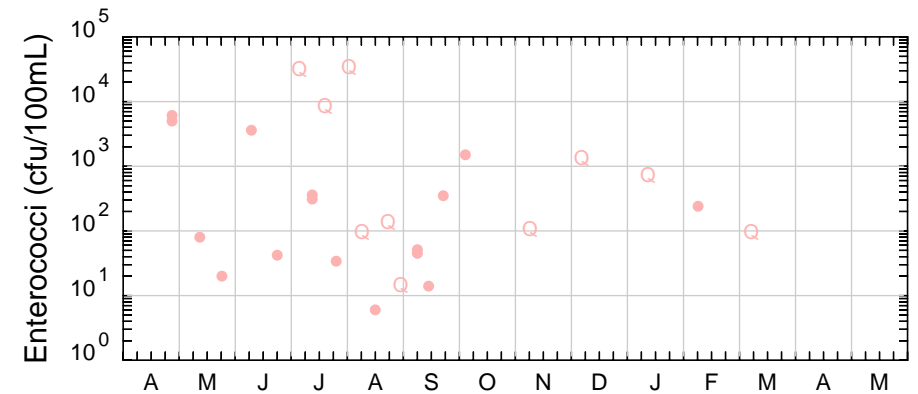
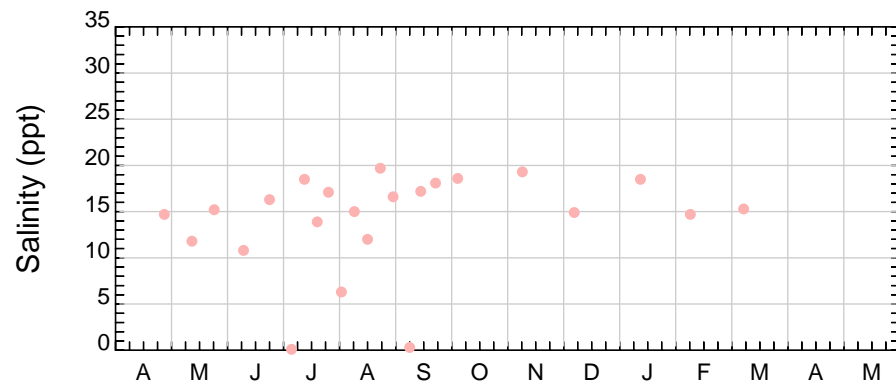
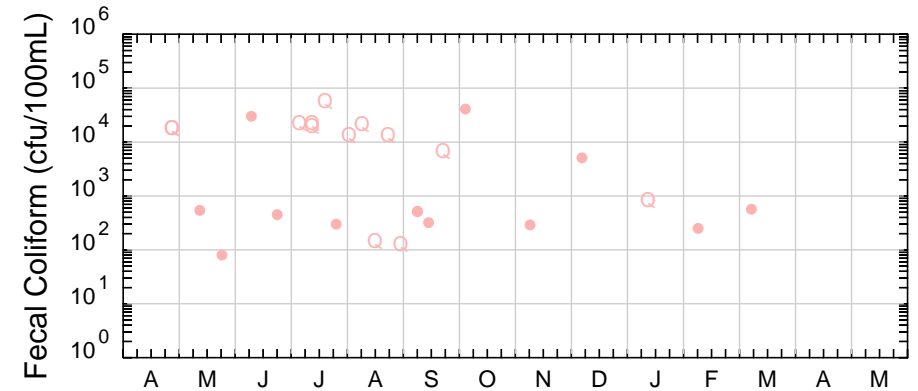
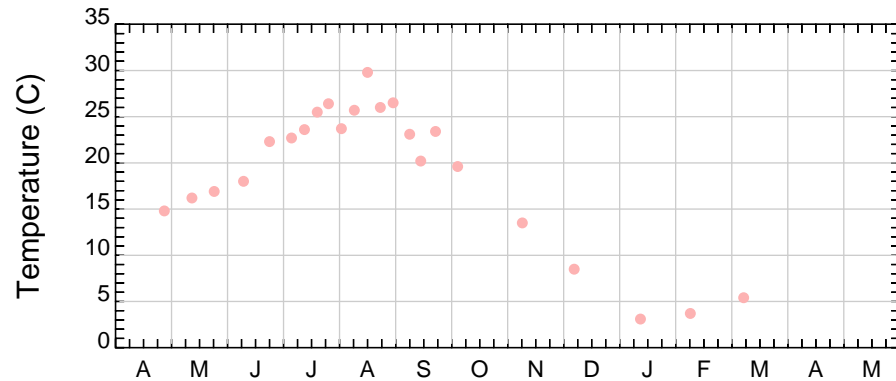
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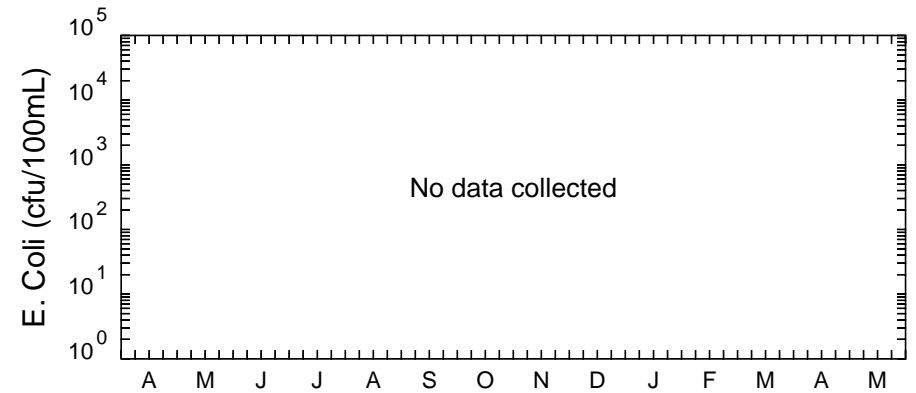
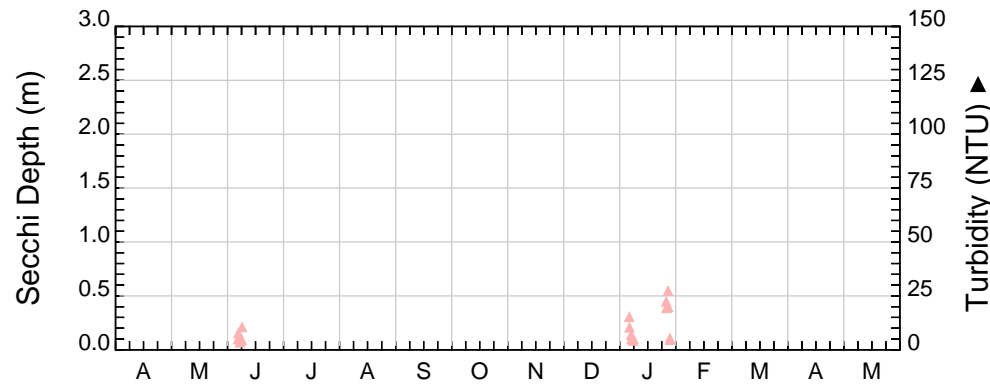
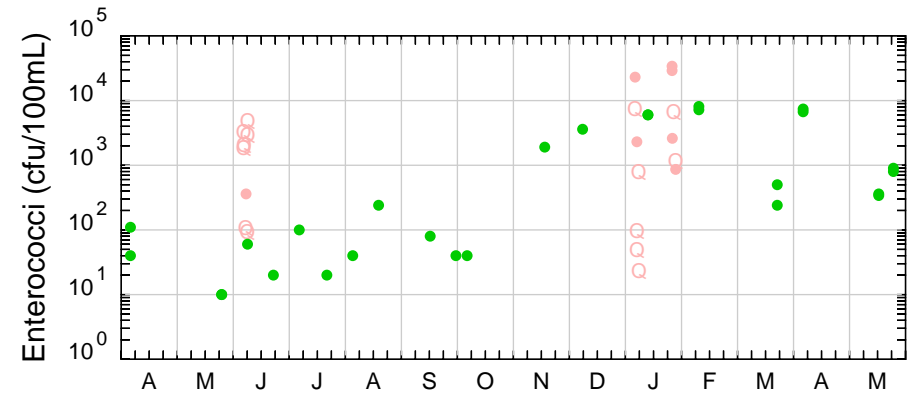
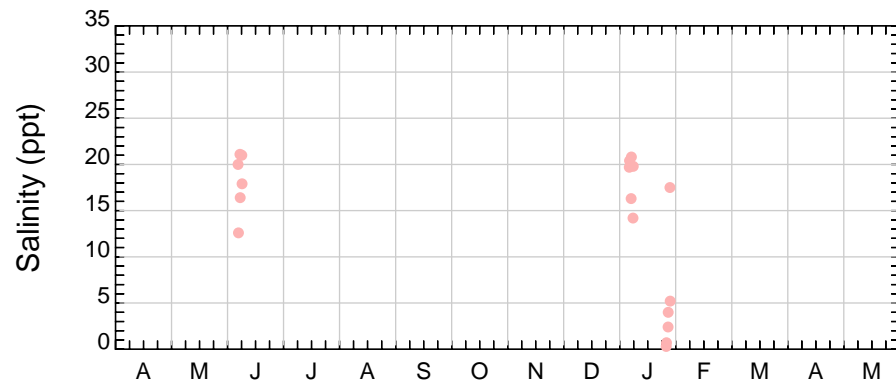
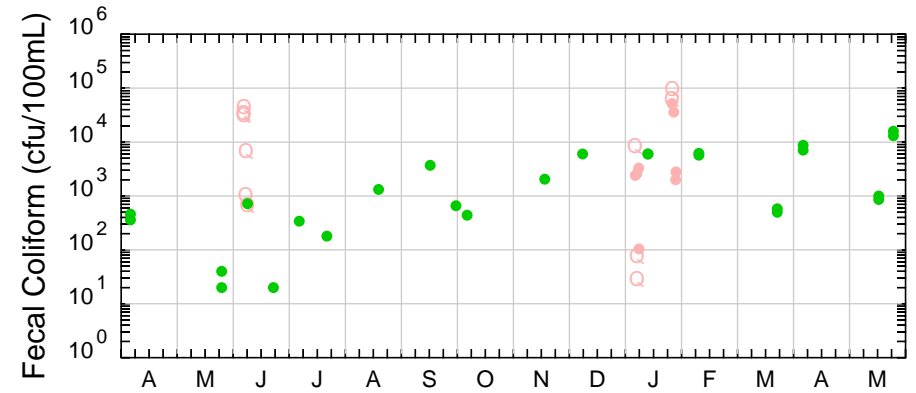
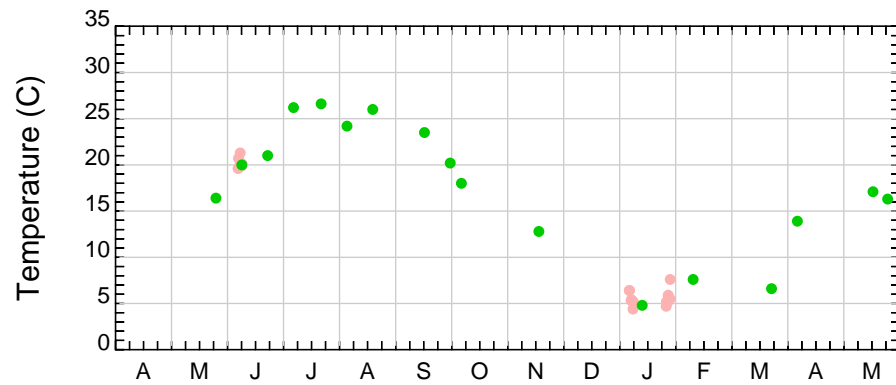
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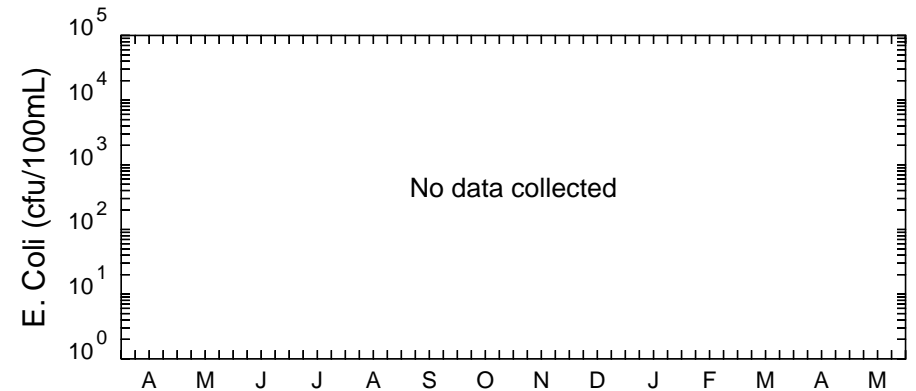
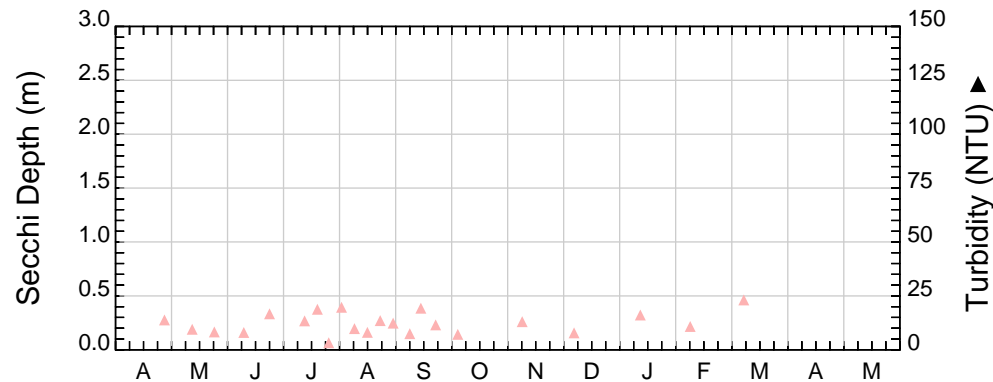
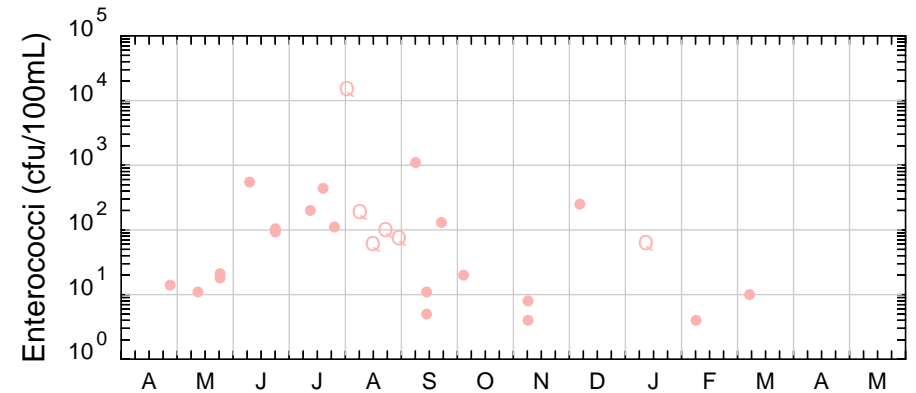
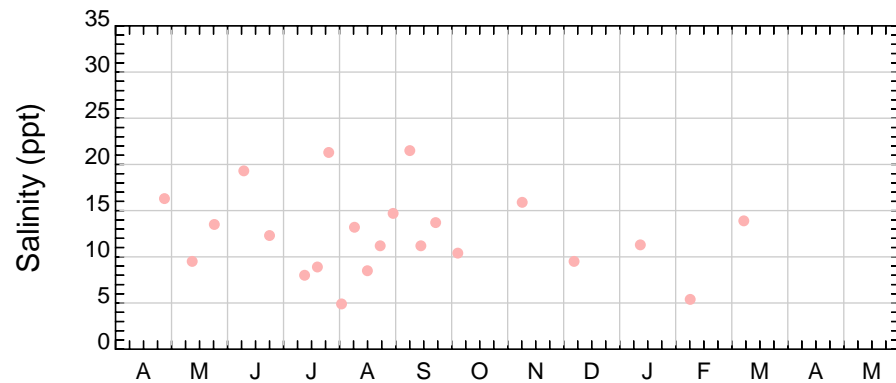
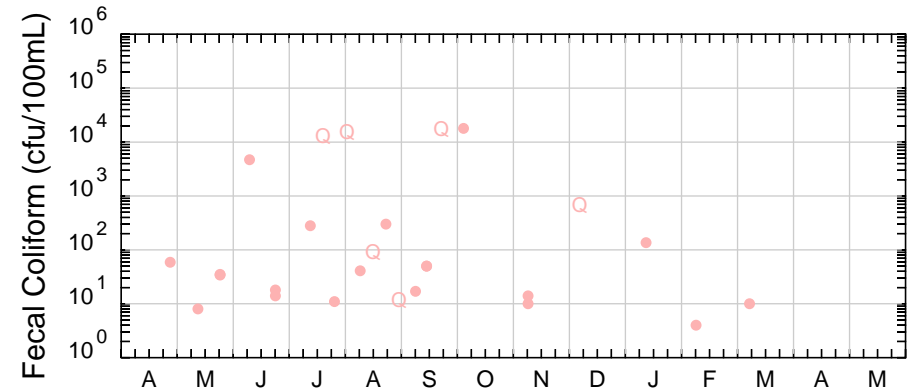
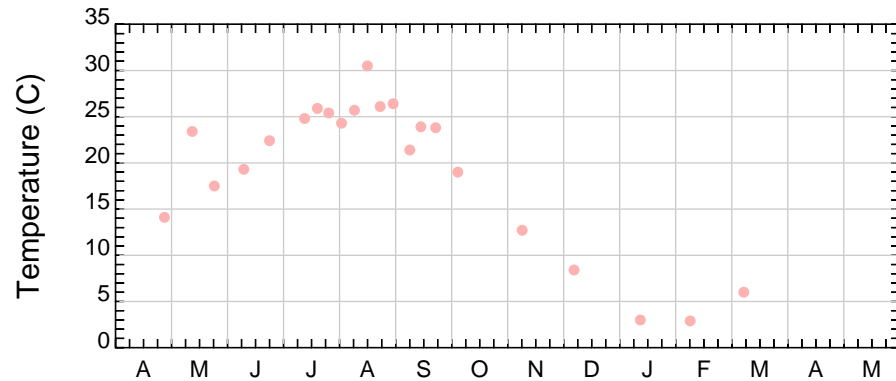


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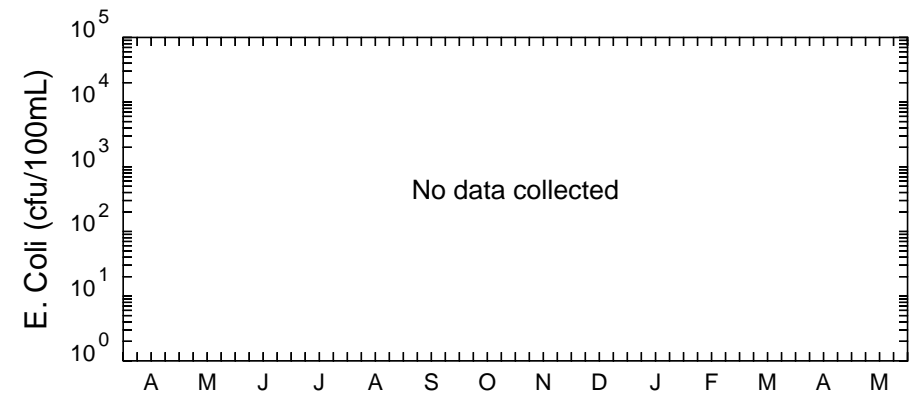
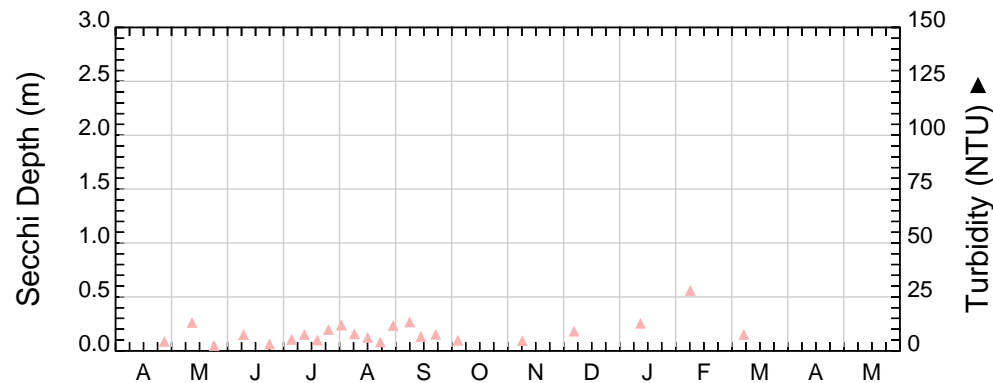
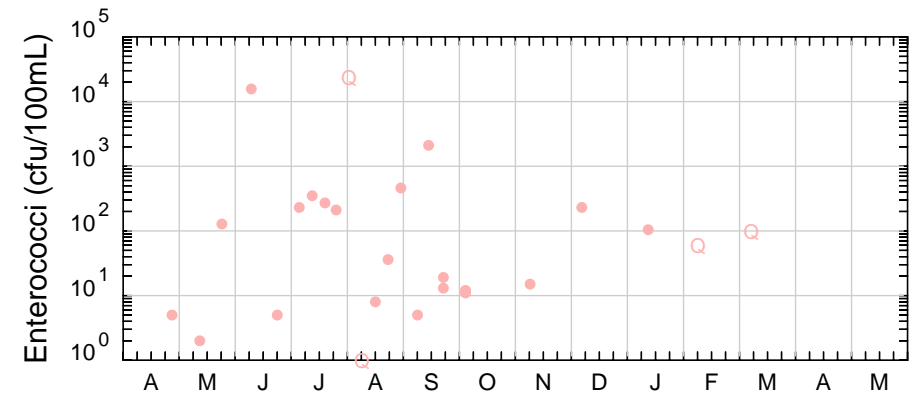
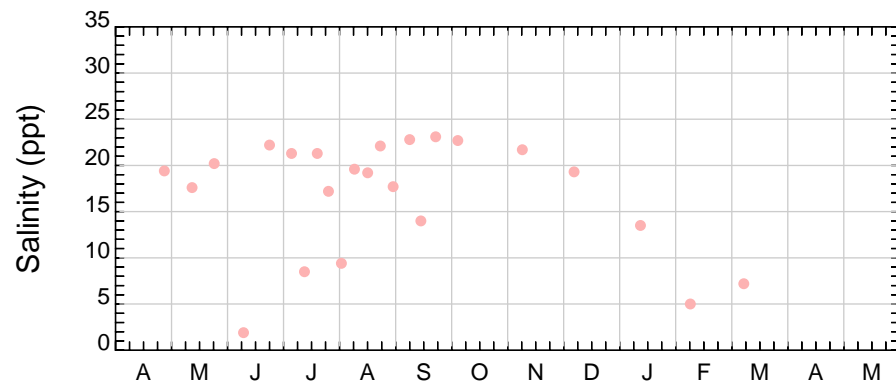
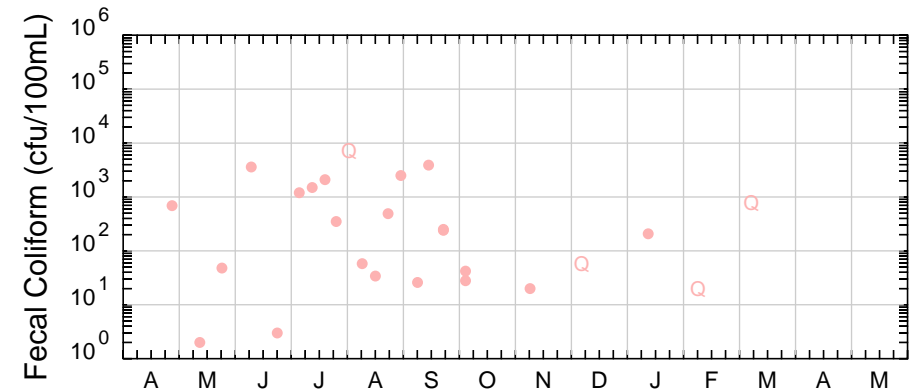
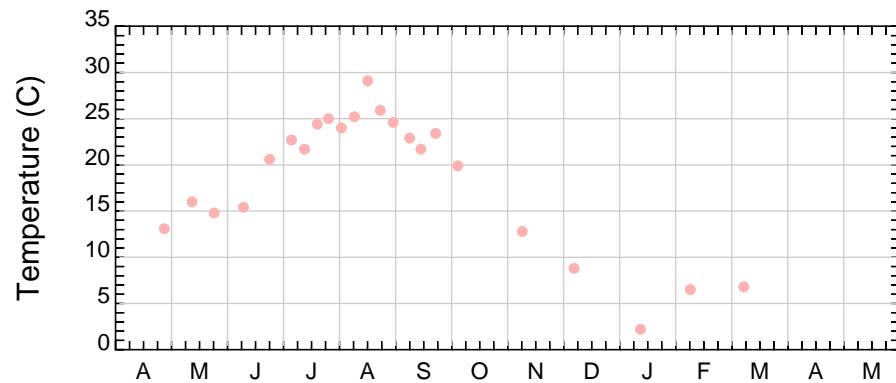


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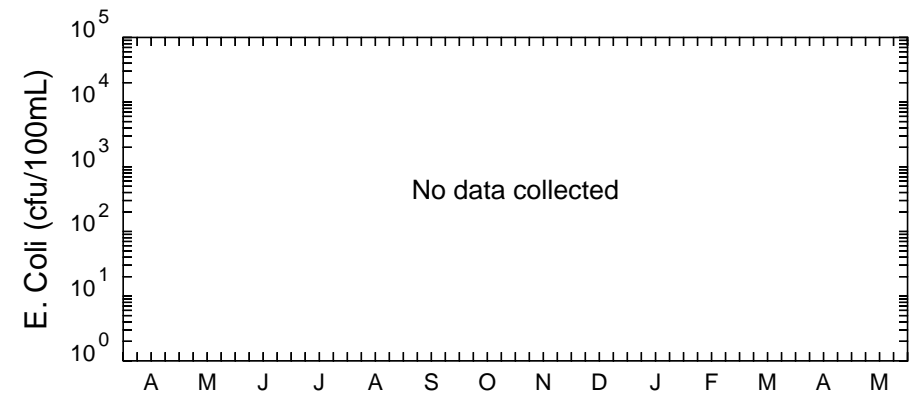
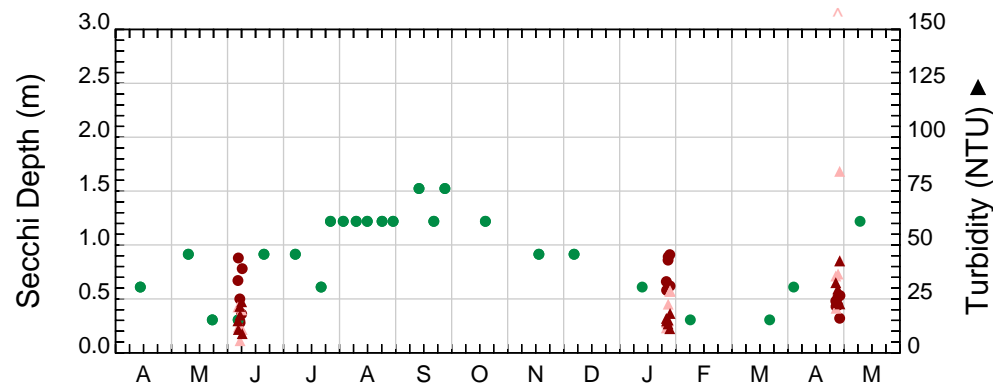
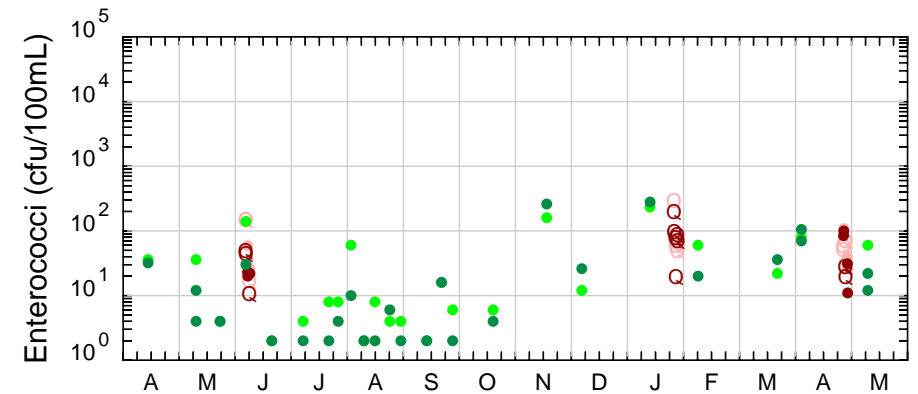
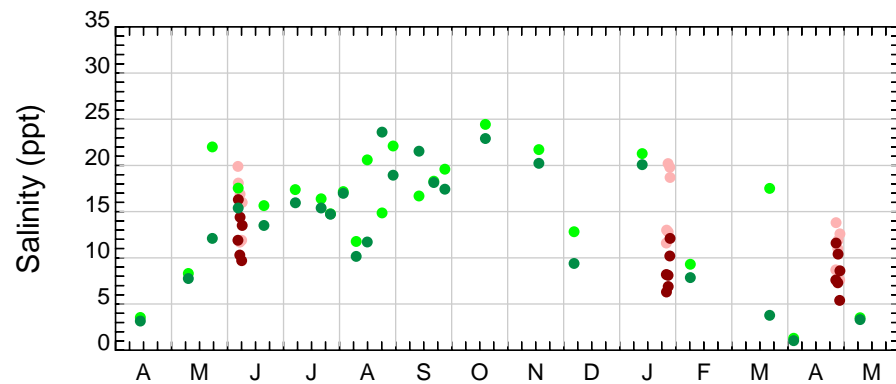
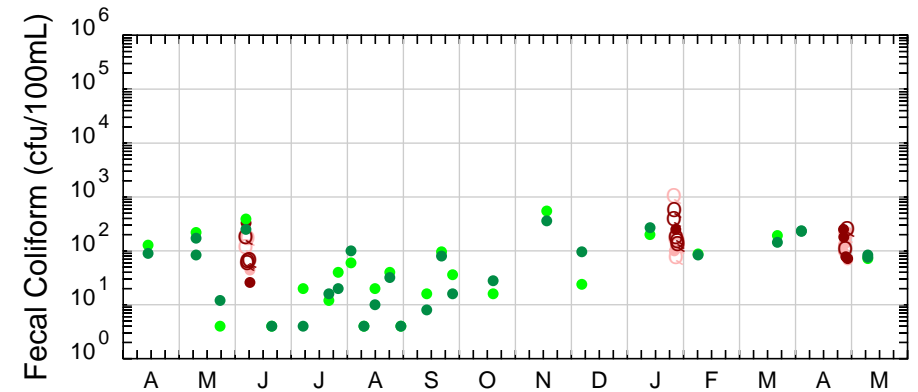
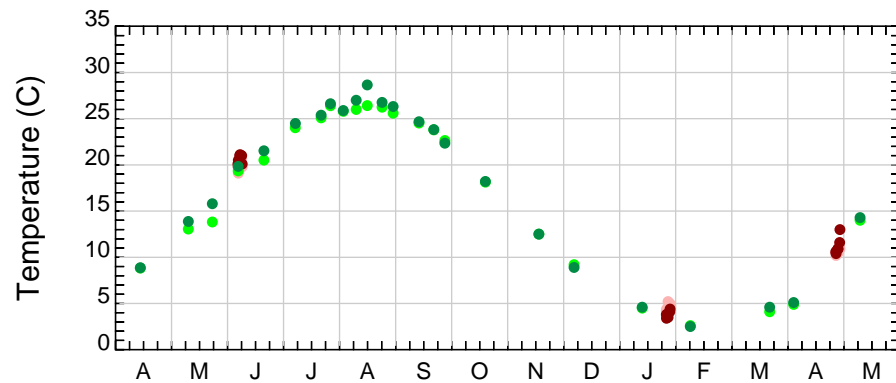
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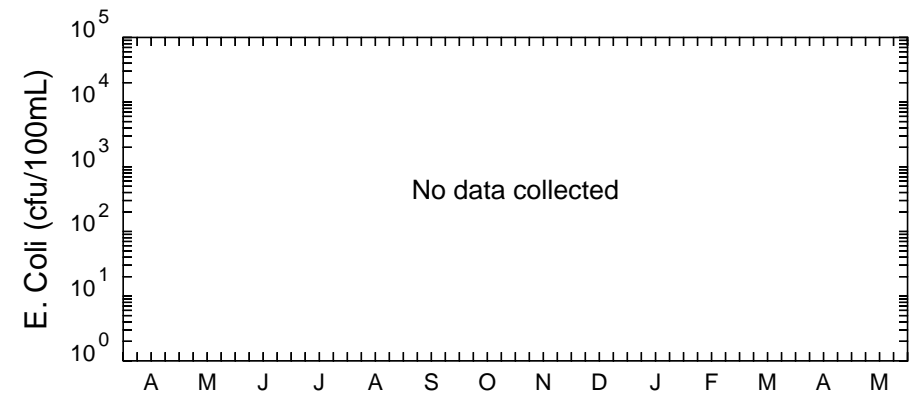
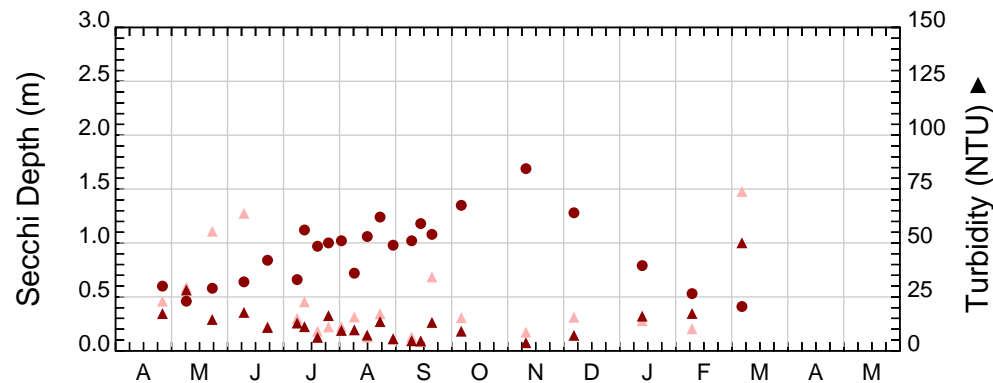
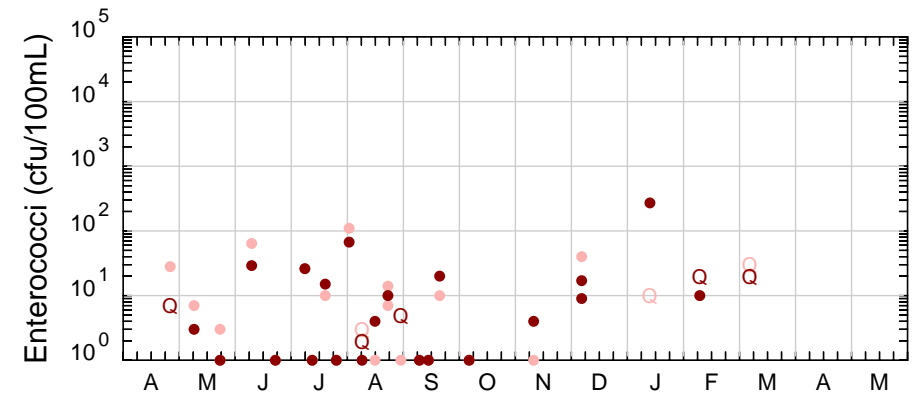
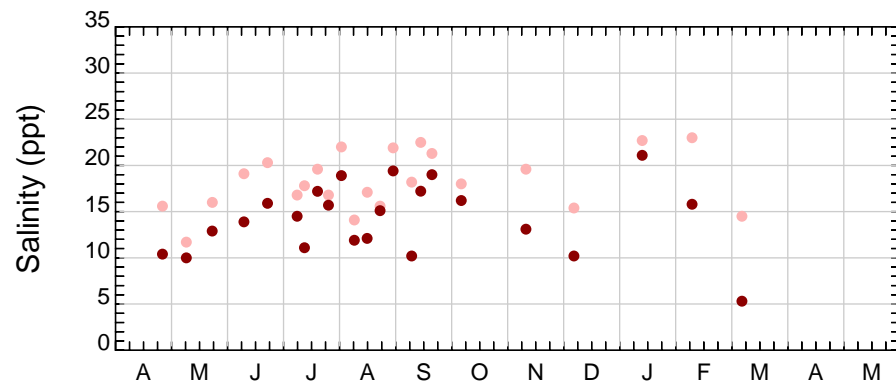
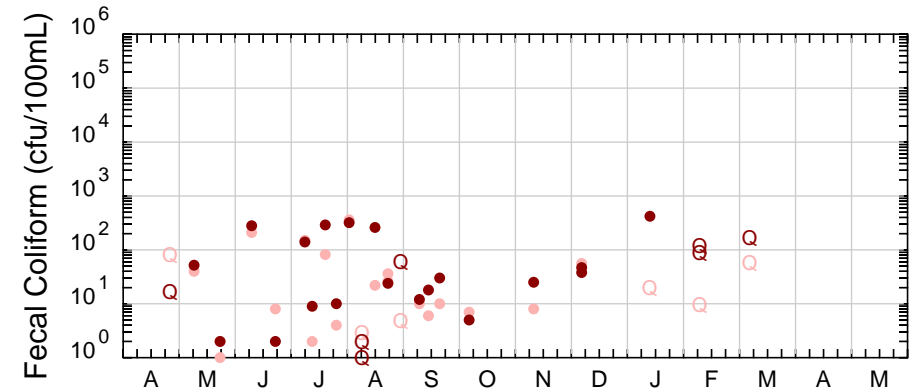
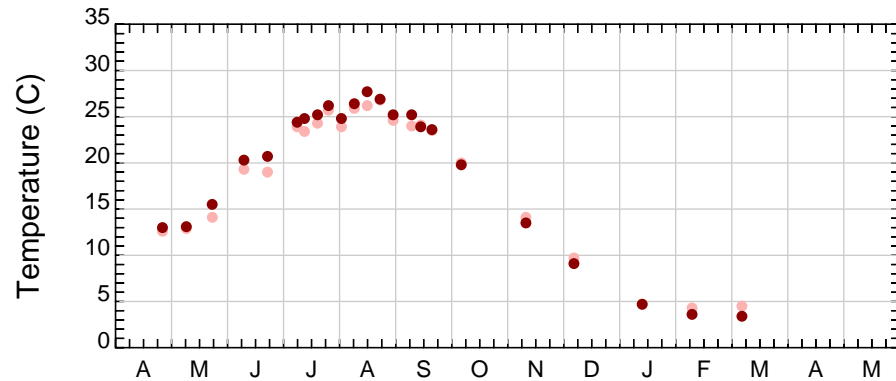


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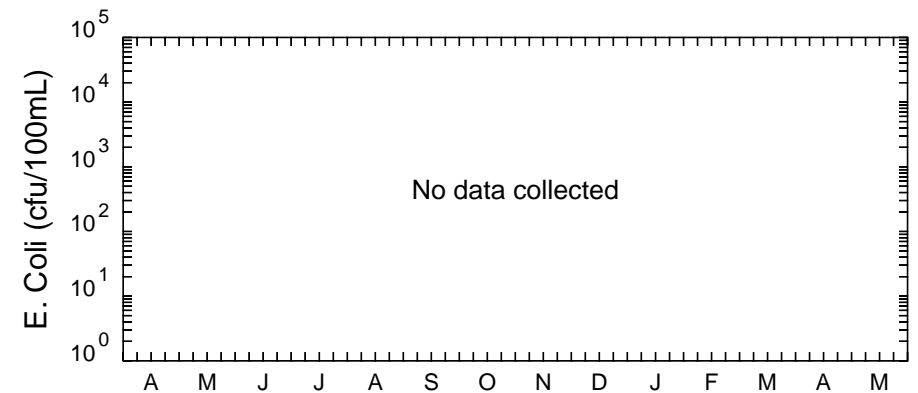
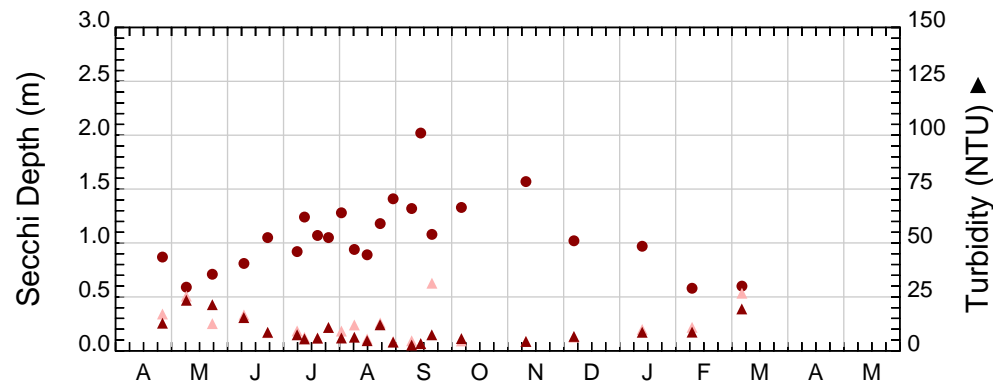
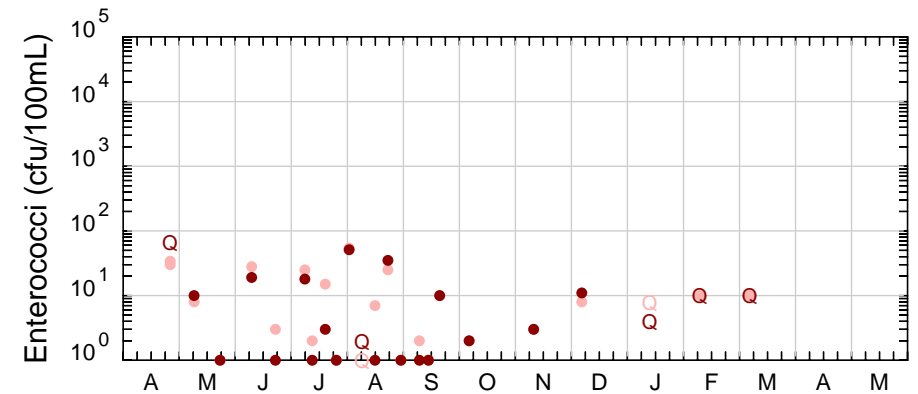
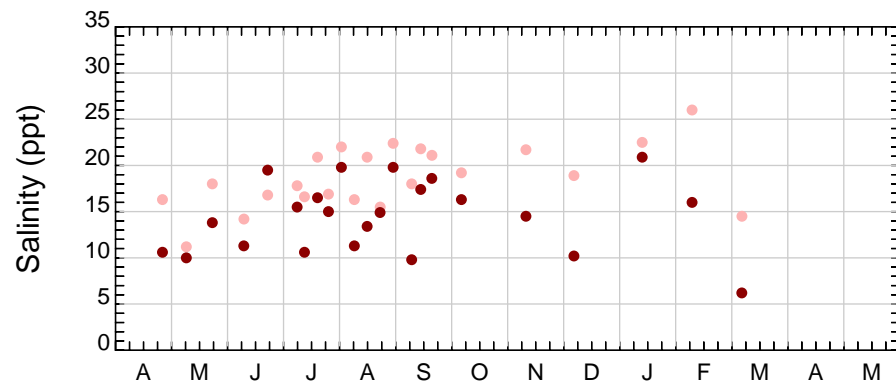
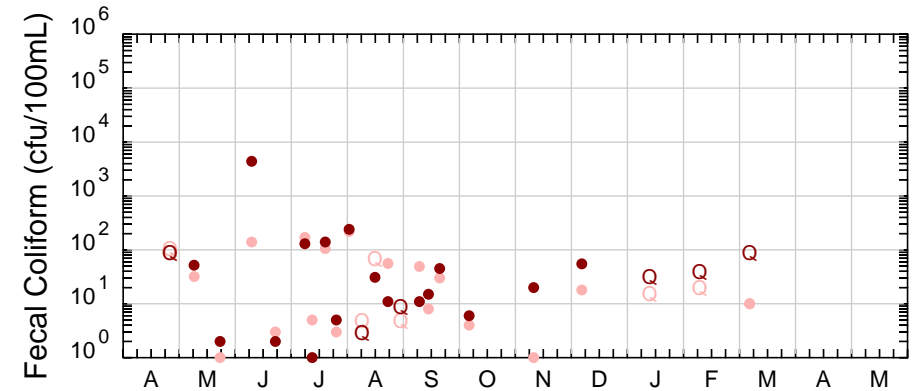
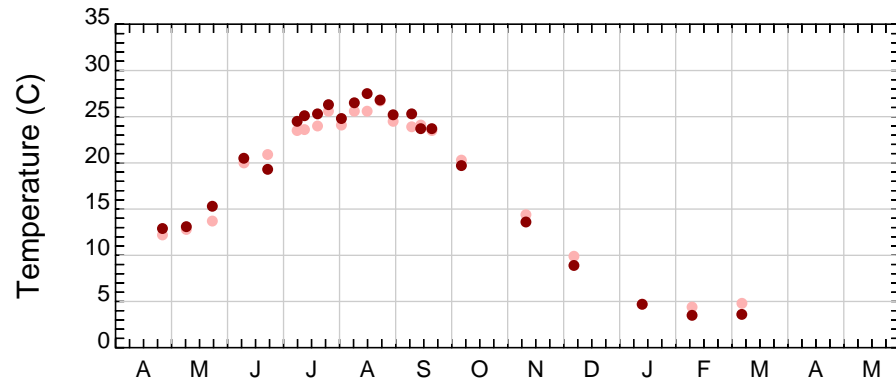


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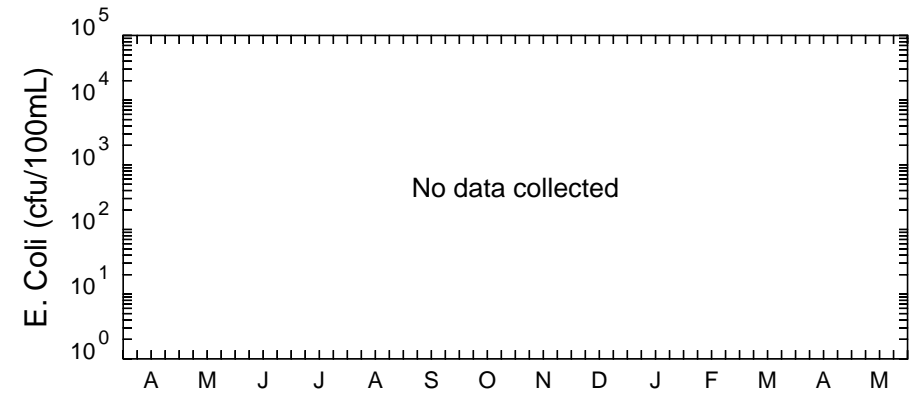
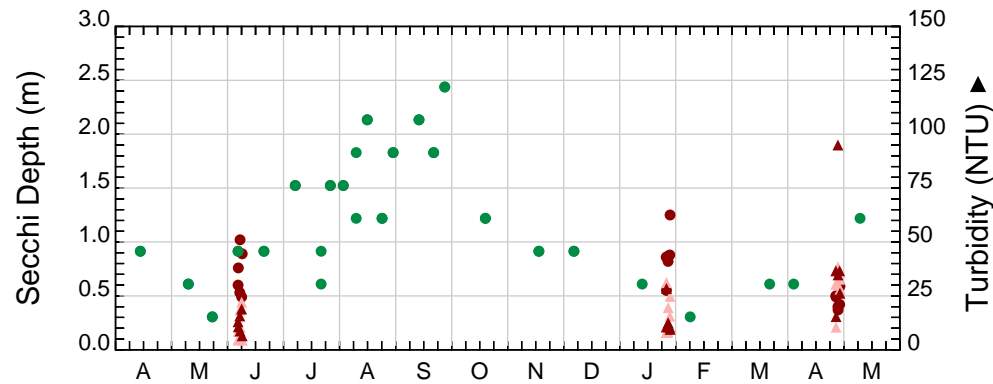
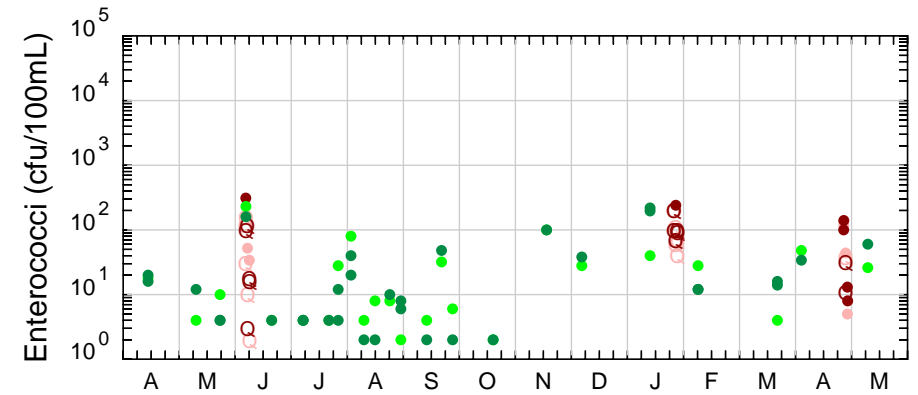
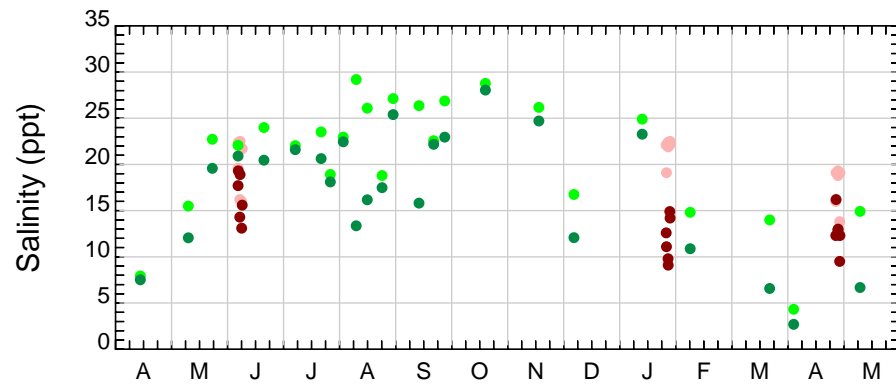
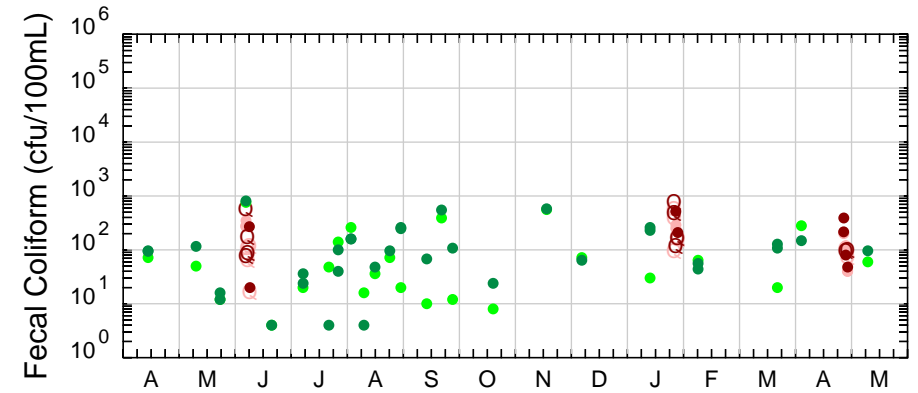
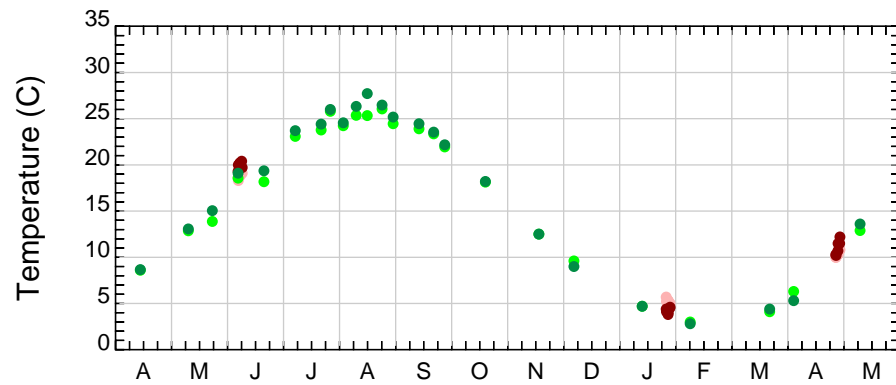
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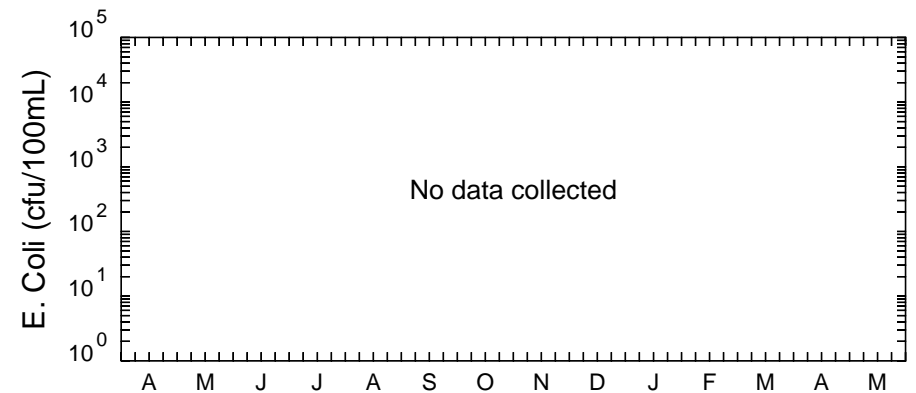
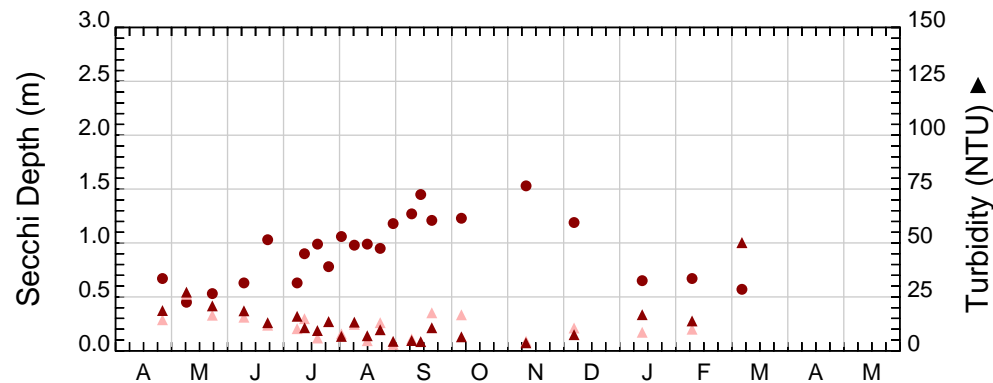
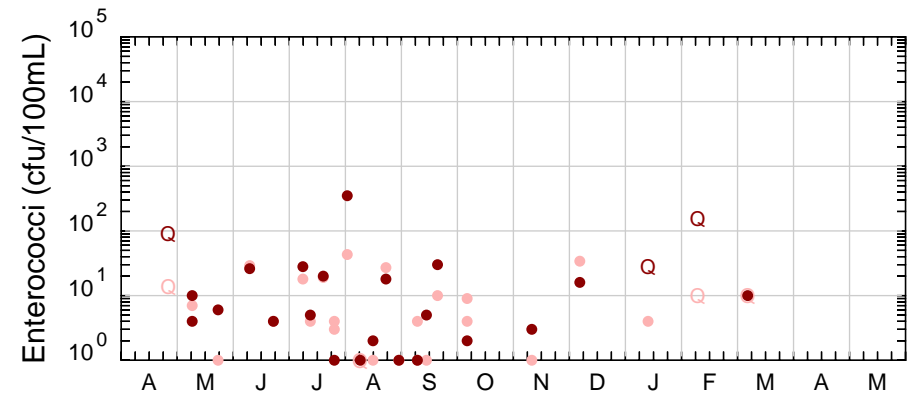
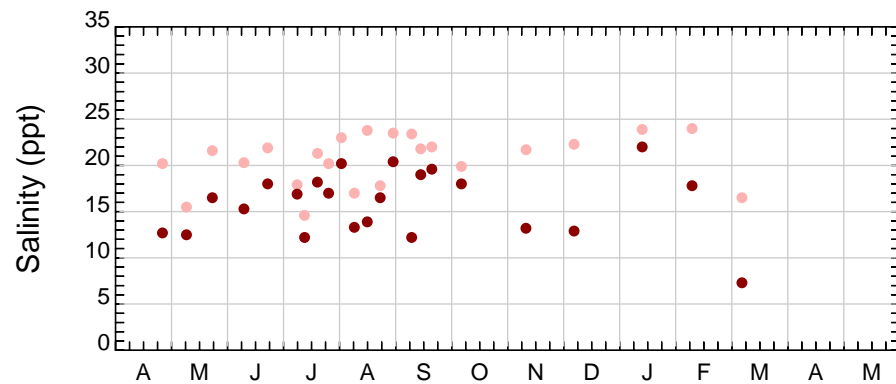
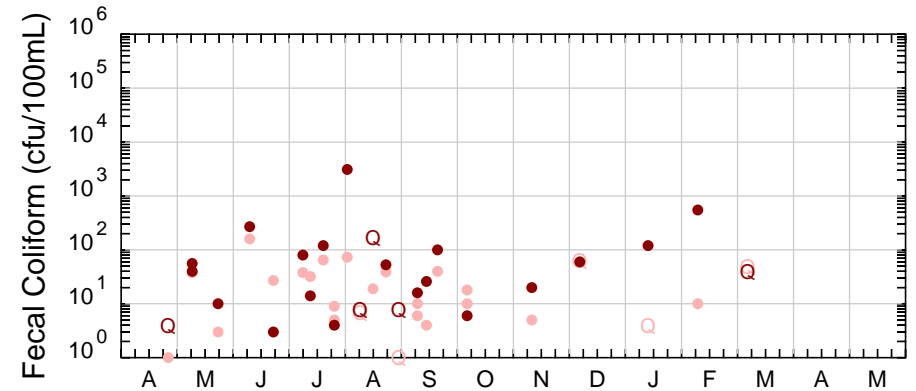
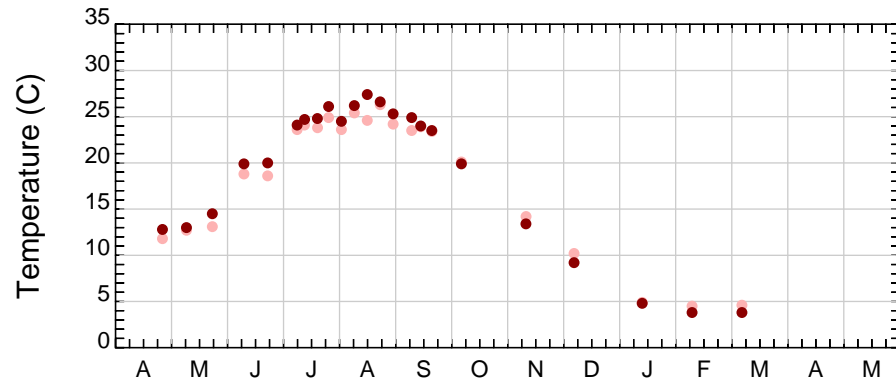
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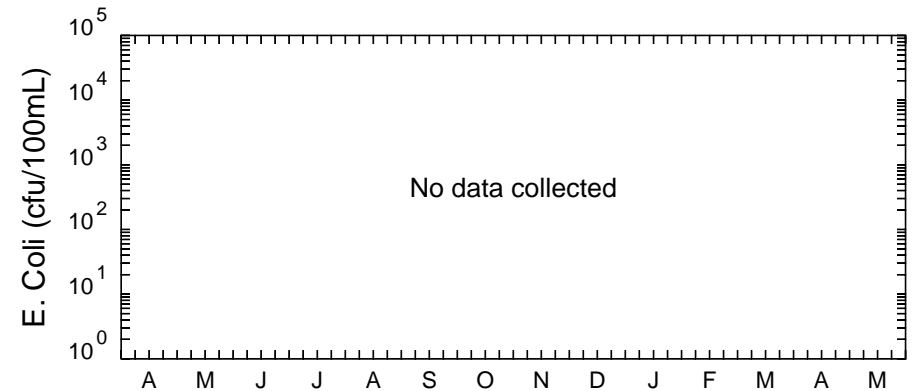
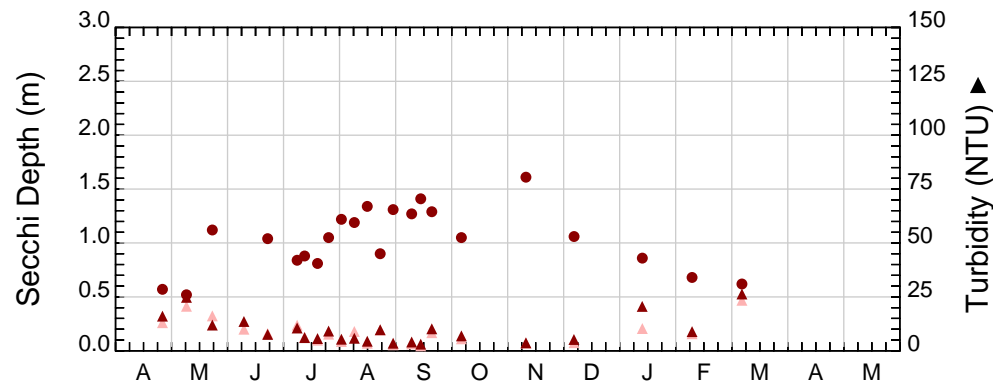
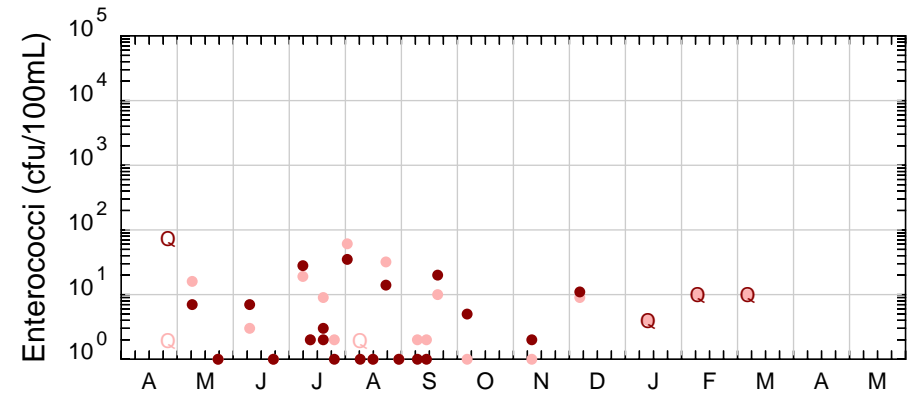
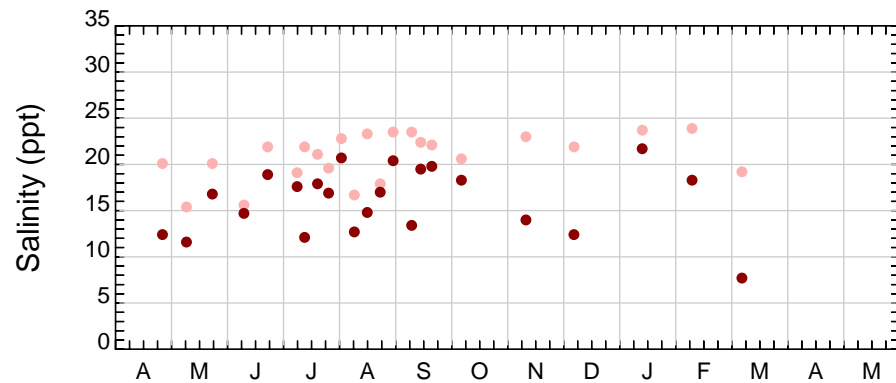
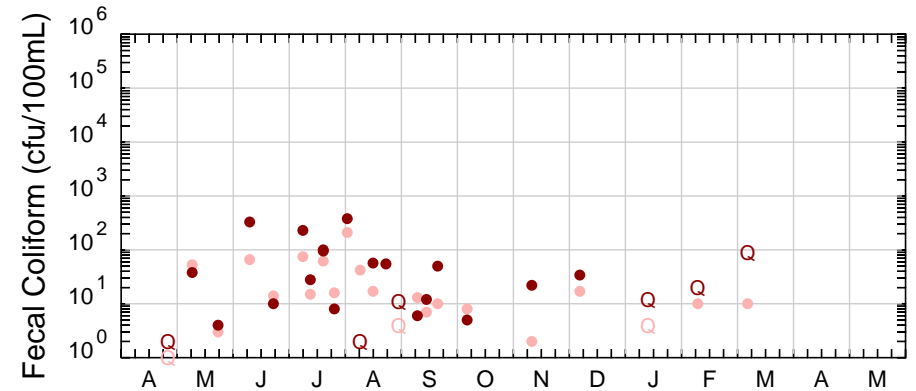
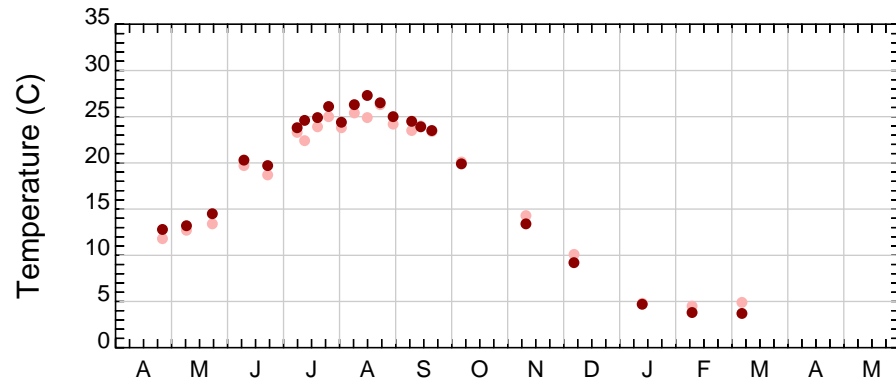
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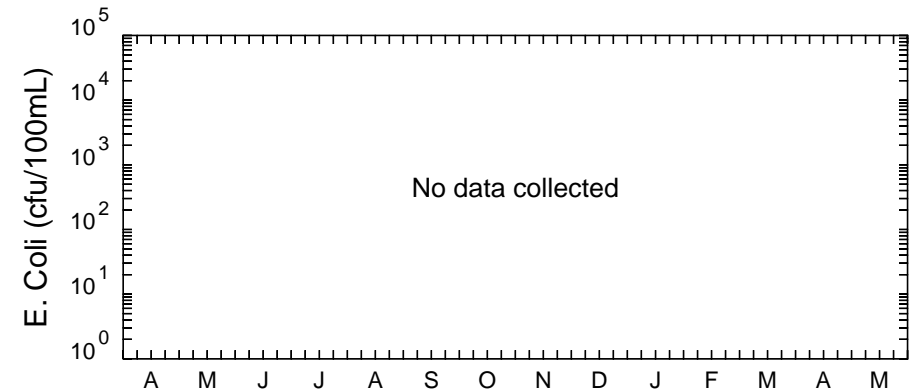
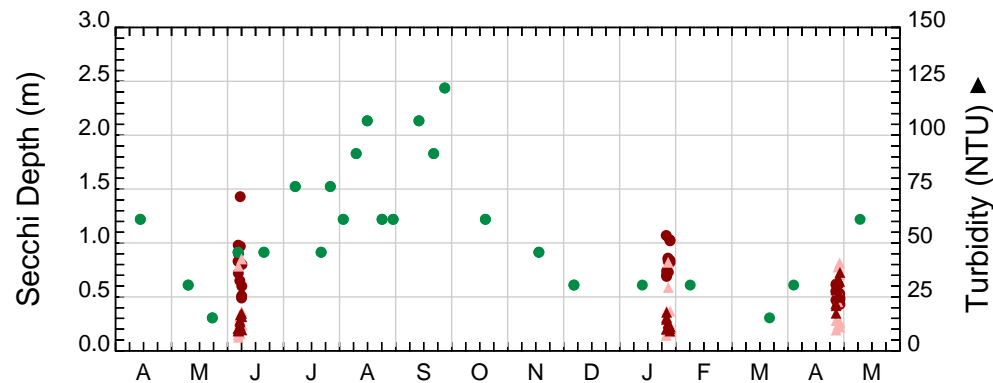
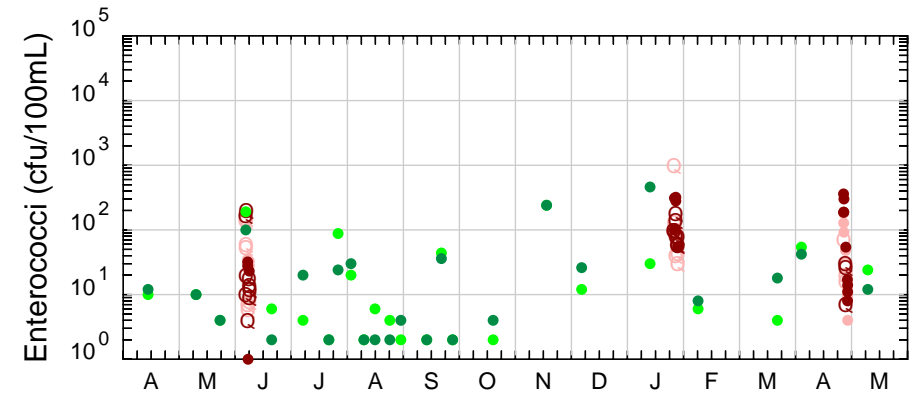
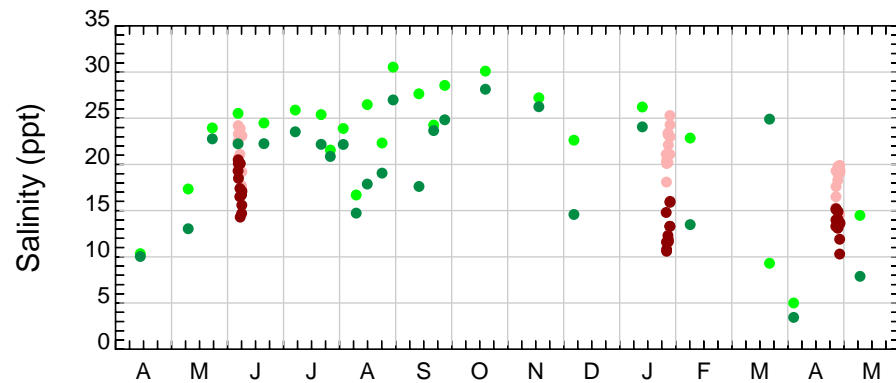
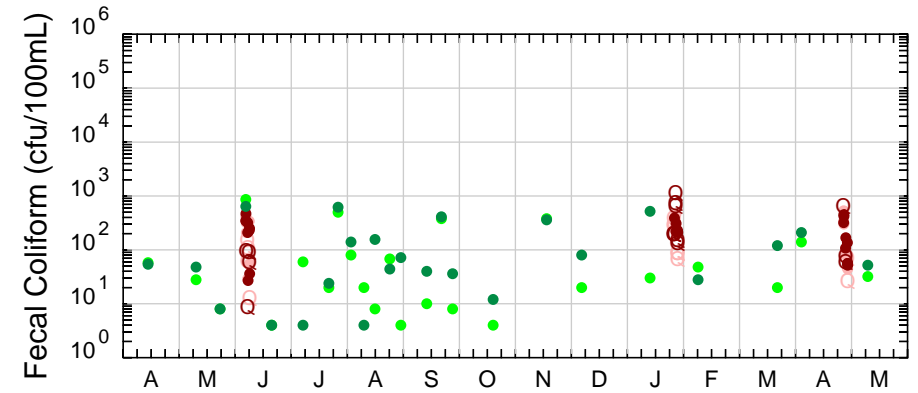
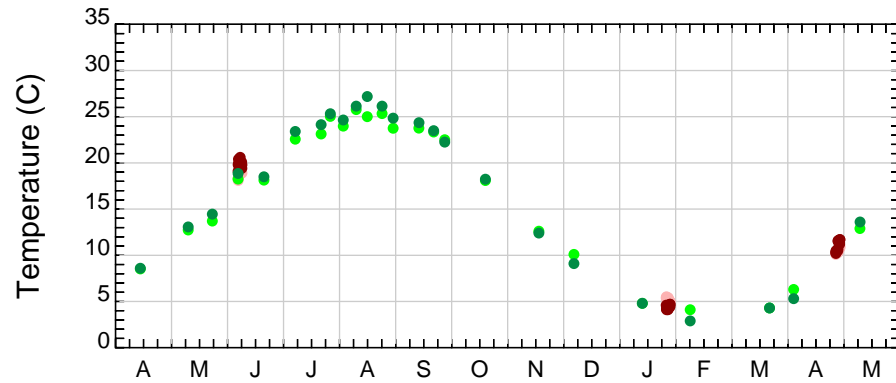
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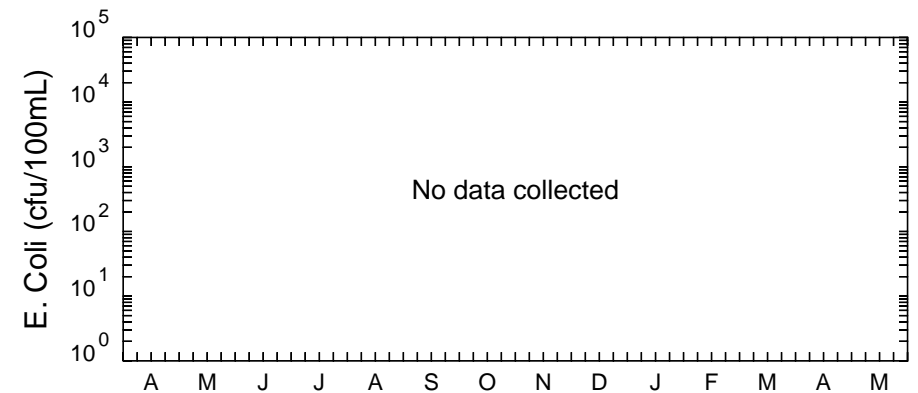
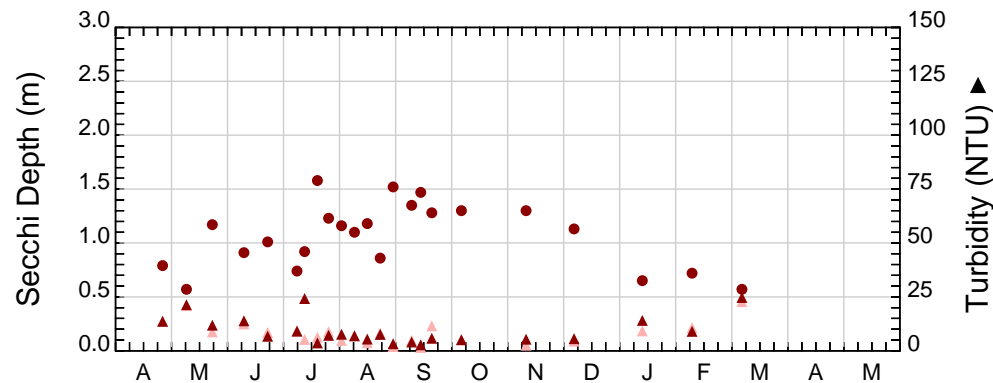
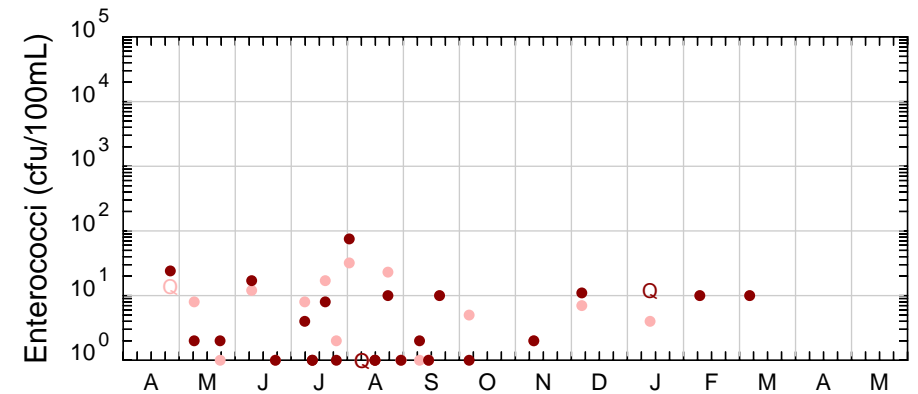
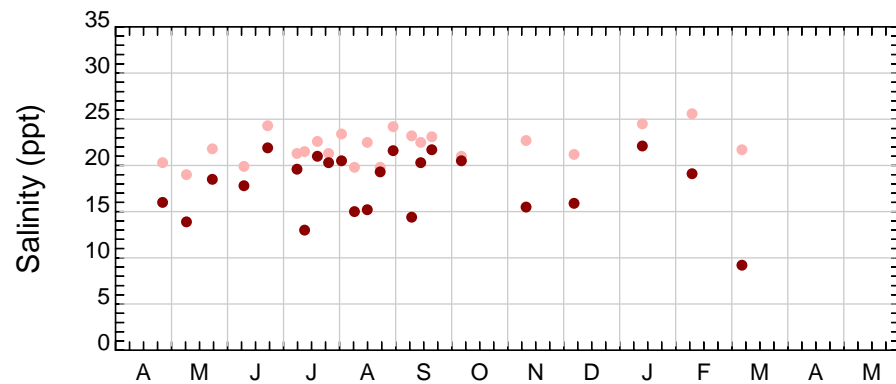
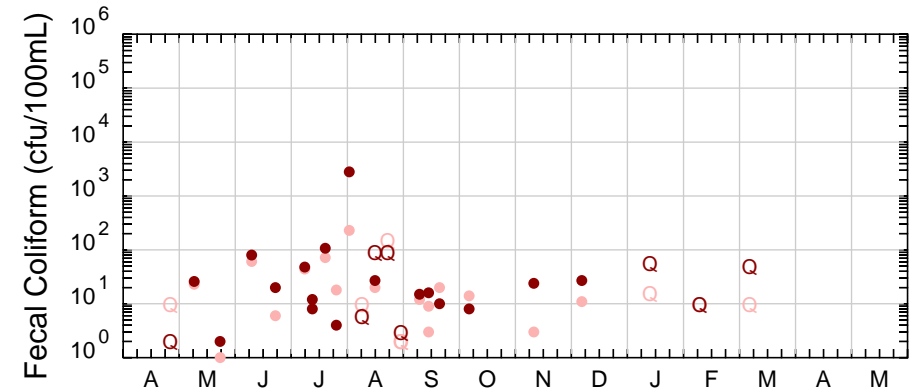
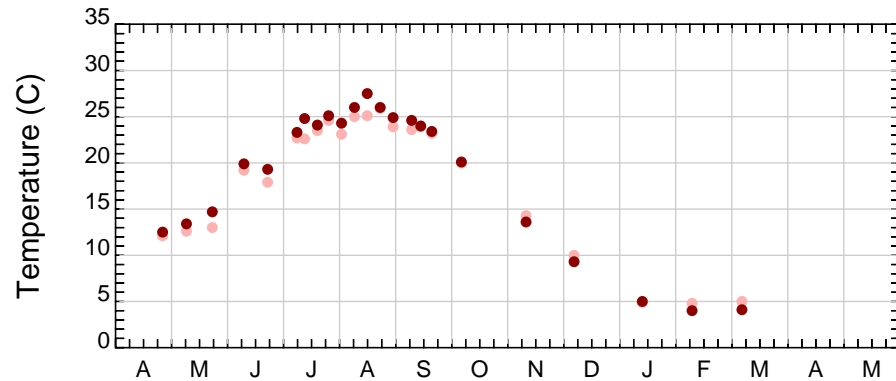
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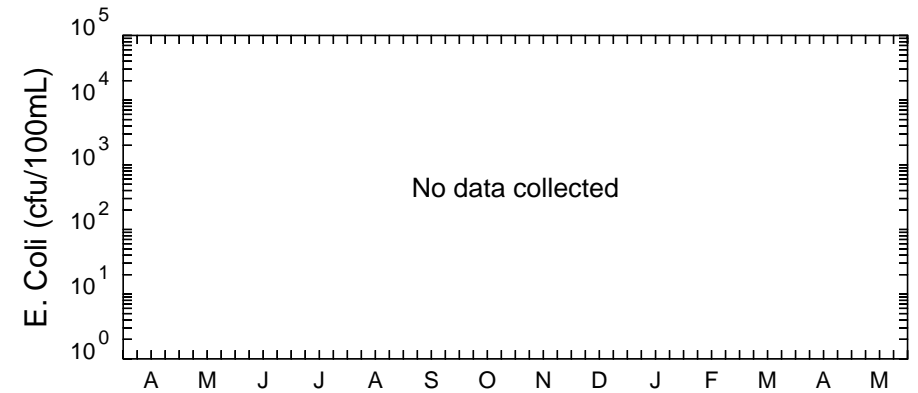
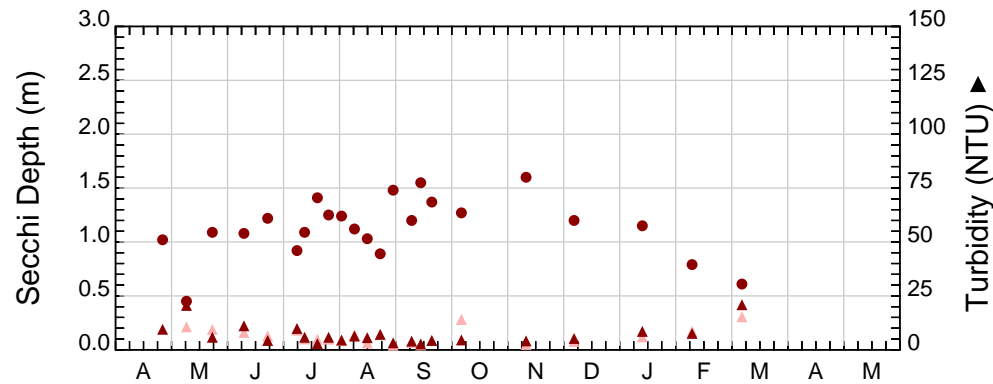
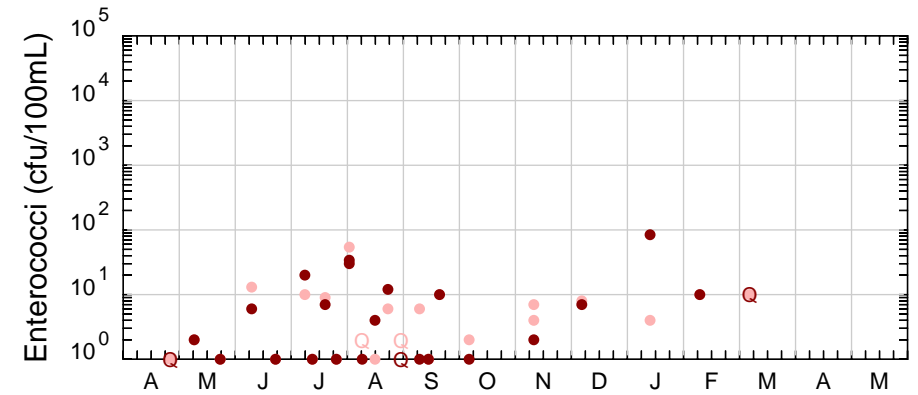
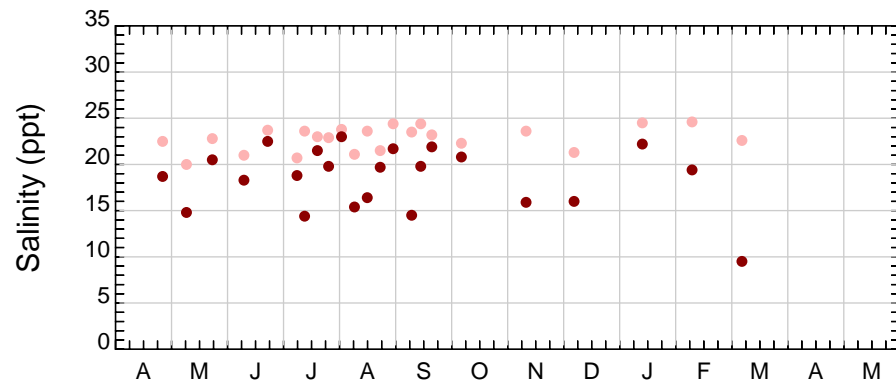
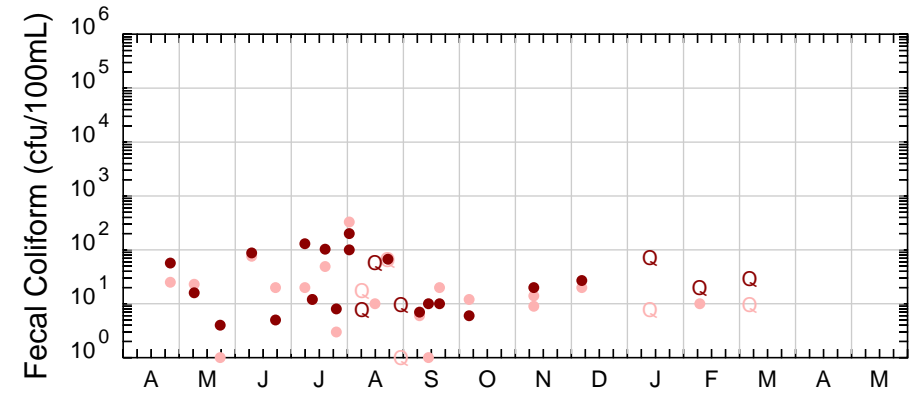
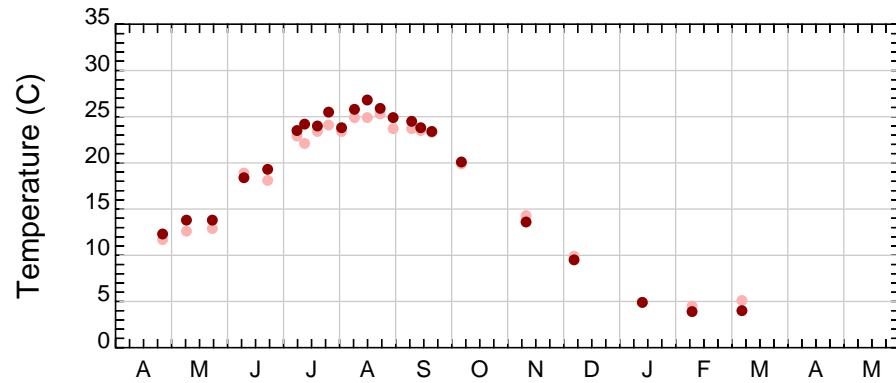
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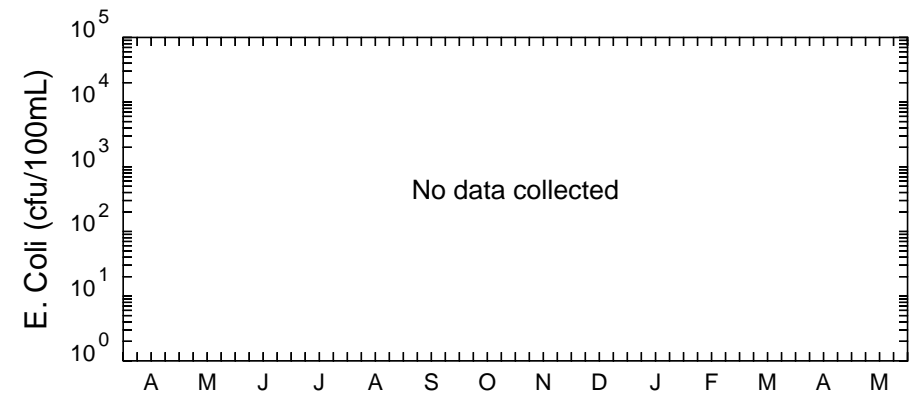
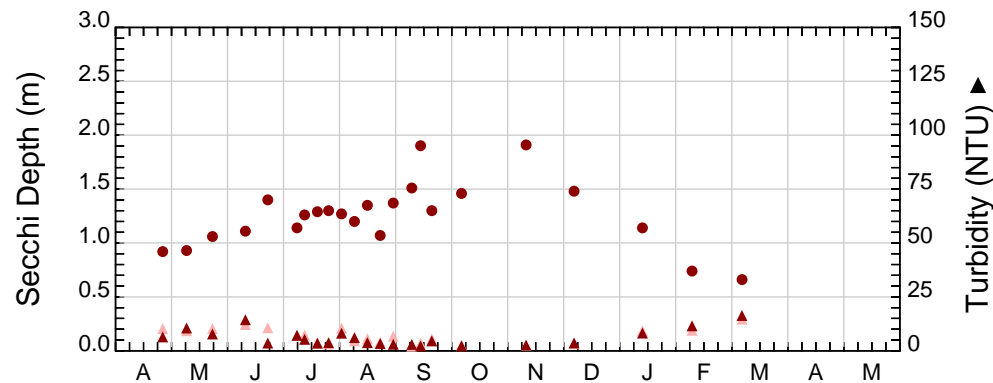
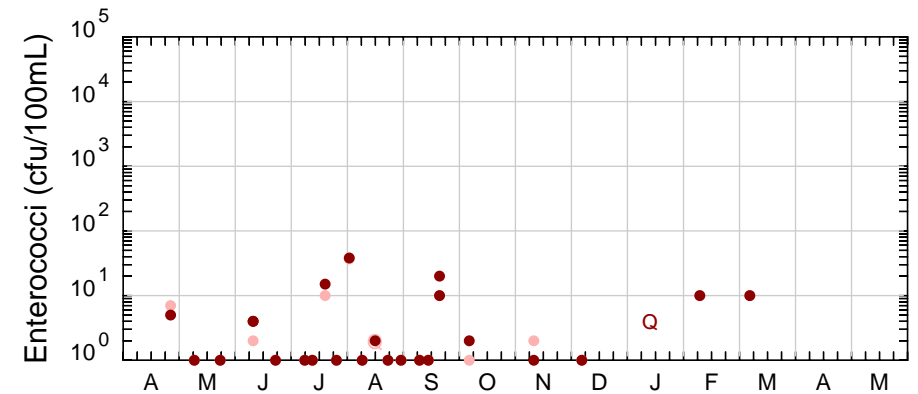
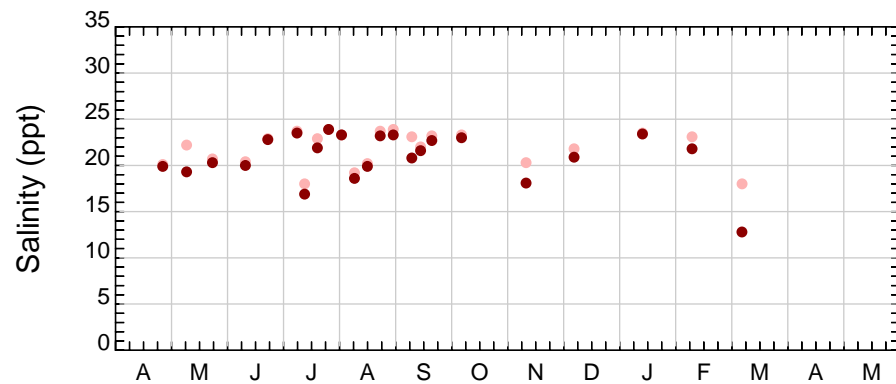
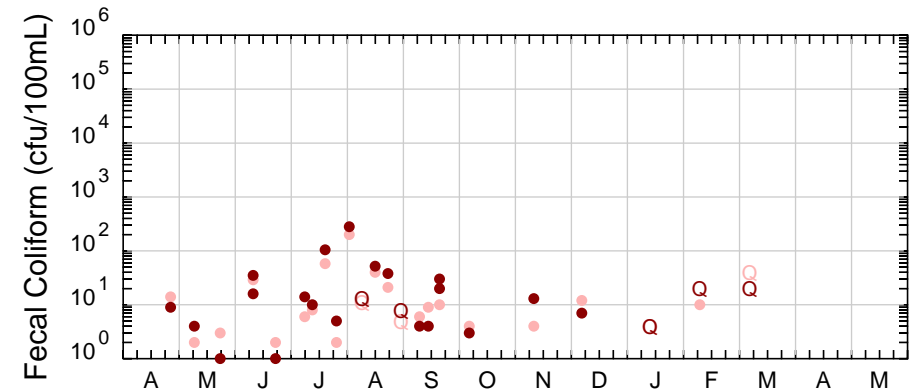
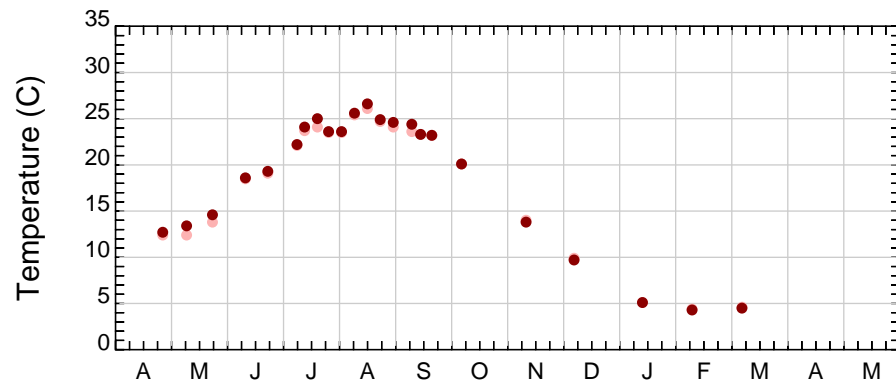
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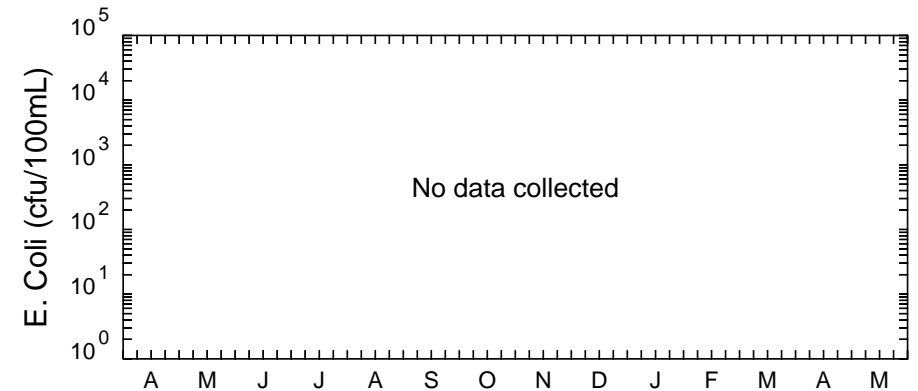
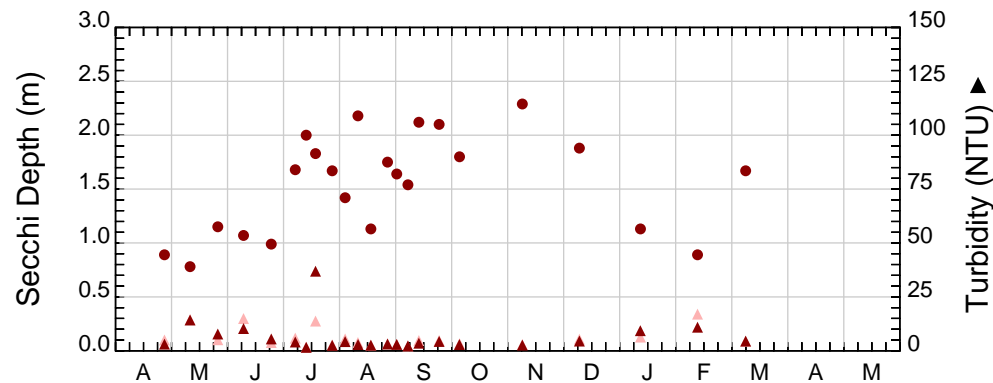
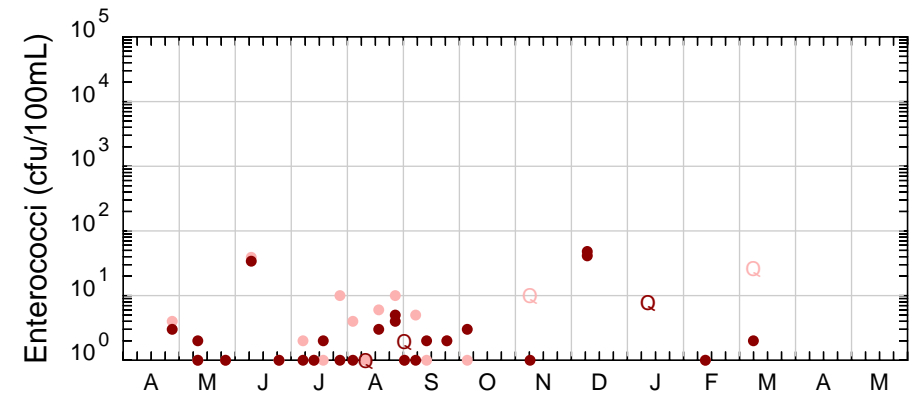
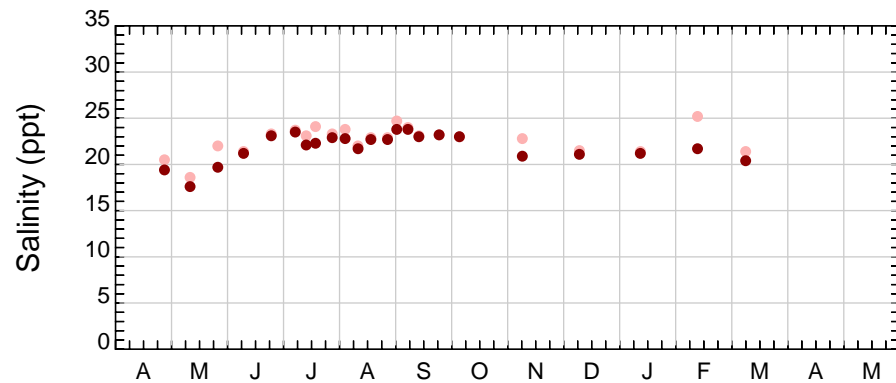
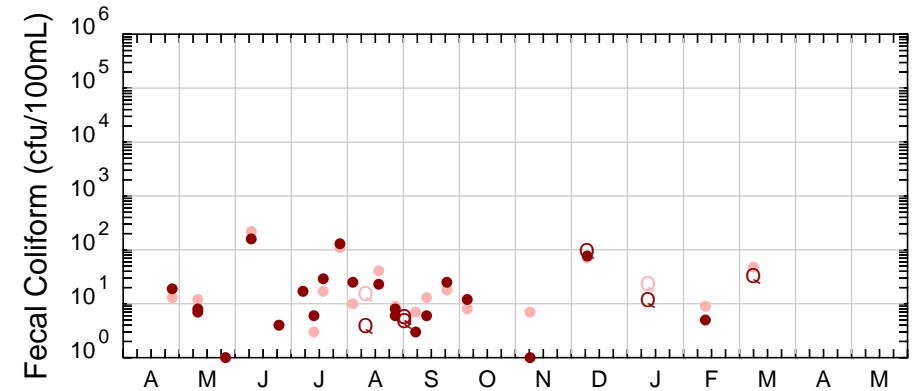
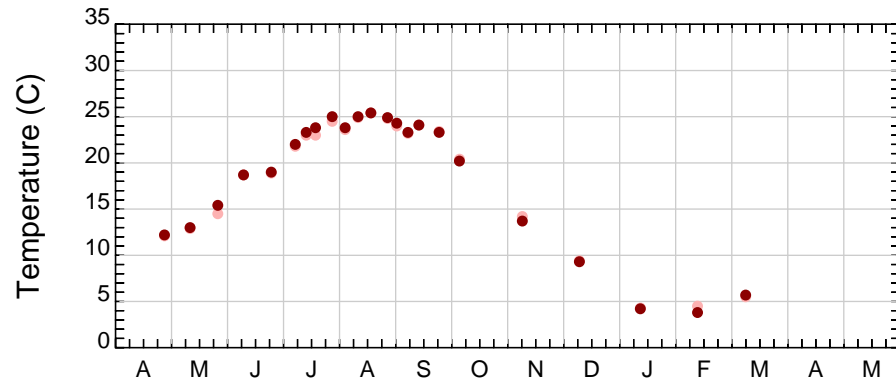


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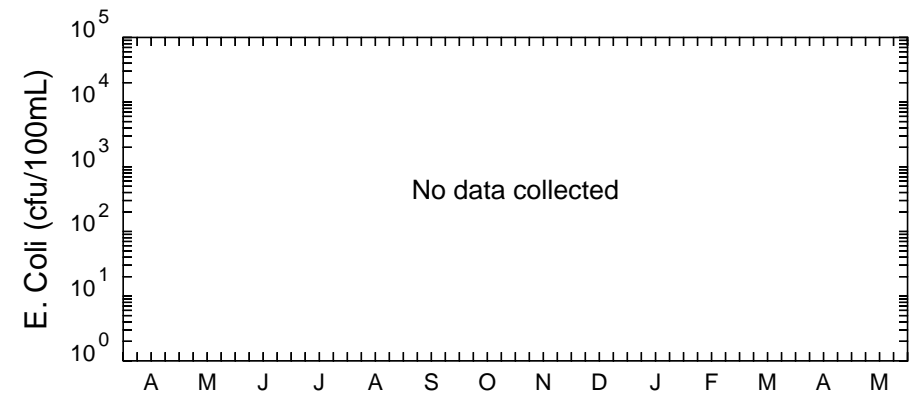
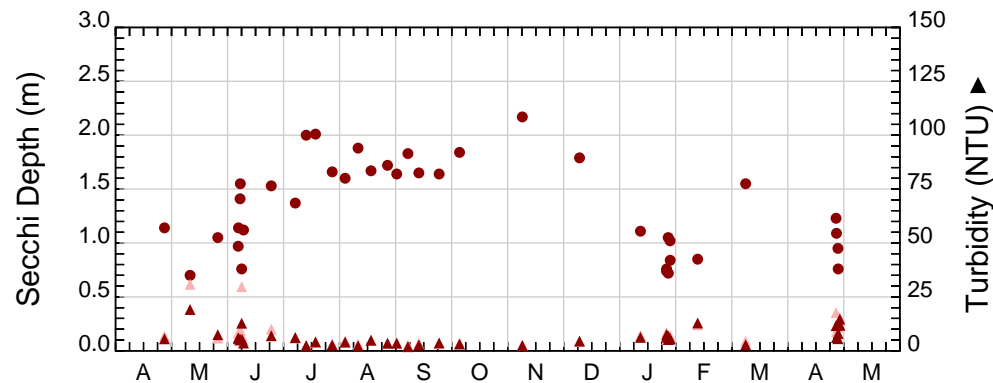
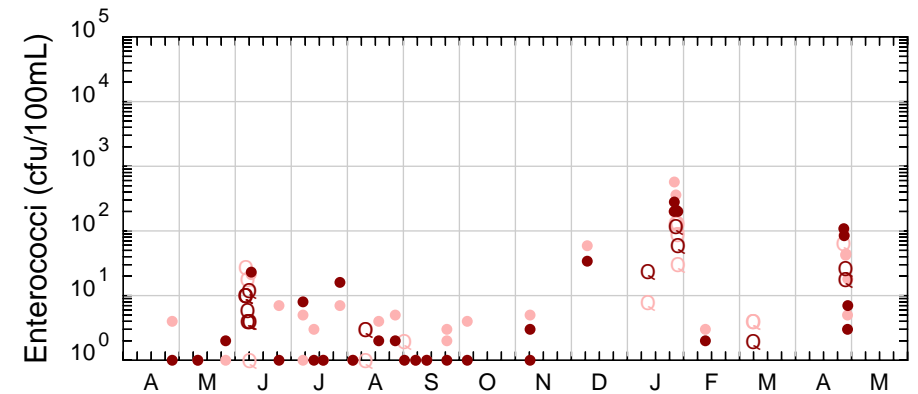
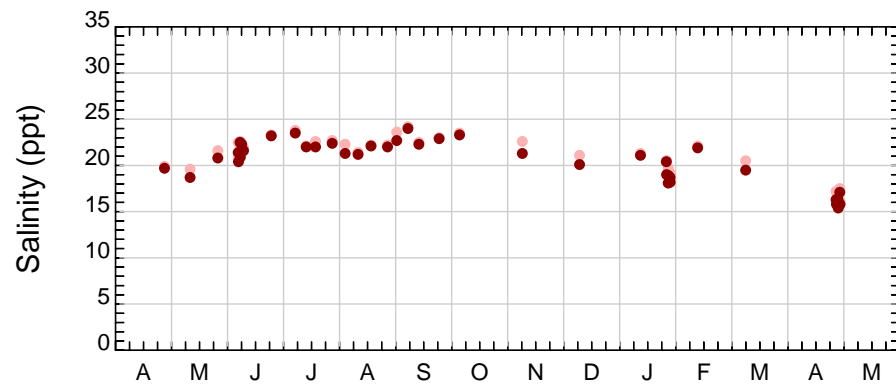
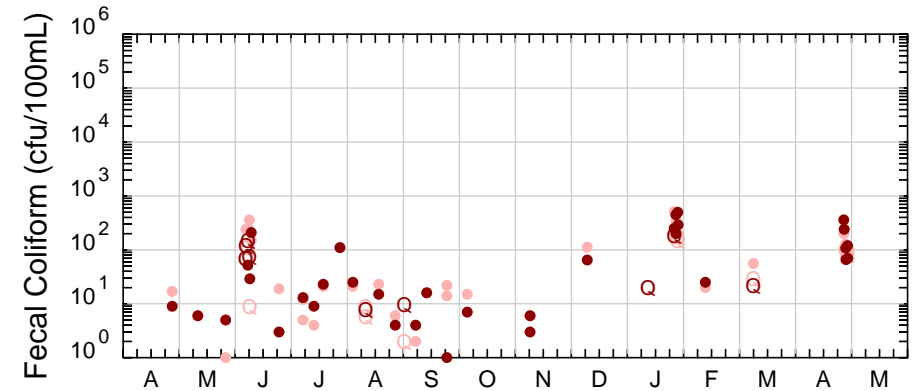
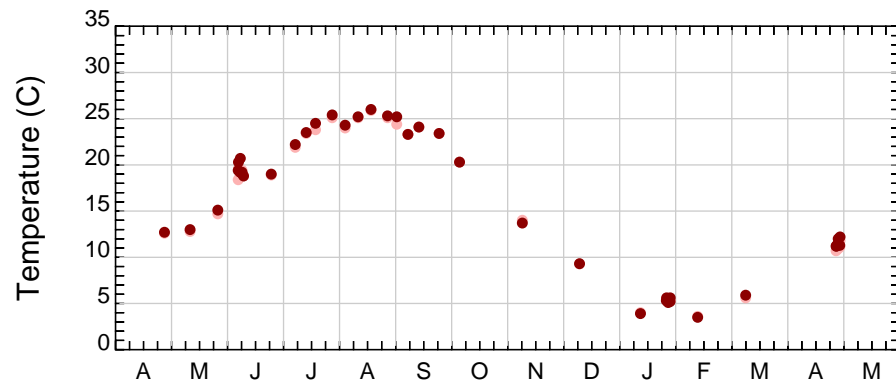
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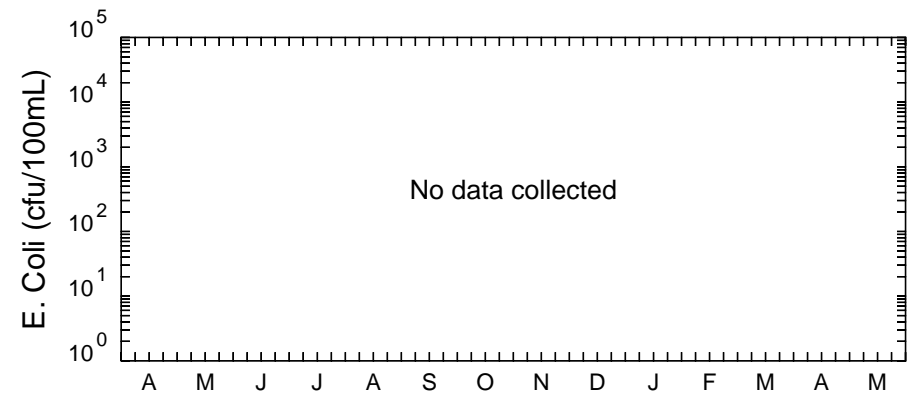
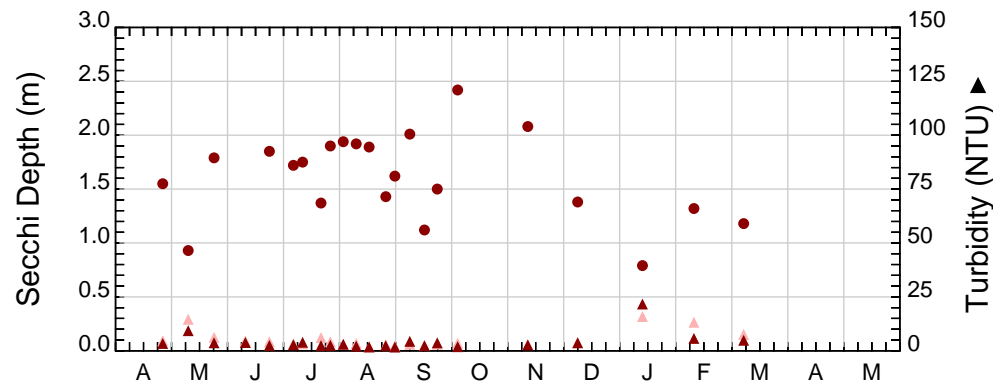
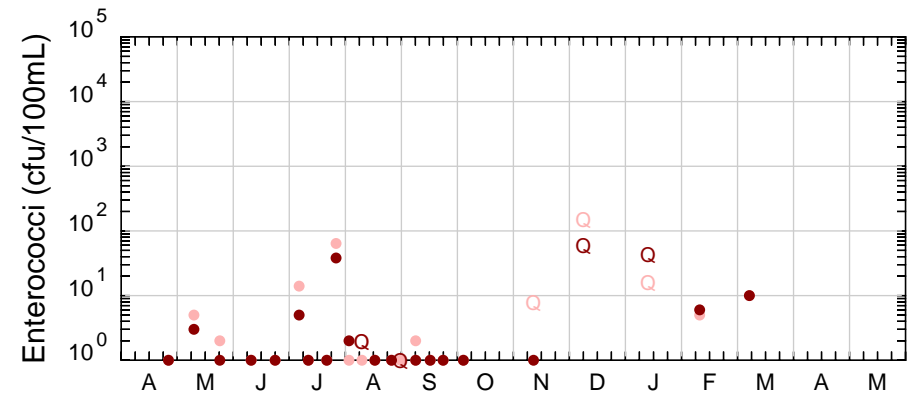
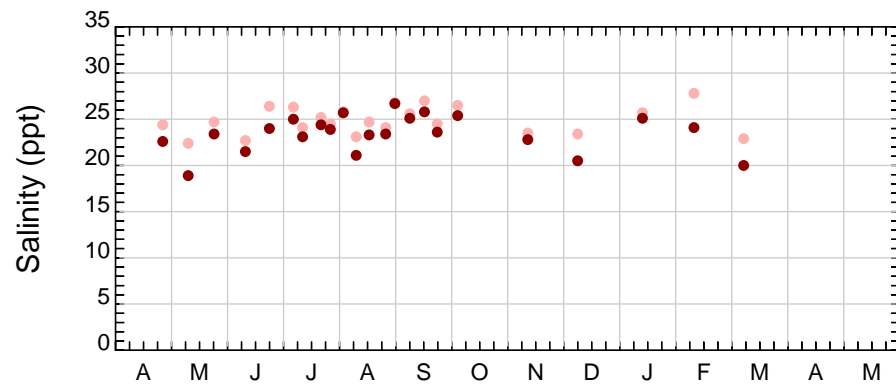
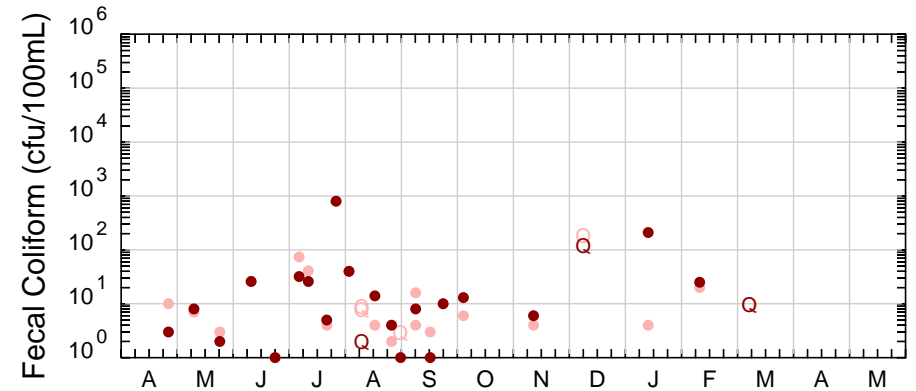
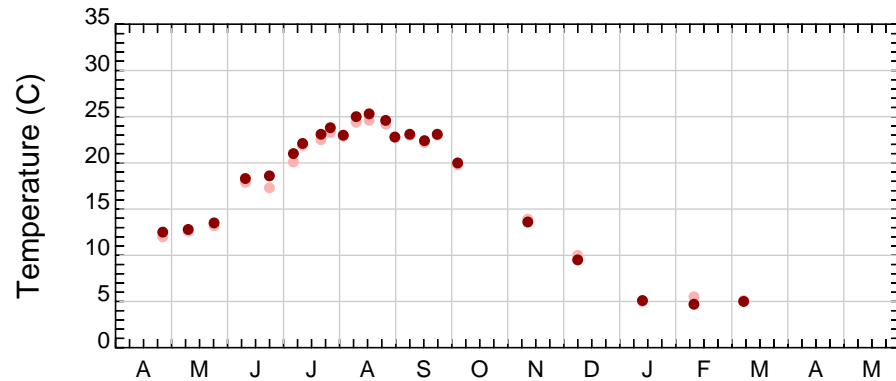
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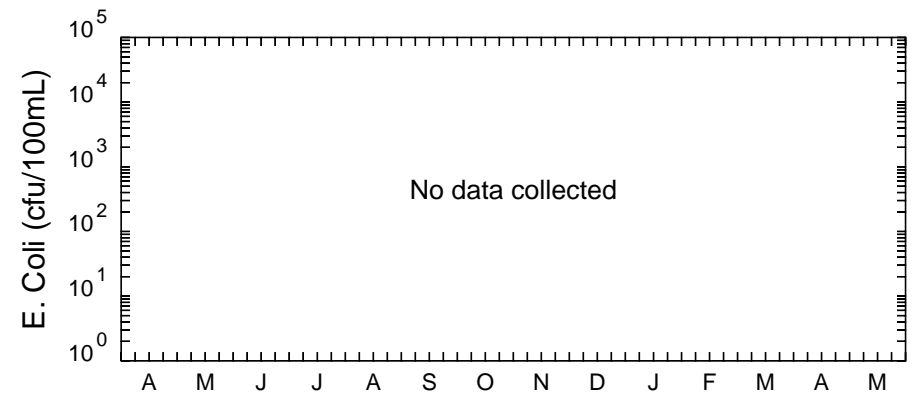
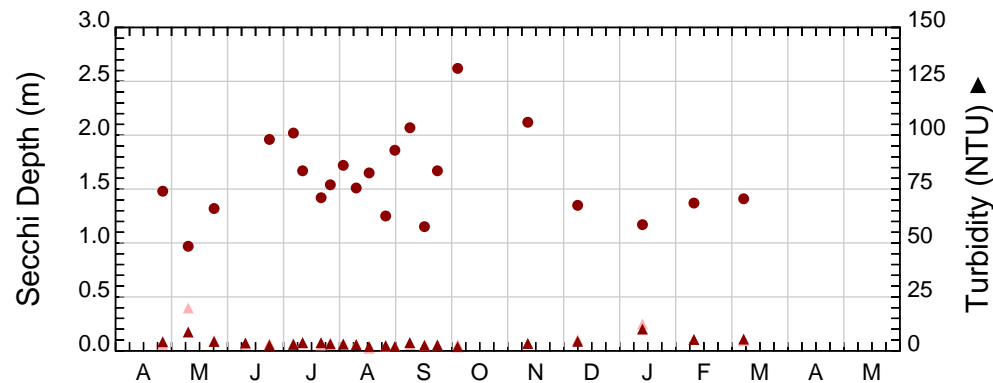
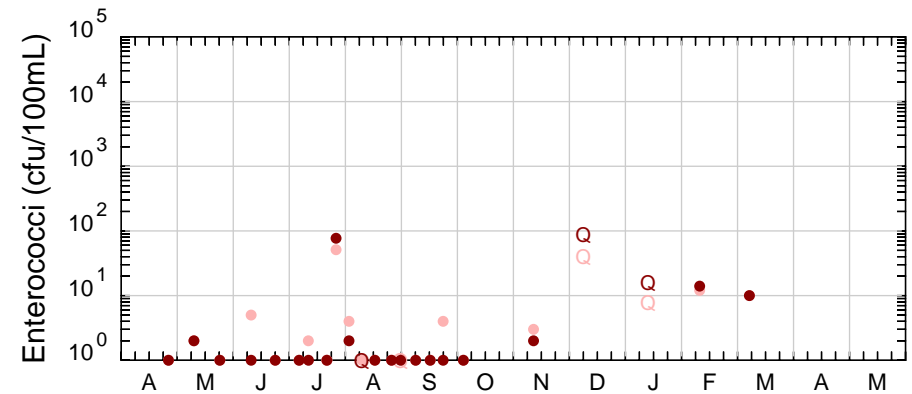
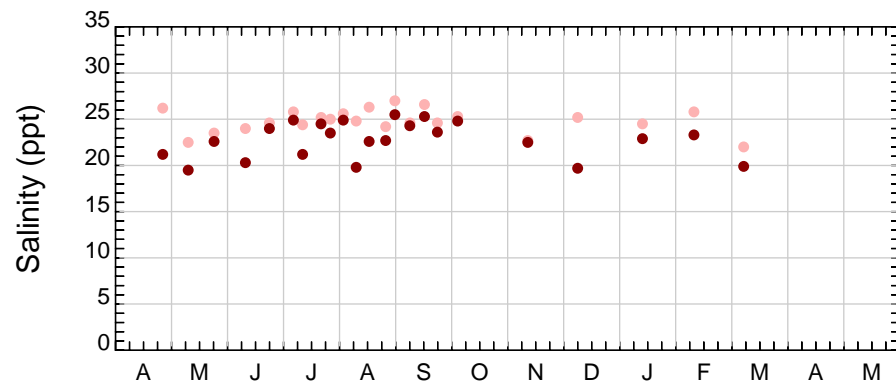
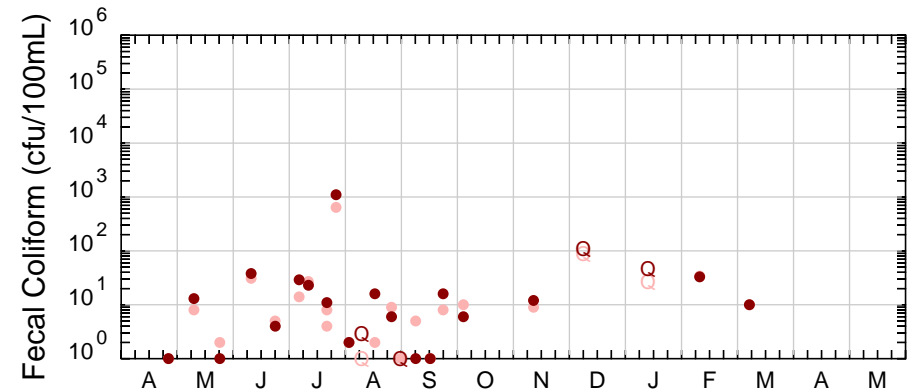
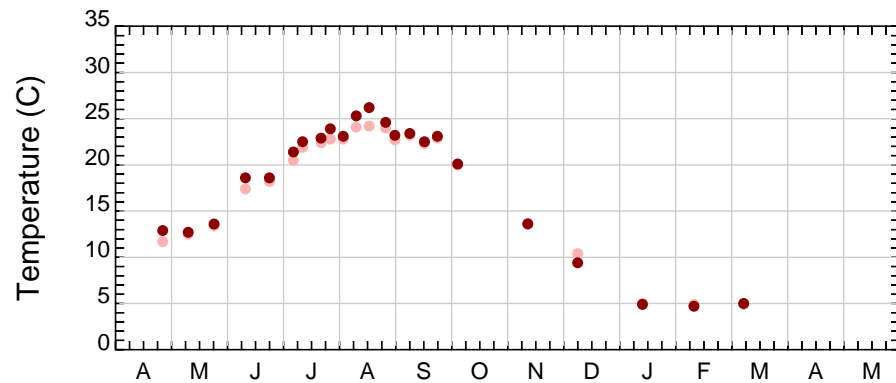
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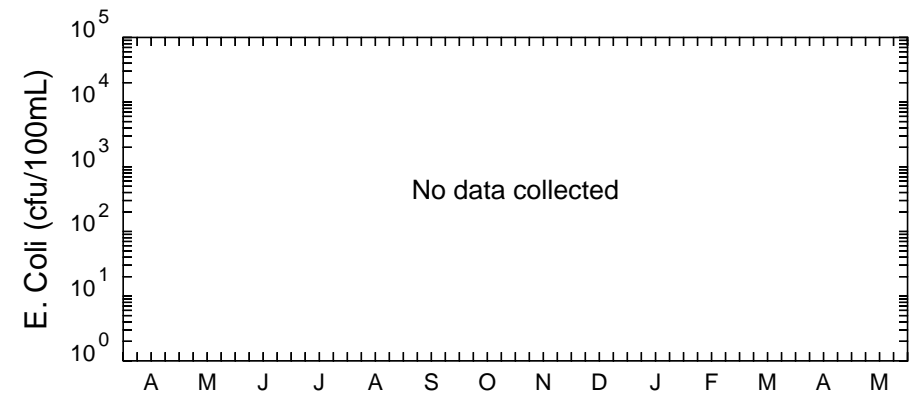
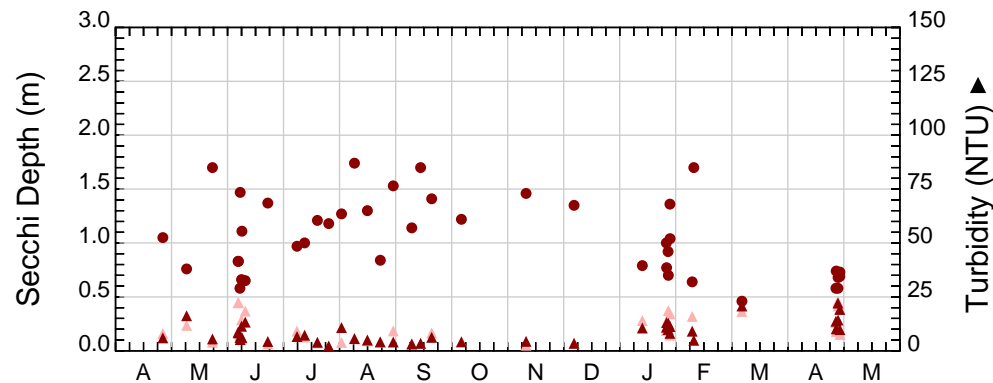
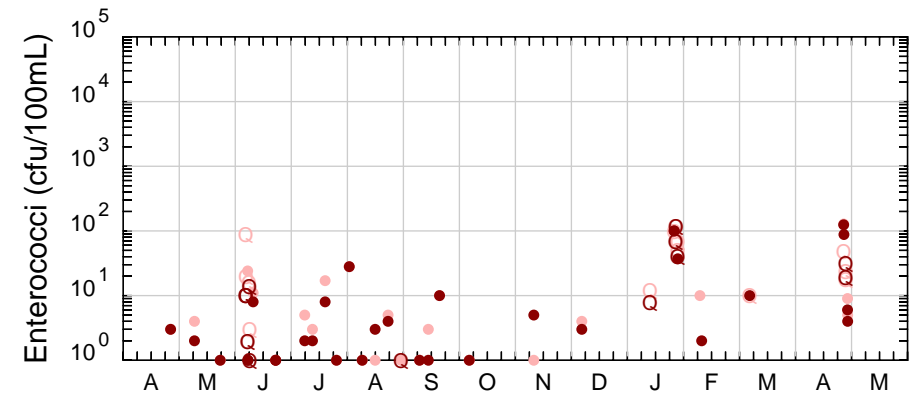
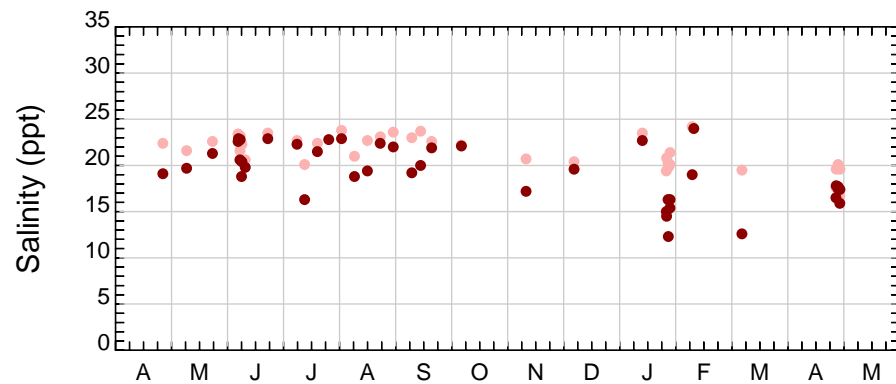
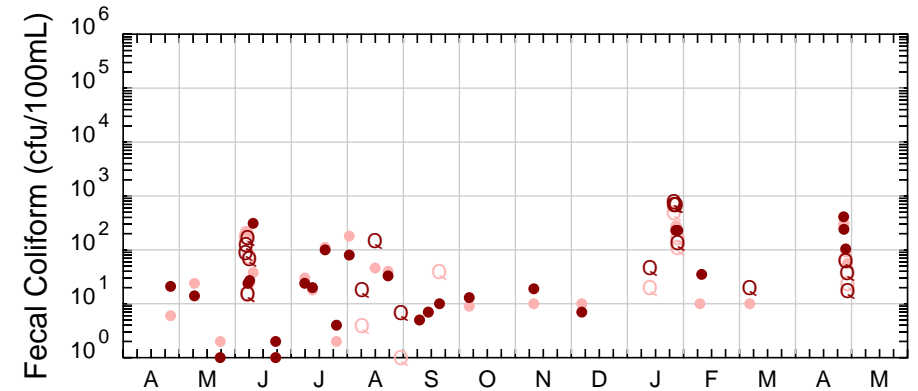
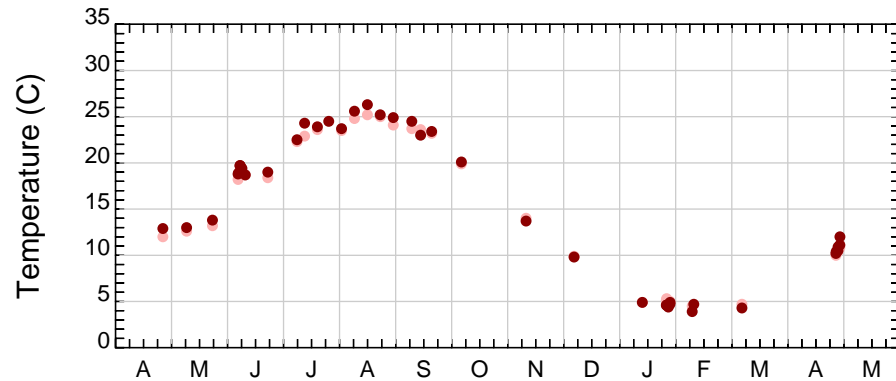
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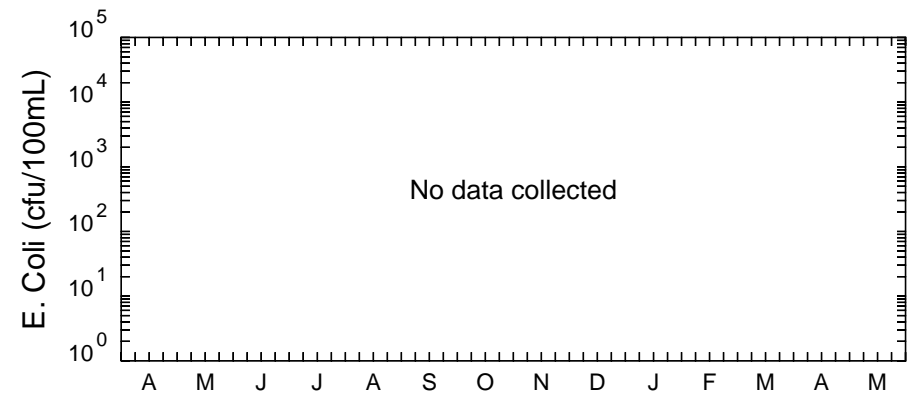
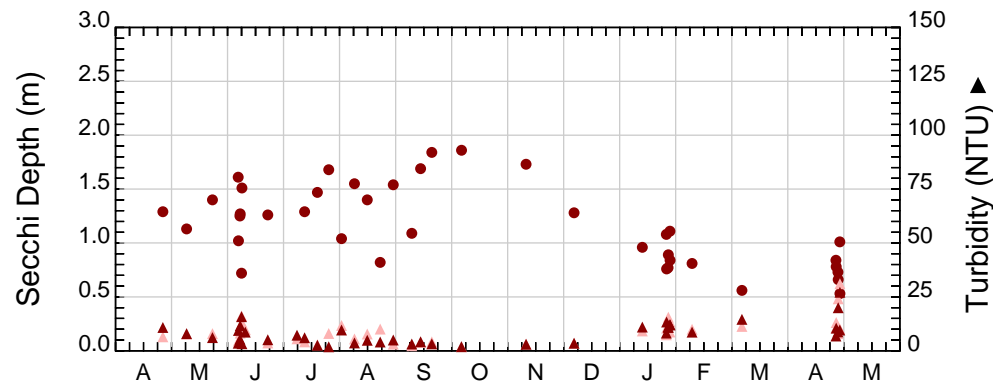
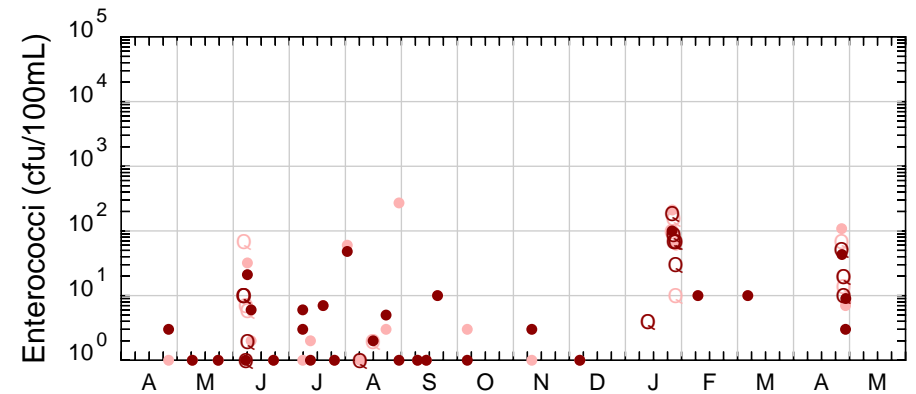
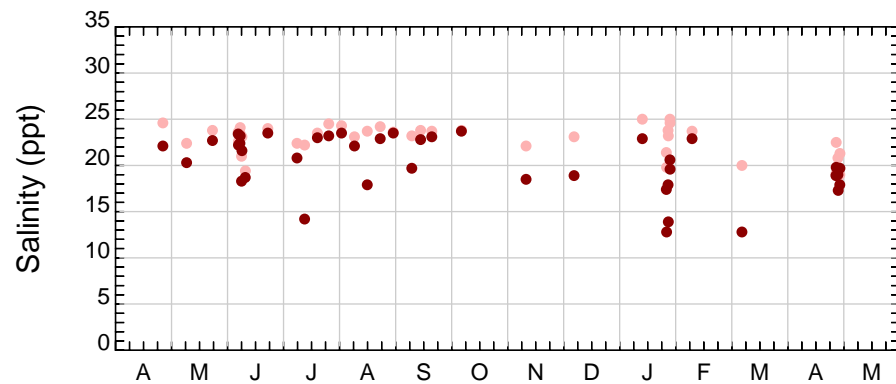
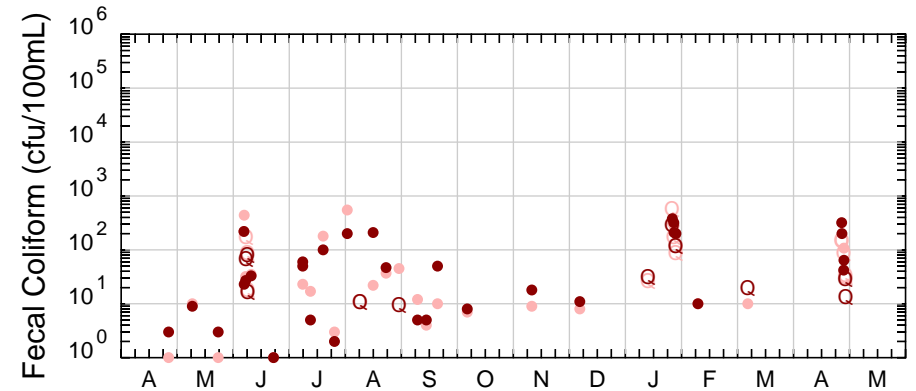
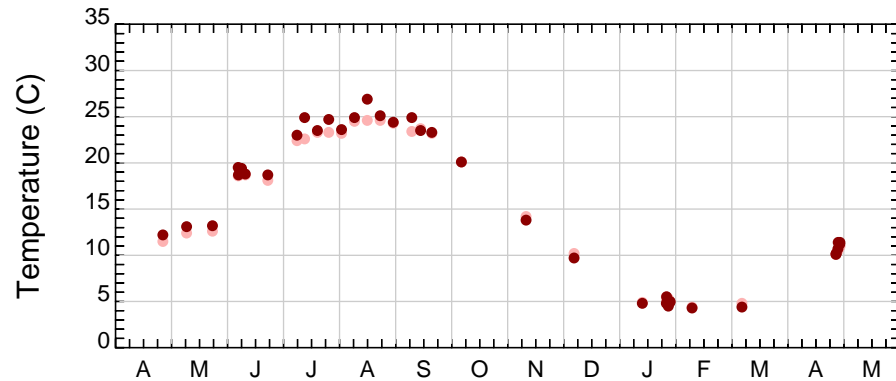


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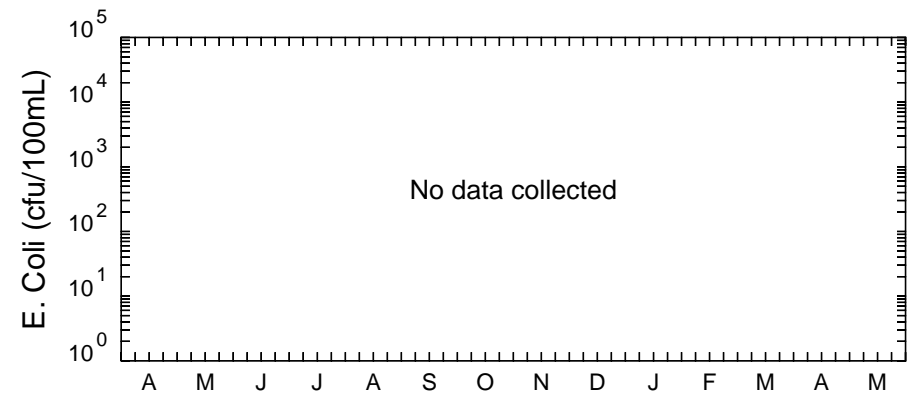
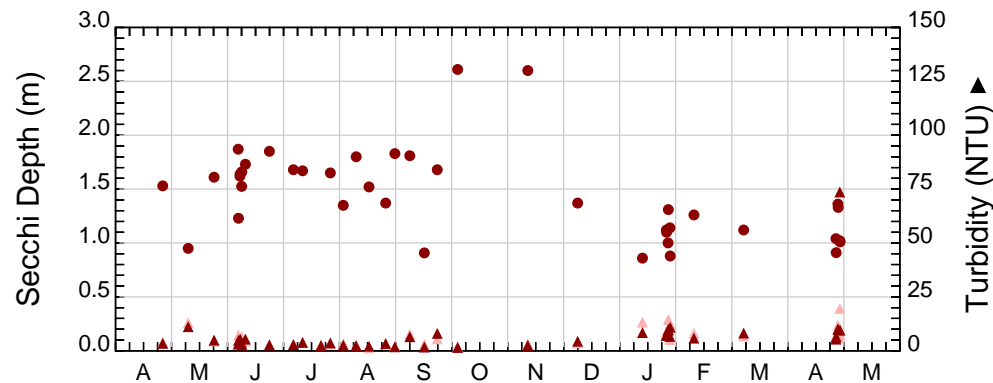
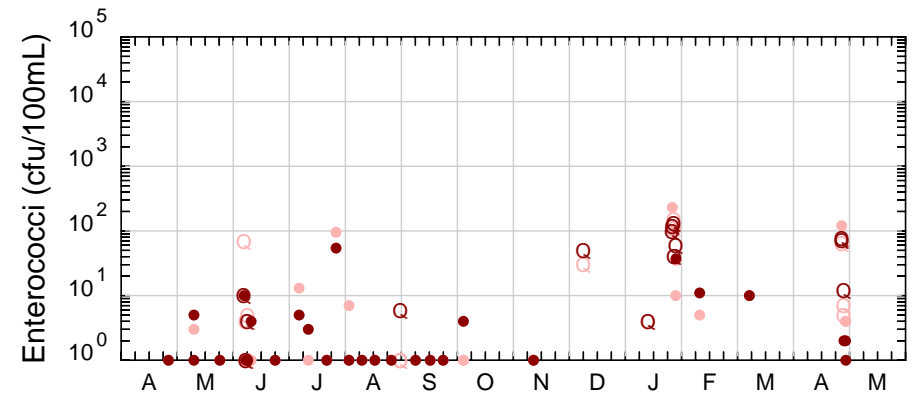
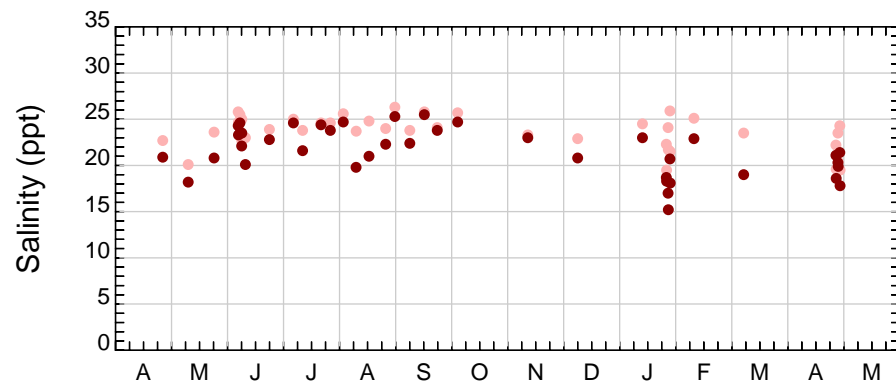
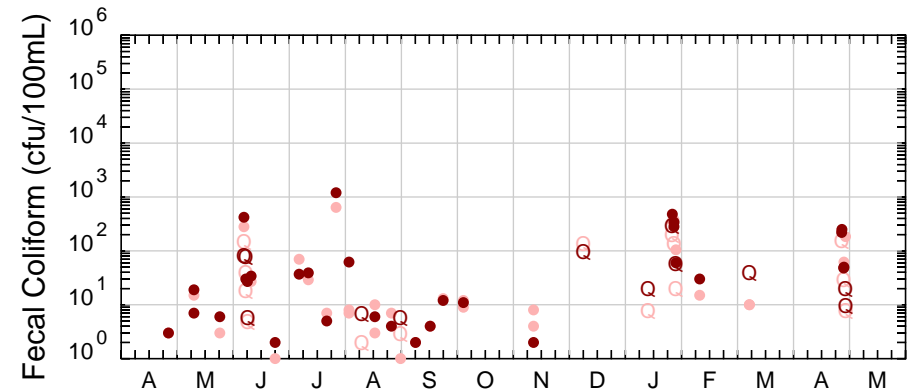
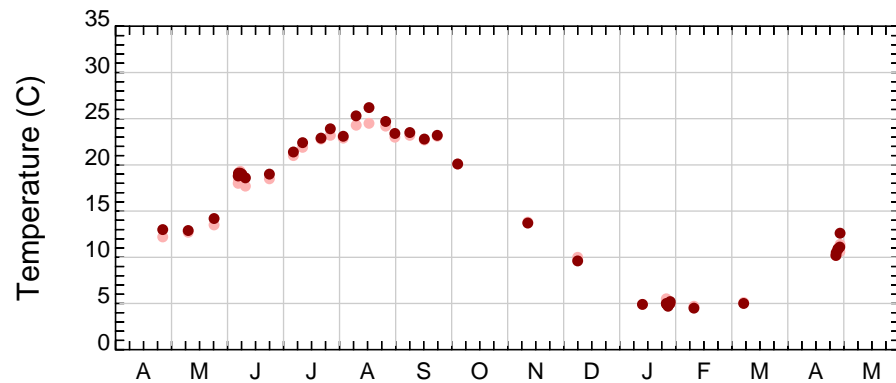


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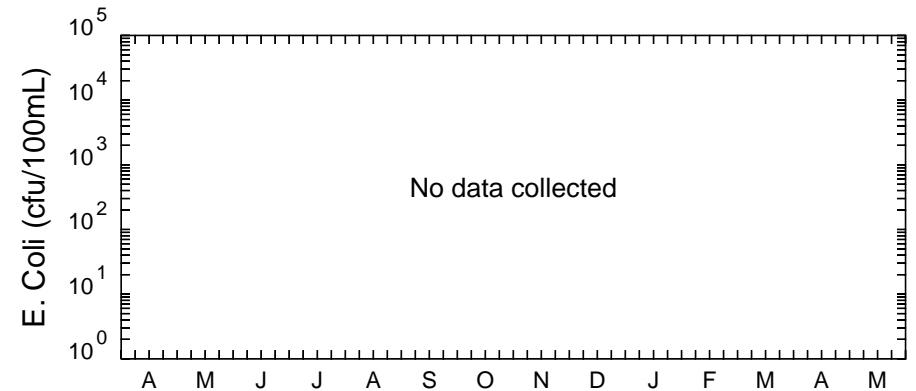
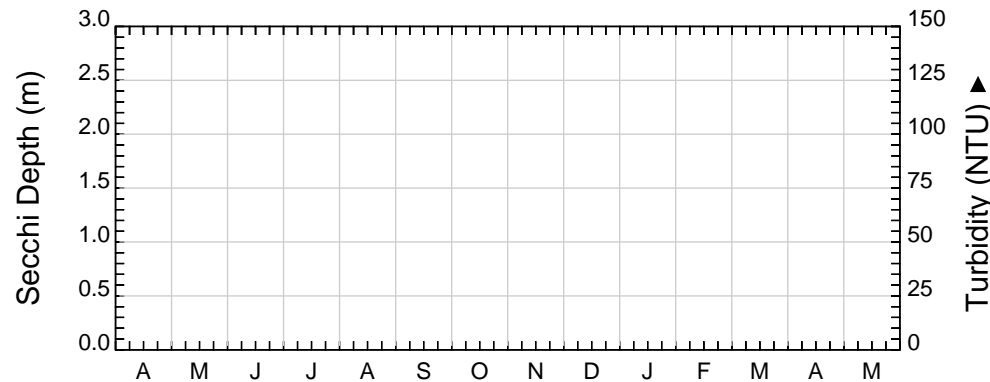
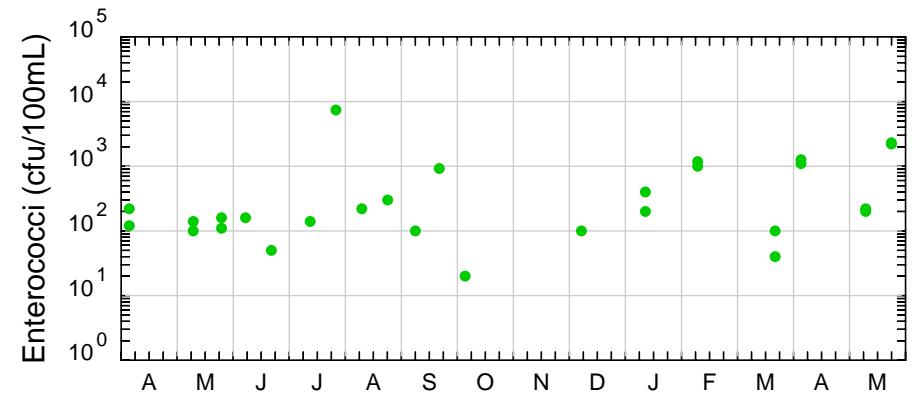
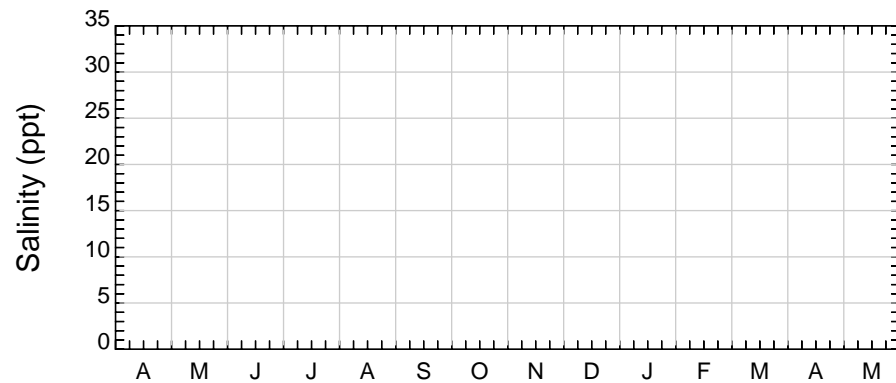
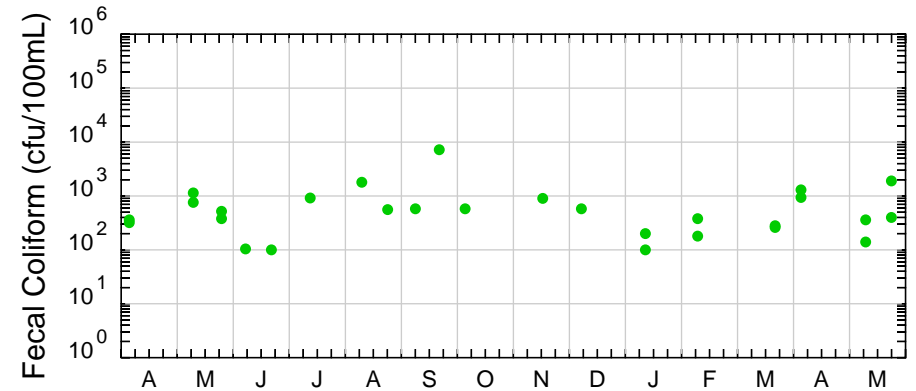
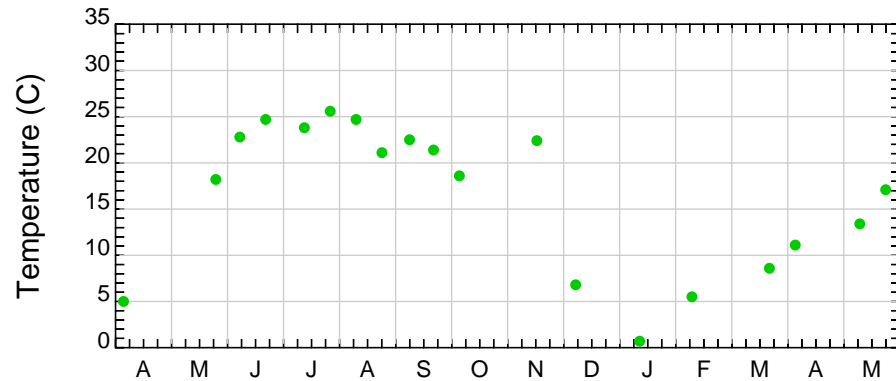
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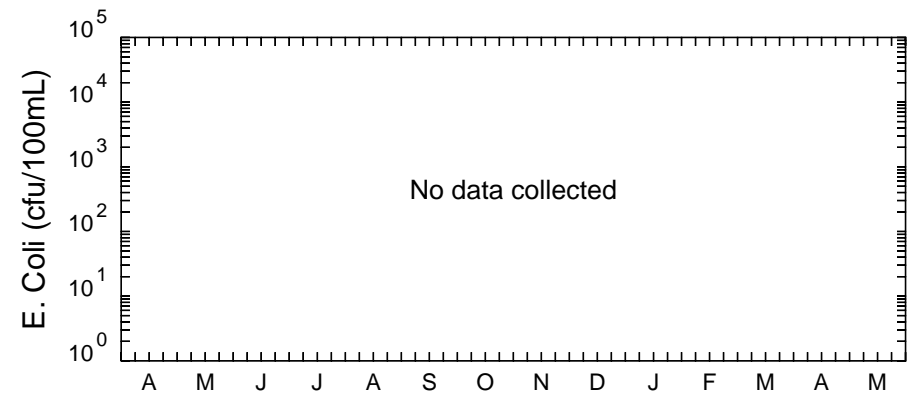
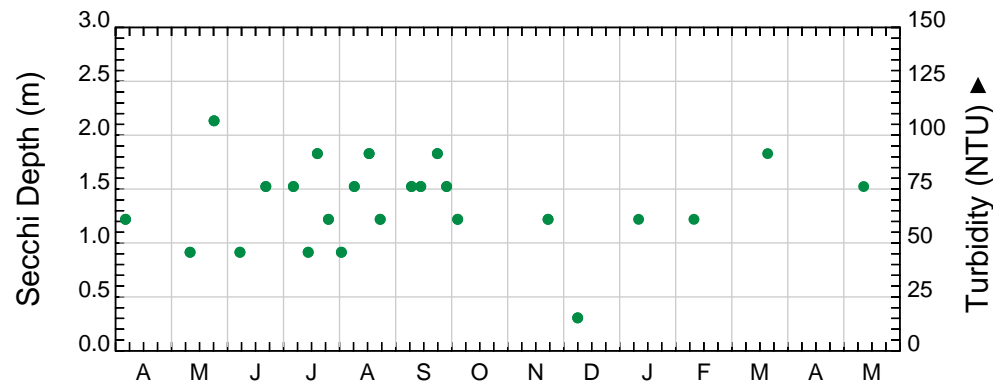
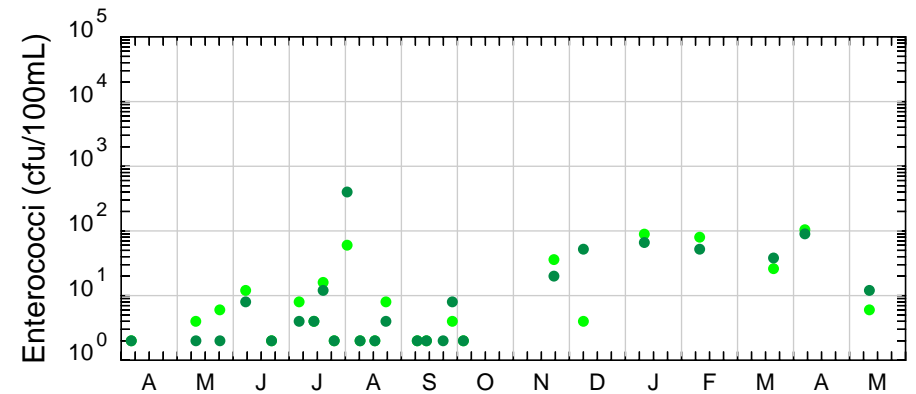
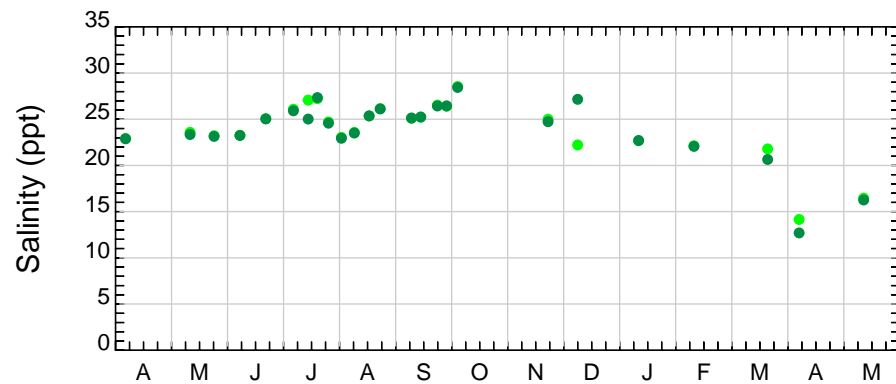
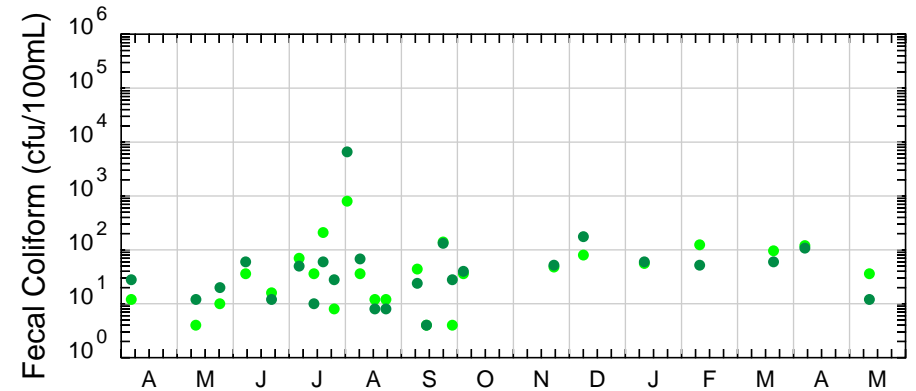
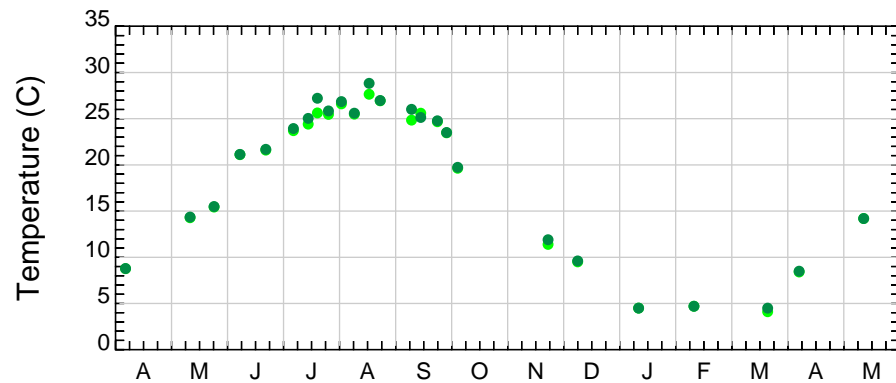
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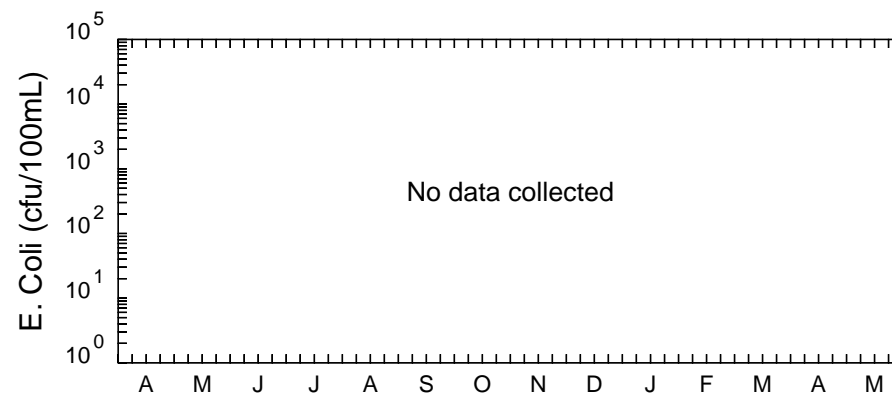
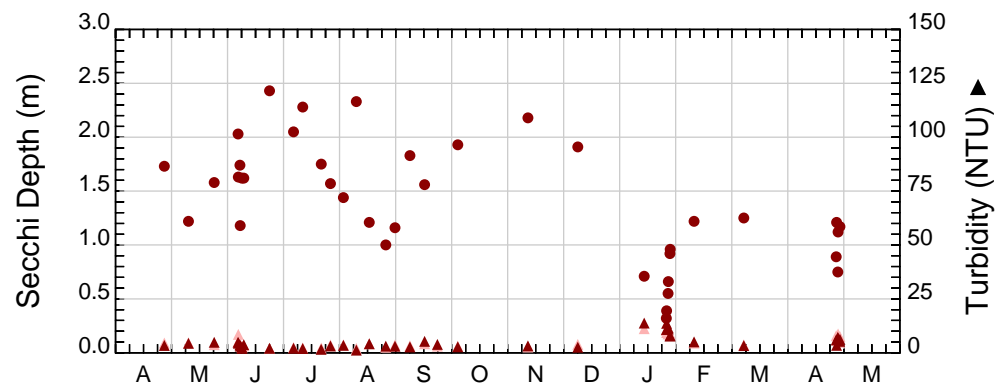
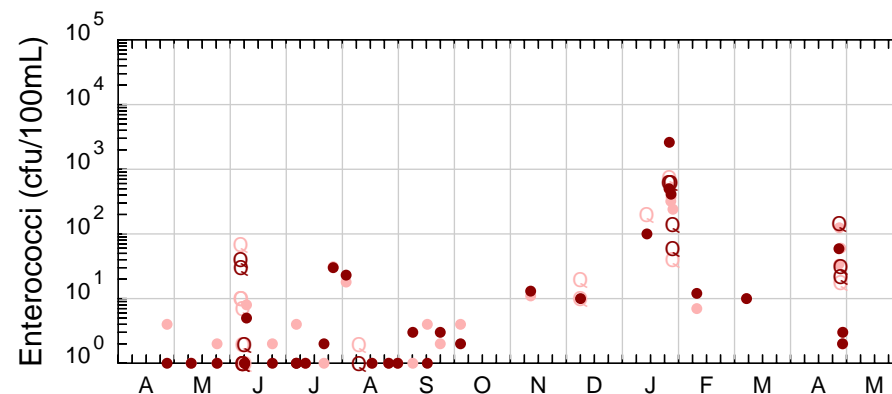
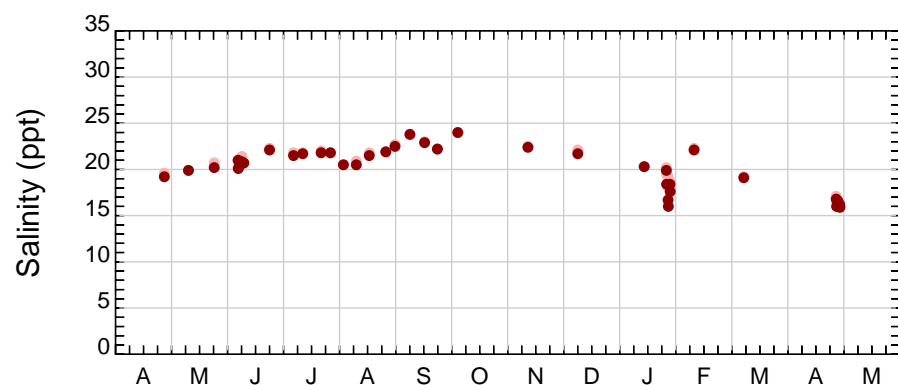
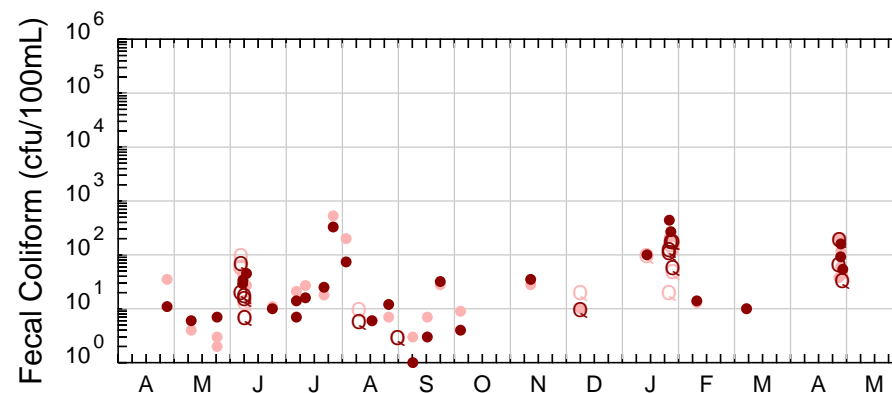
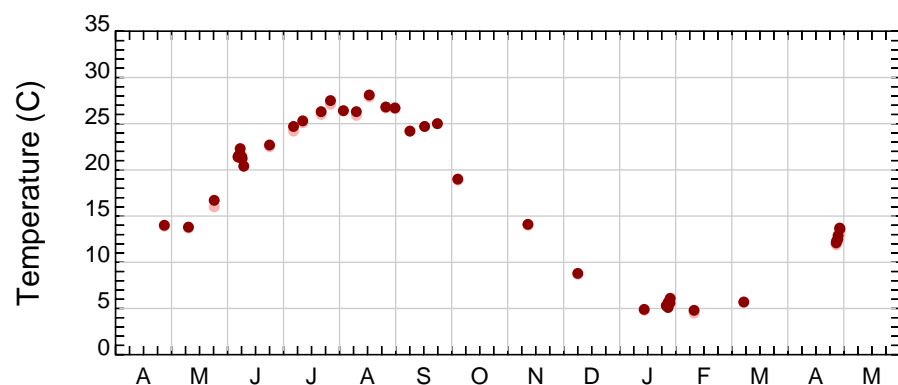
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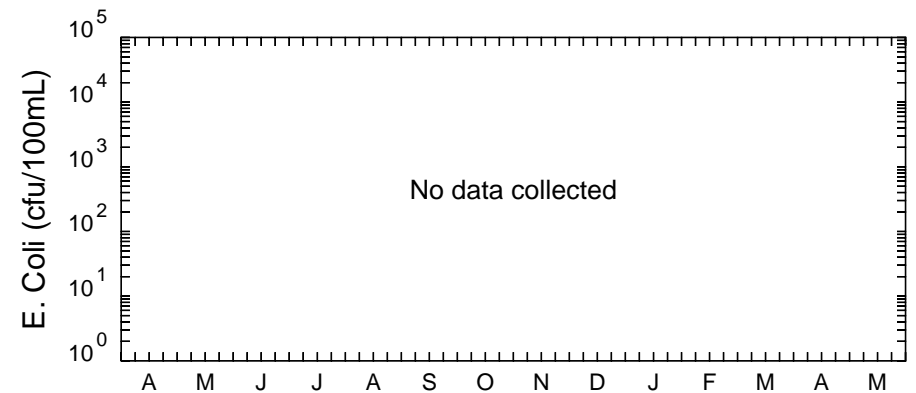
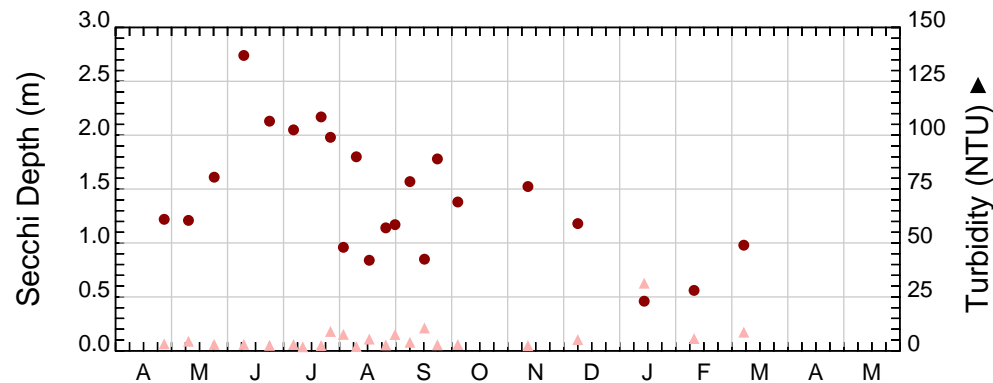
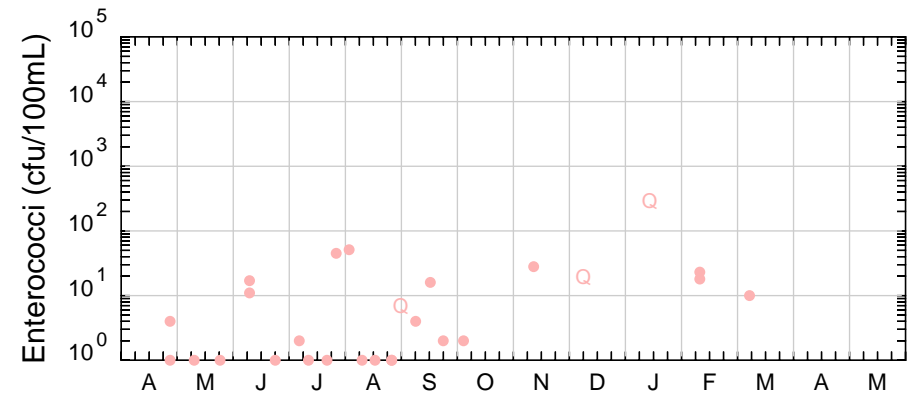
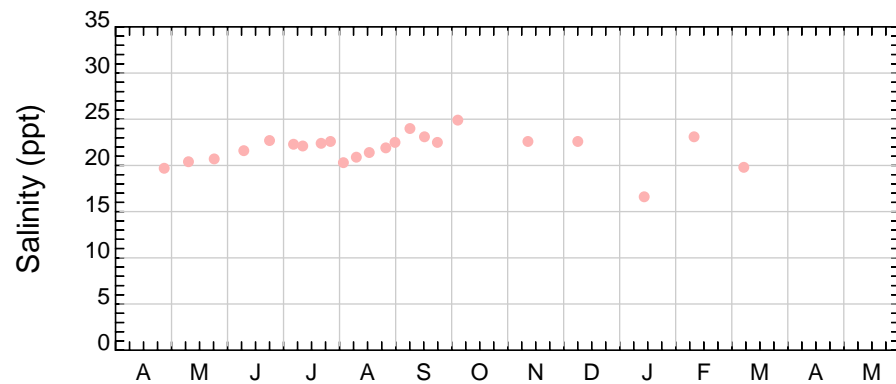
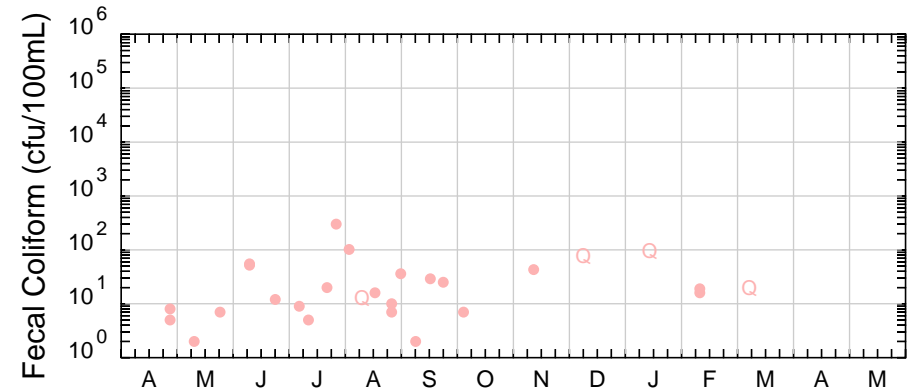
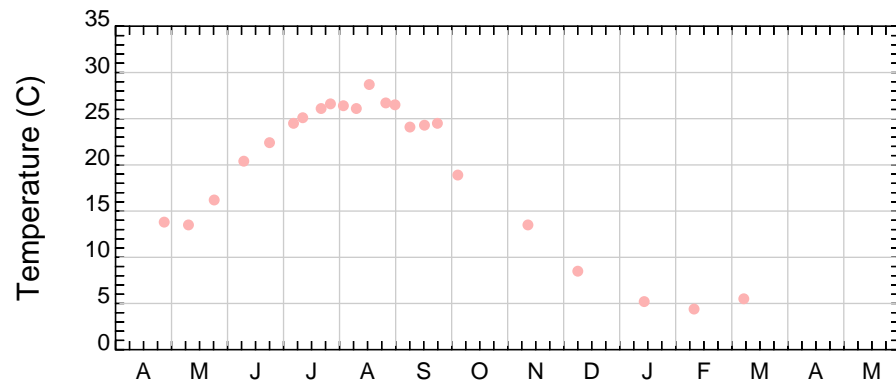
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
for notes on qualifiers

Time (Month)
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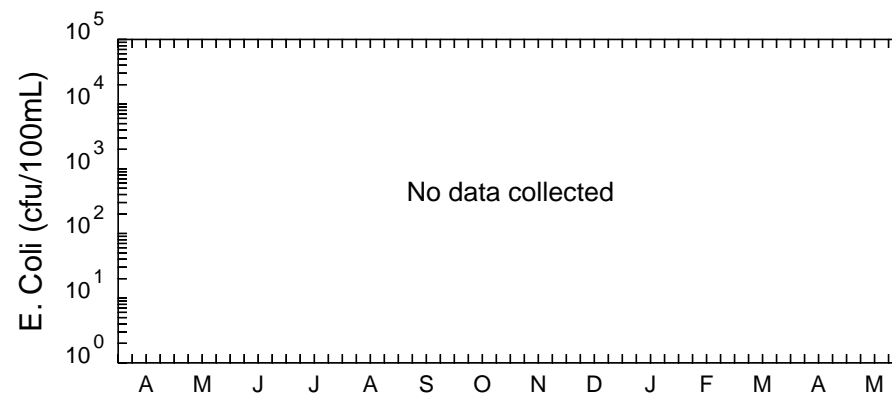
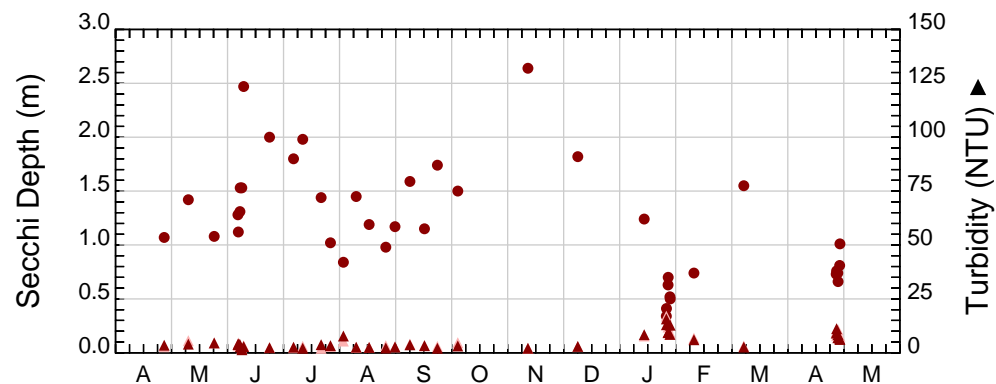
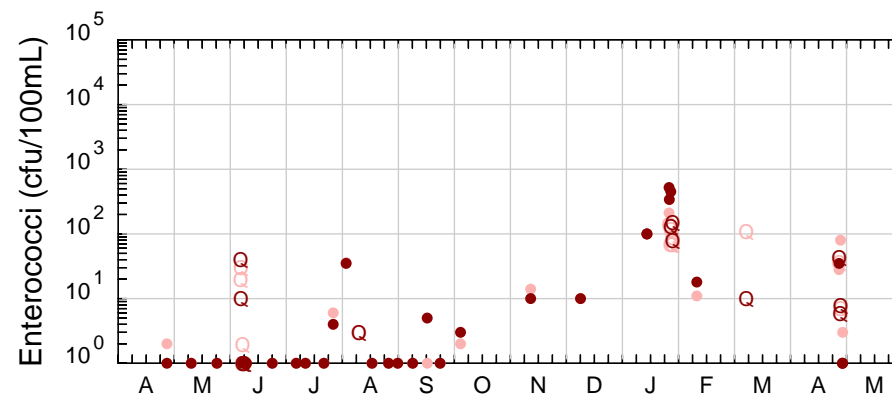
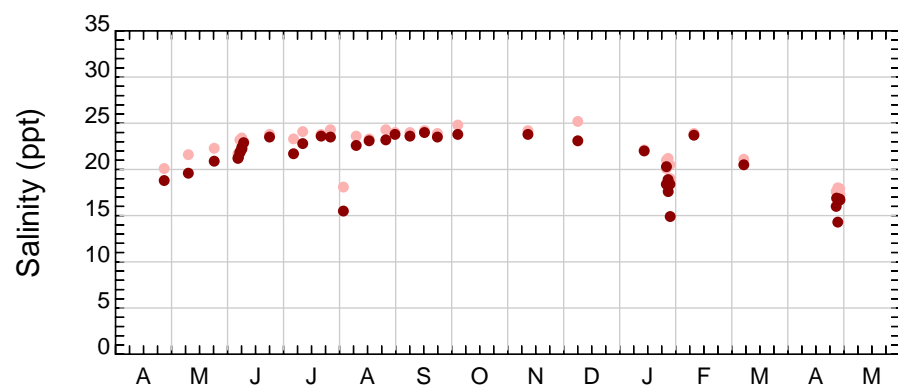
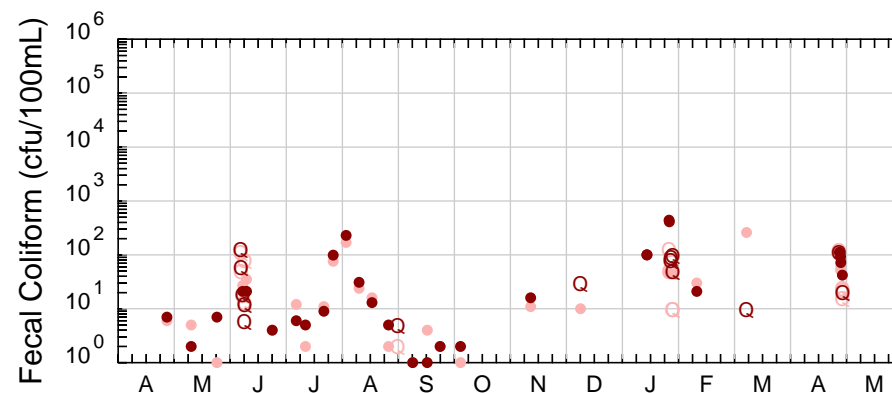
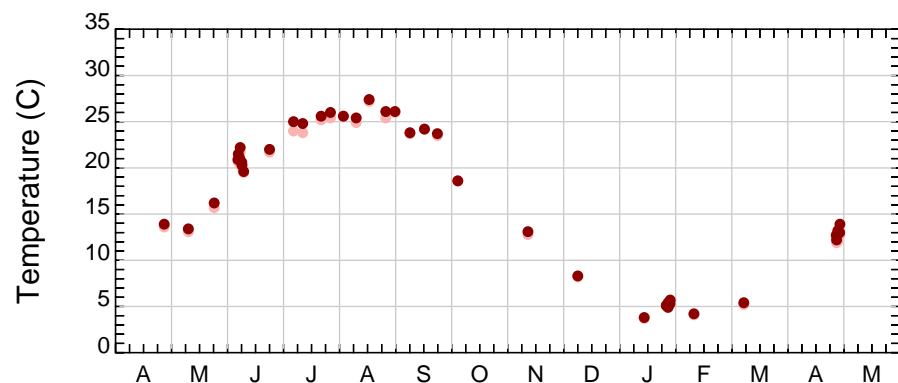
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
for notes on qualifiers

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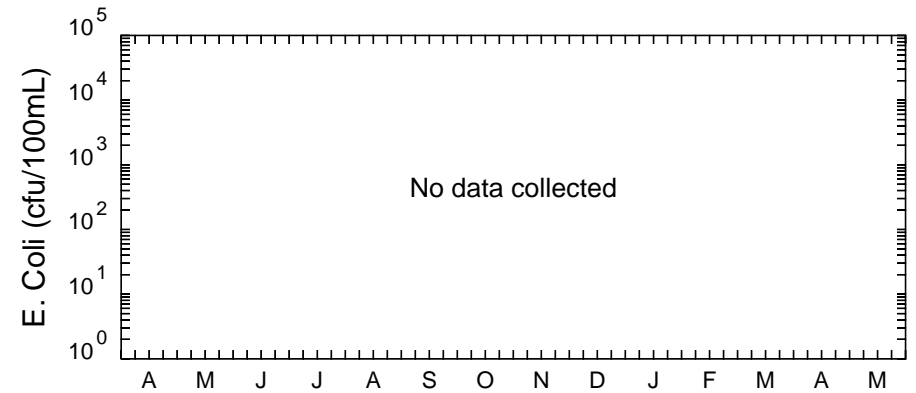
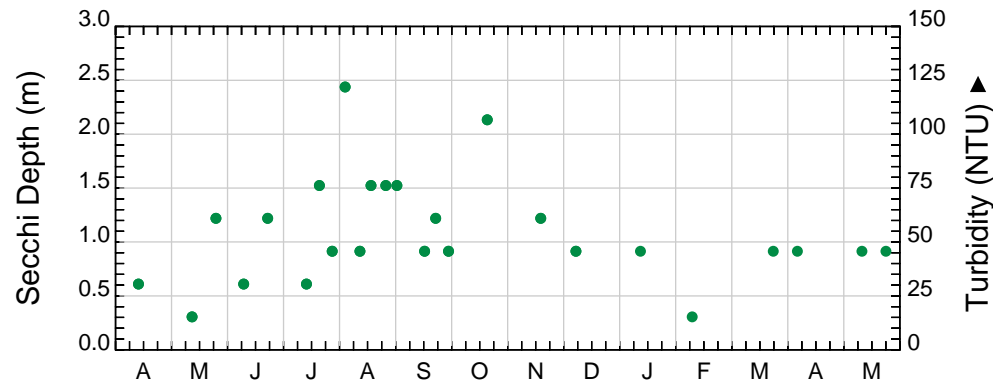
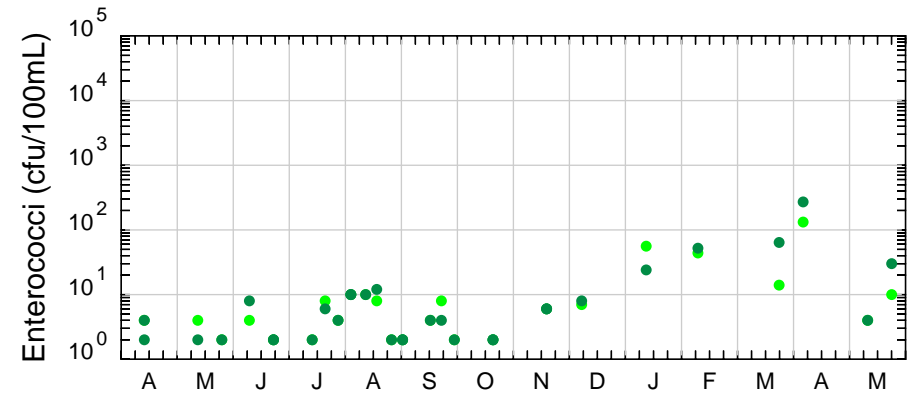
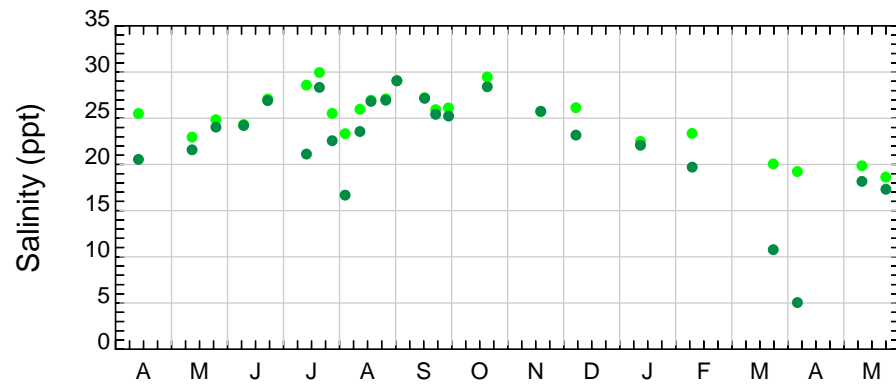
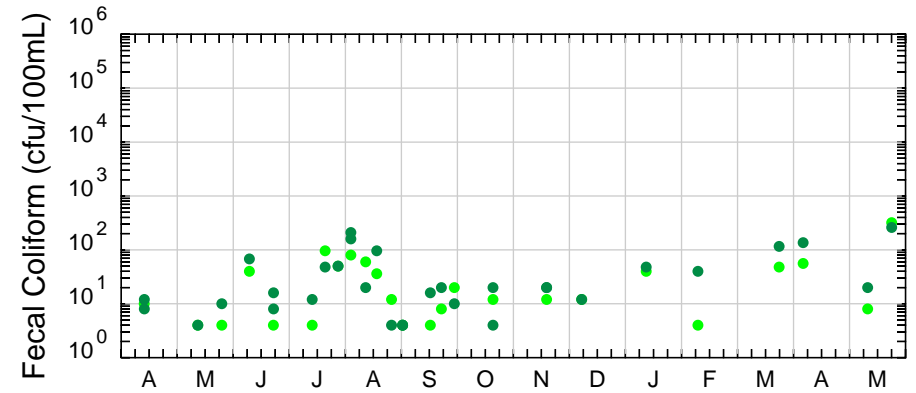
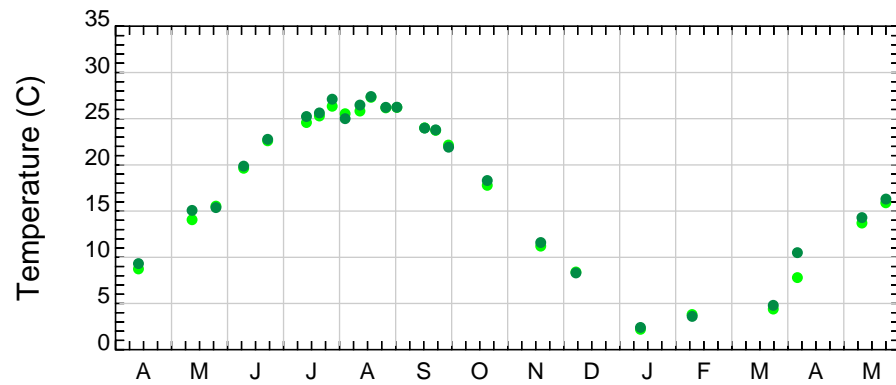
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
for notes on qualifiers

Time (Month)
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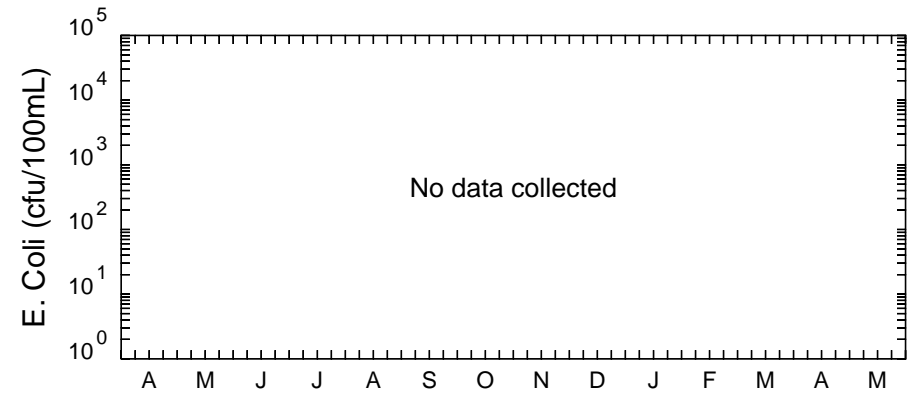
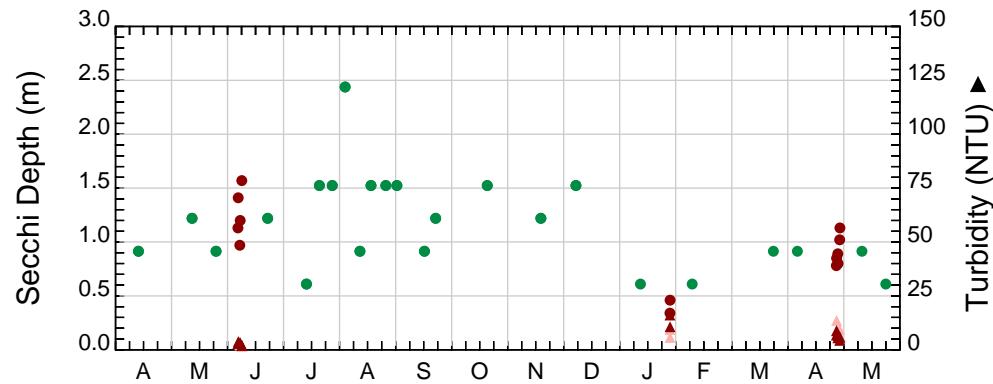
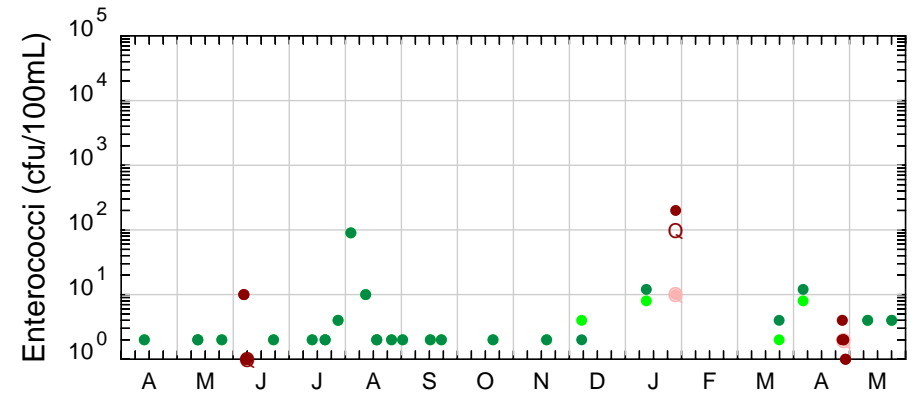
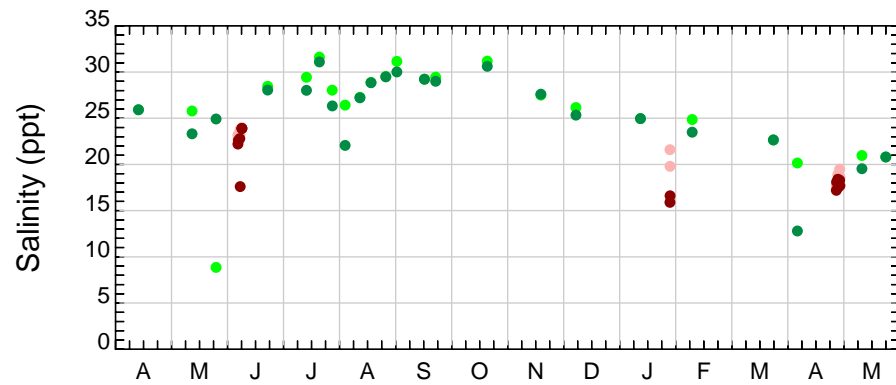
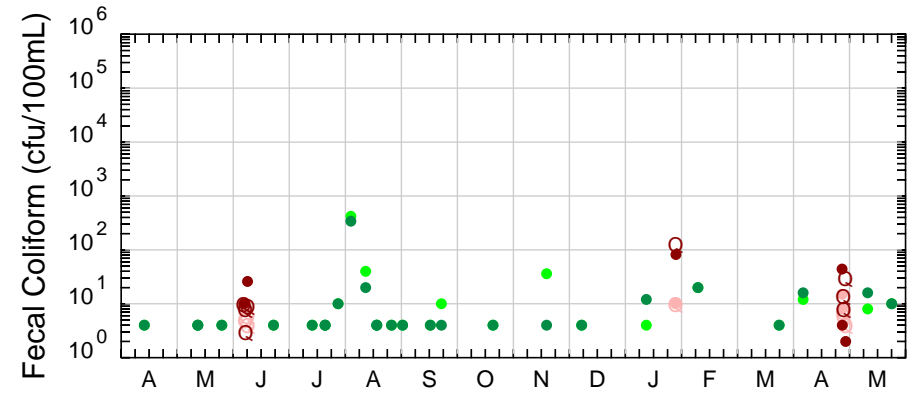
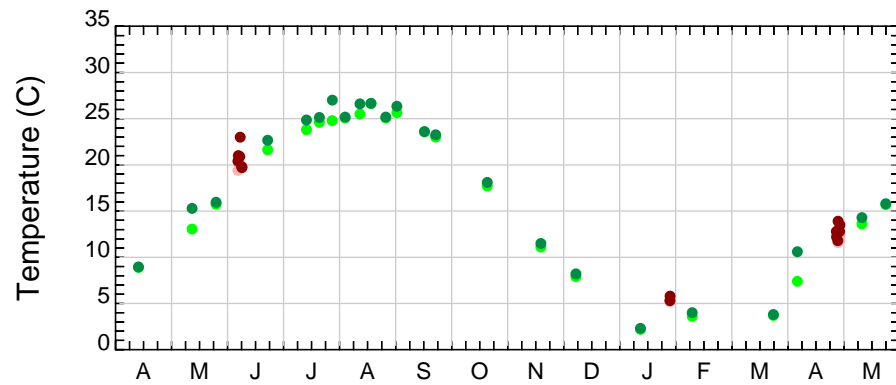
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
for notes on qualifiers

Time (Month)
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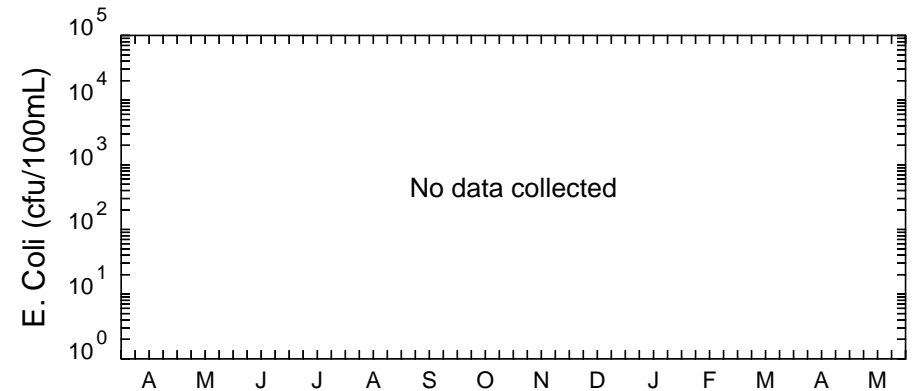
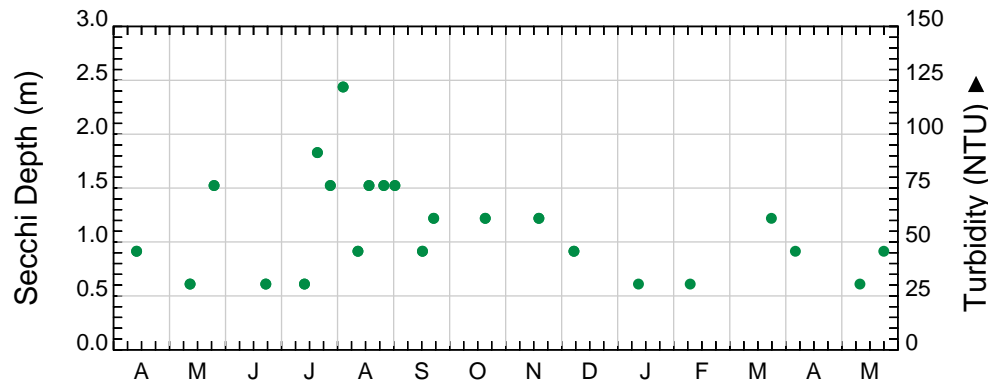
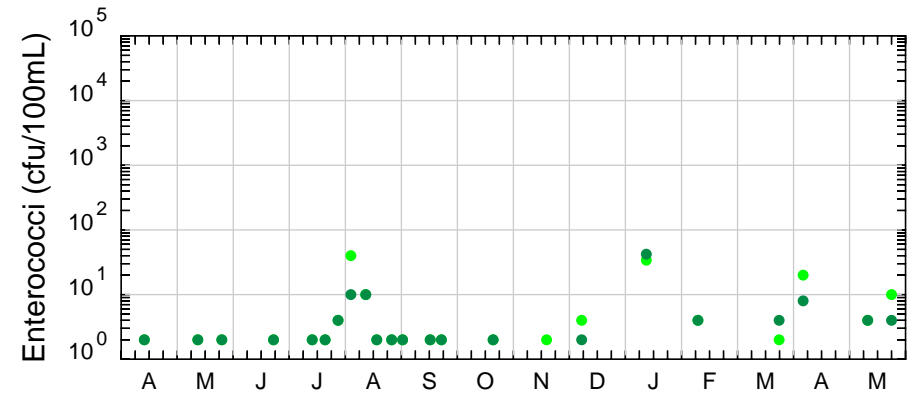
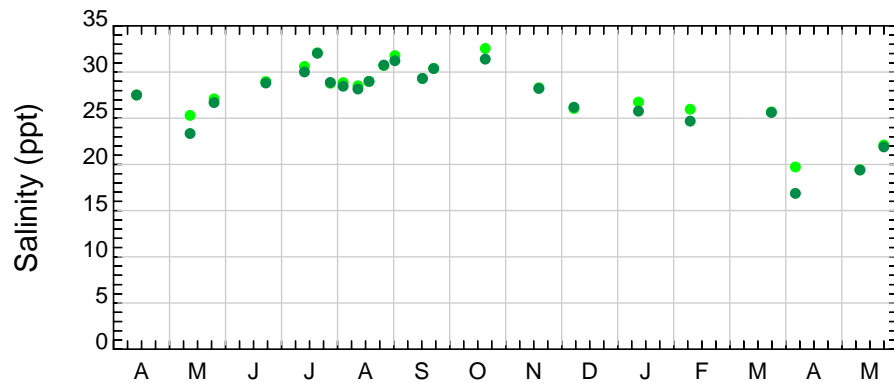
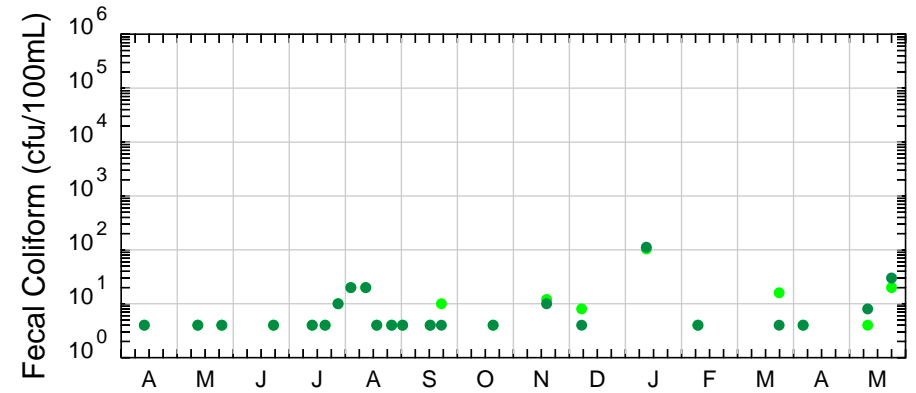
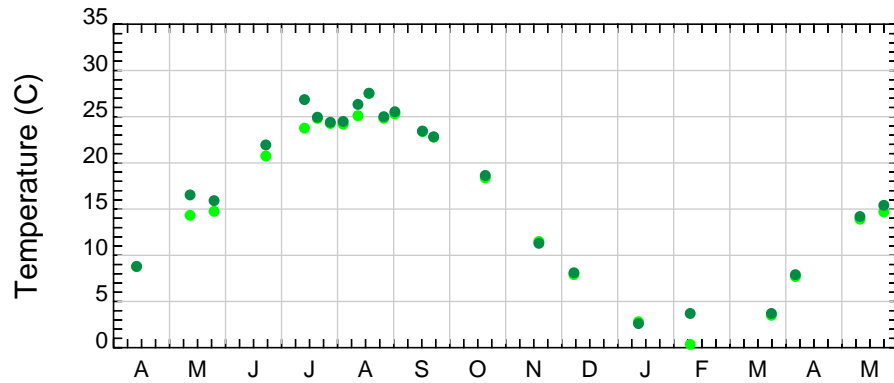
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG
○ Q See page 1 of attachment
for notes on qualifiers

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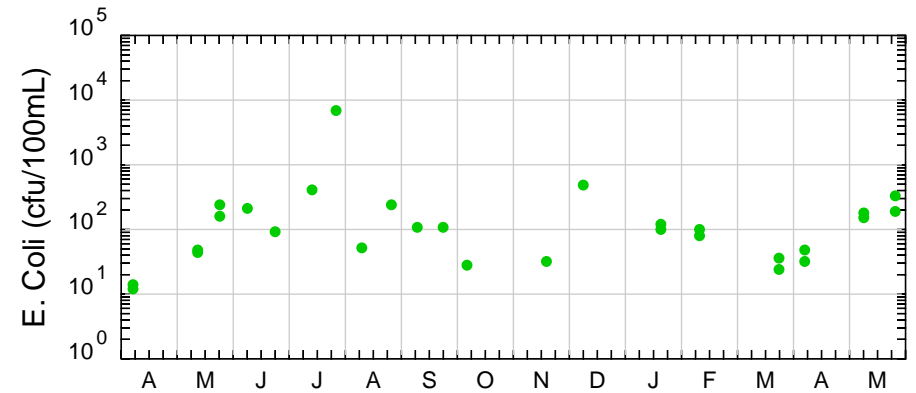
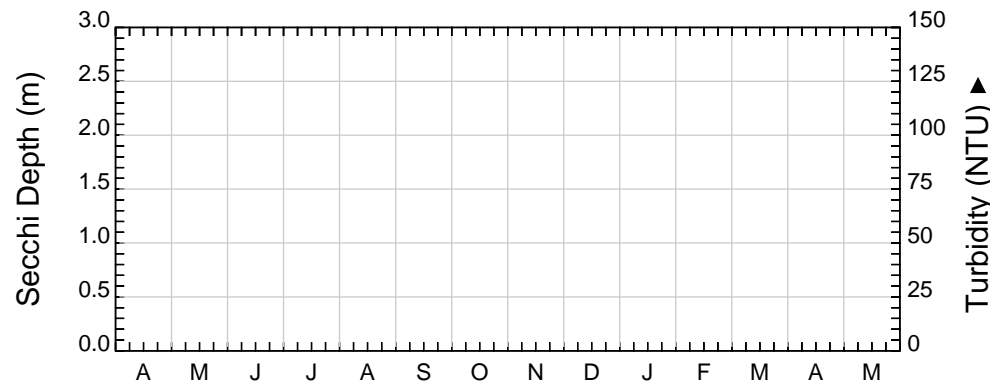
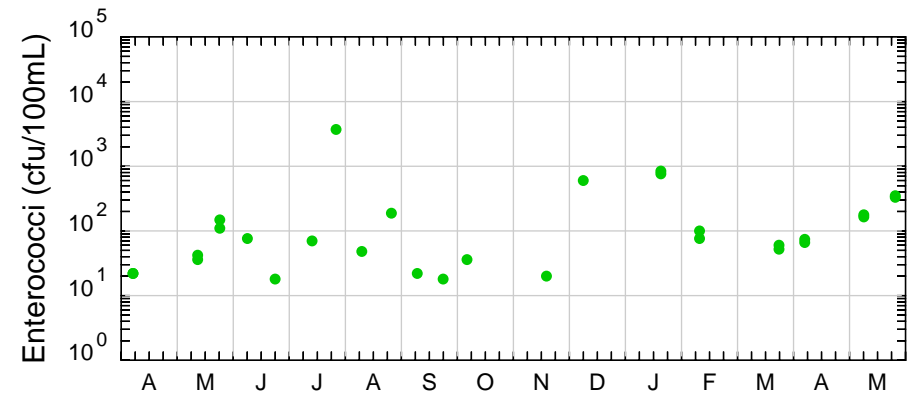
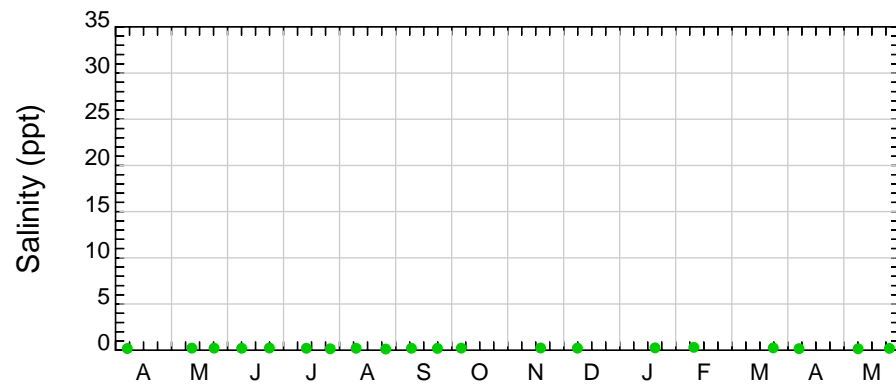
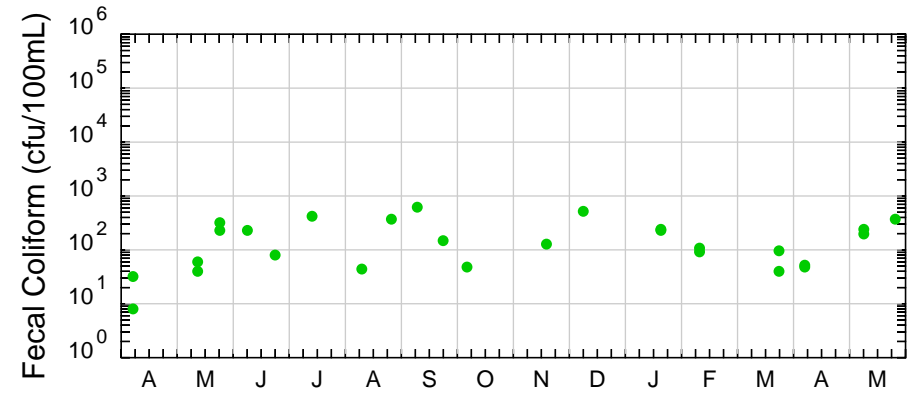
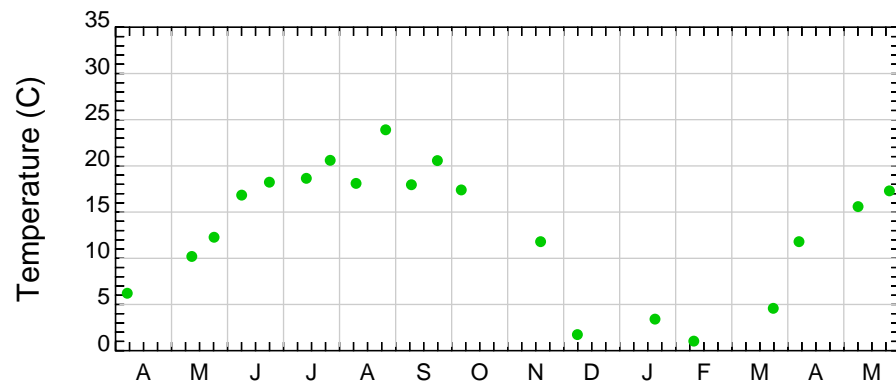
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
for notes on qualifiers

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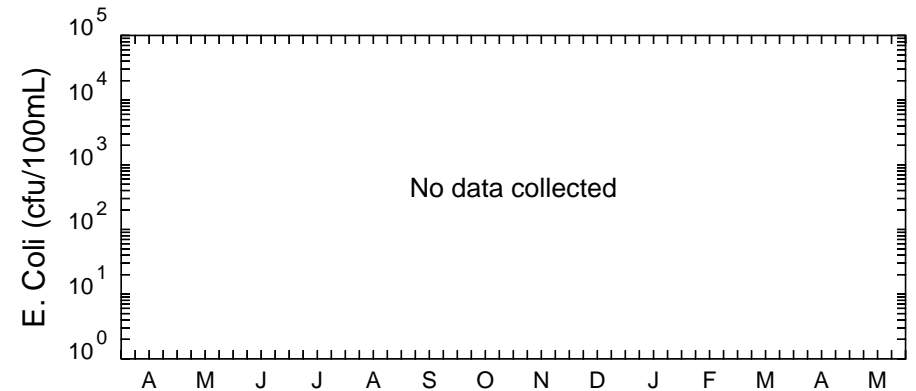
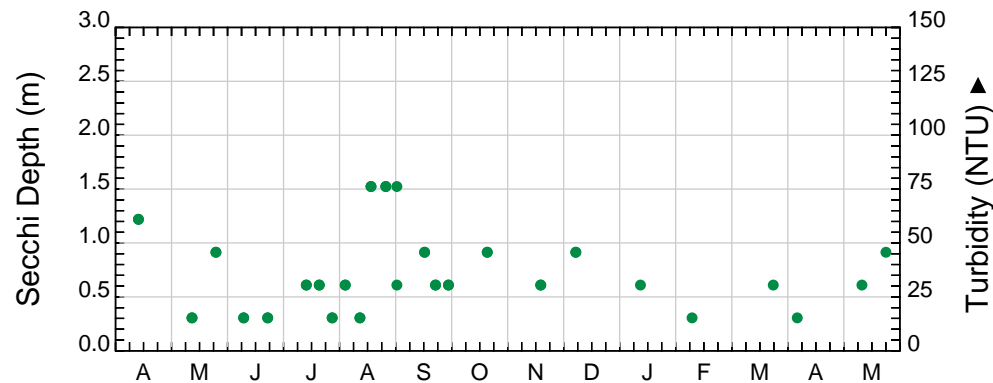
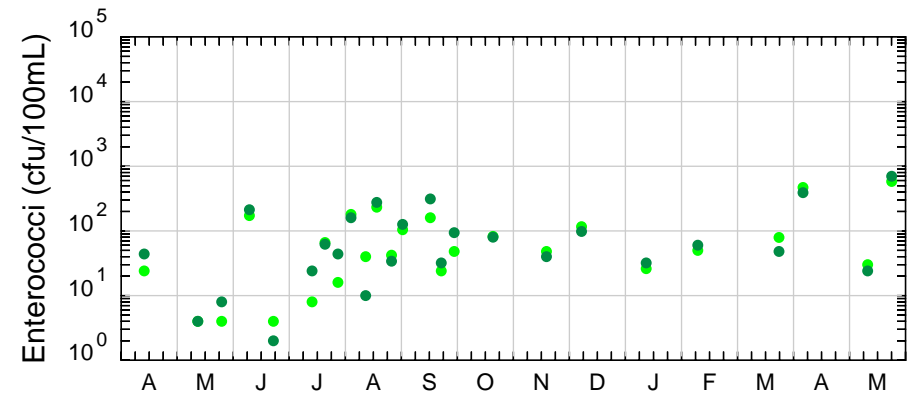
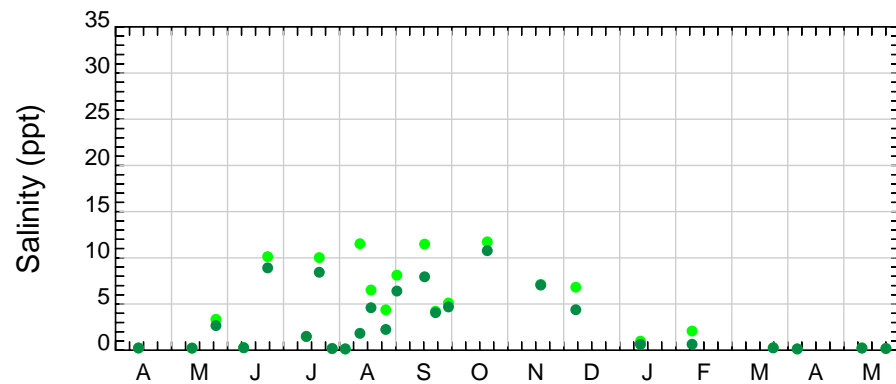
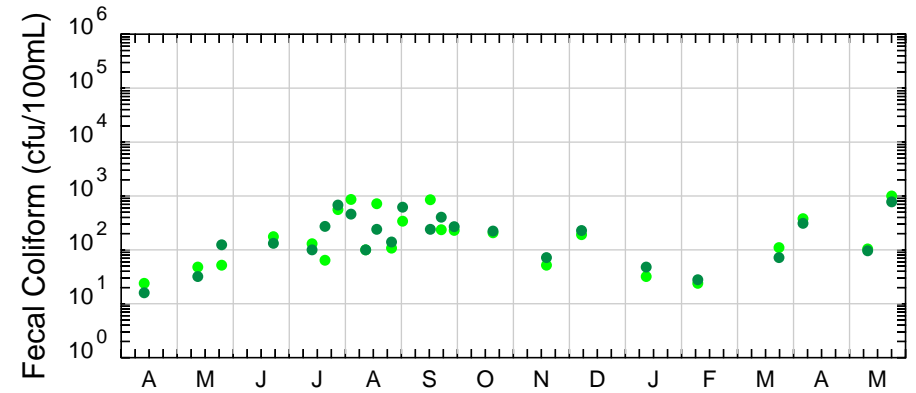
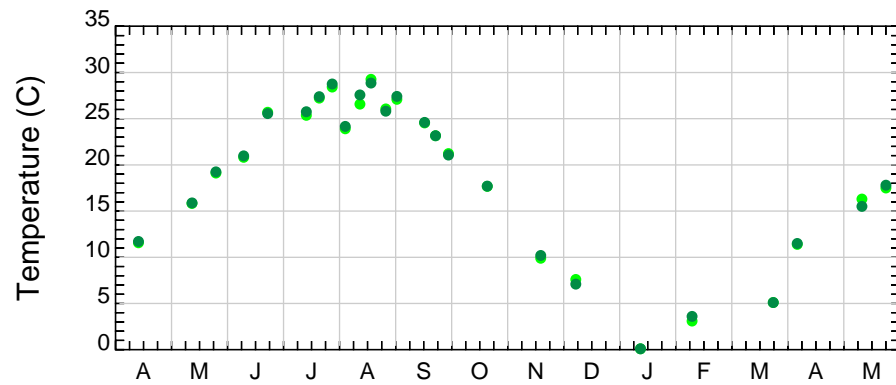
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
for notes on qualifiers

Time (Month)
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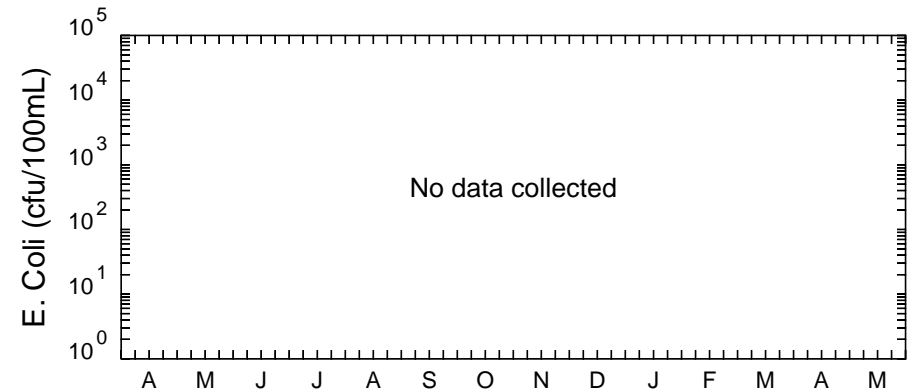
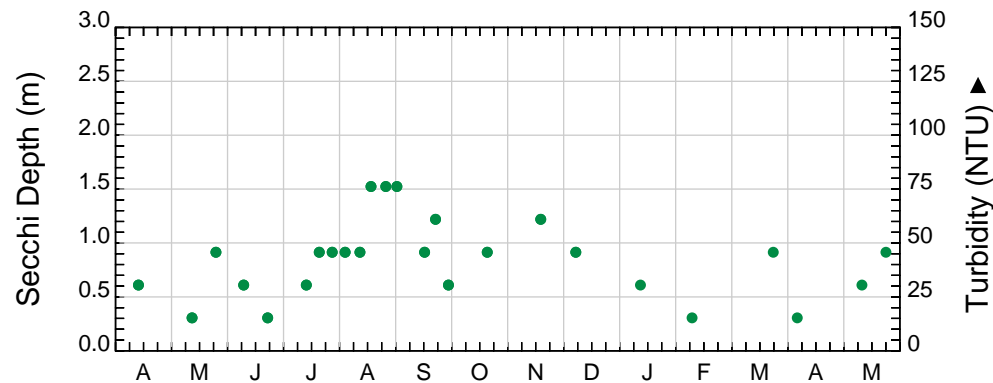
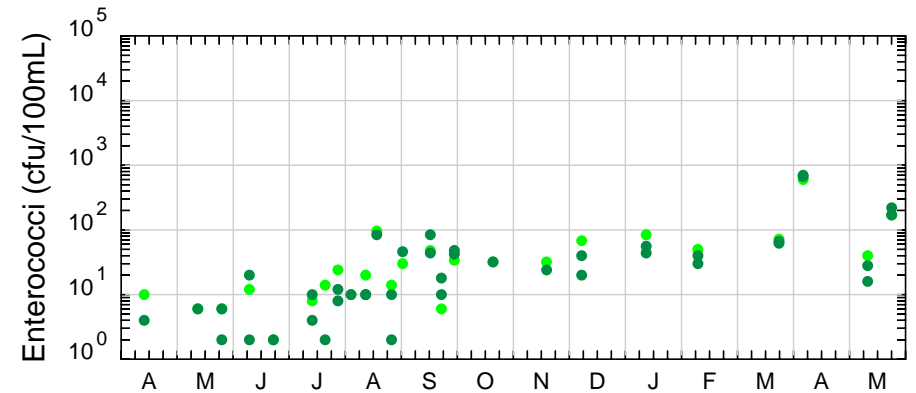
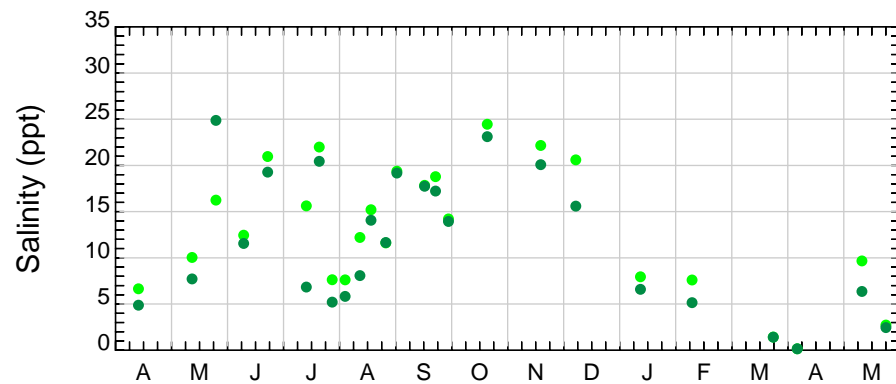
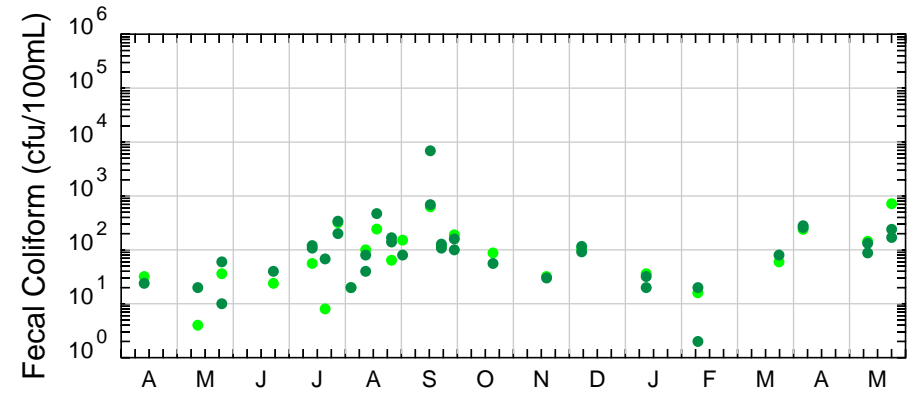
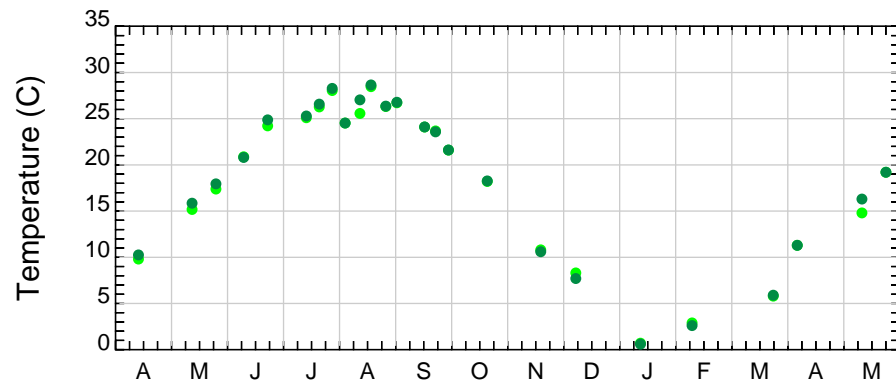
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
for notes on qualifiers

Time (Month)
2016 / 2017

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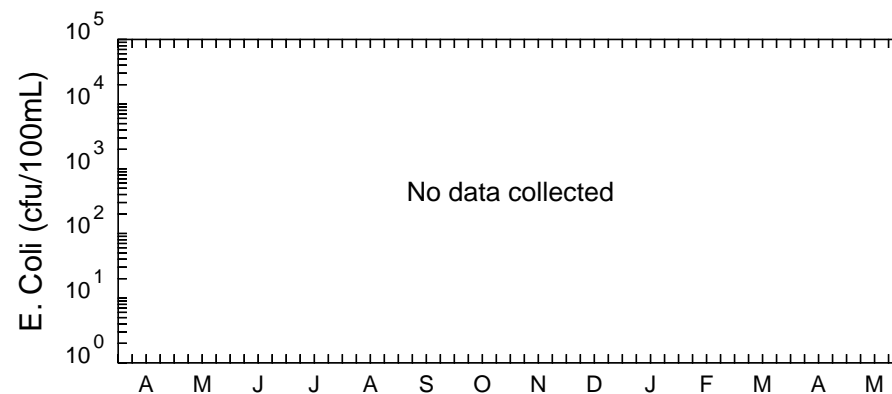
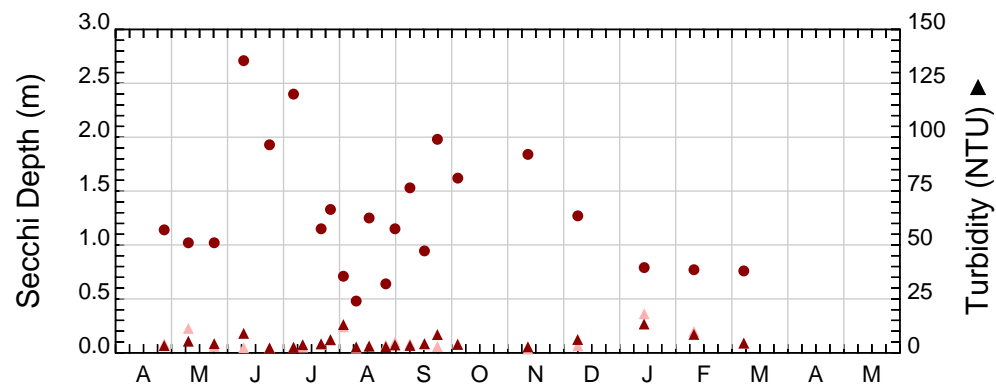
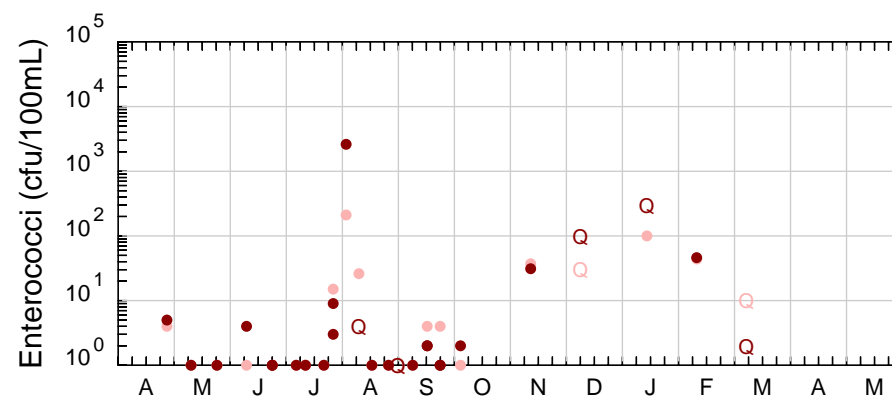
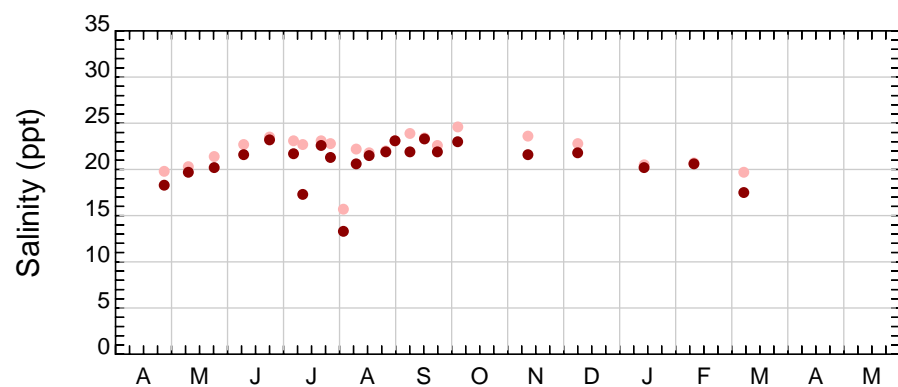
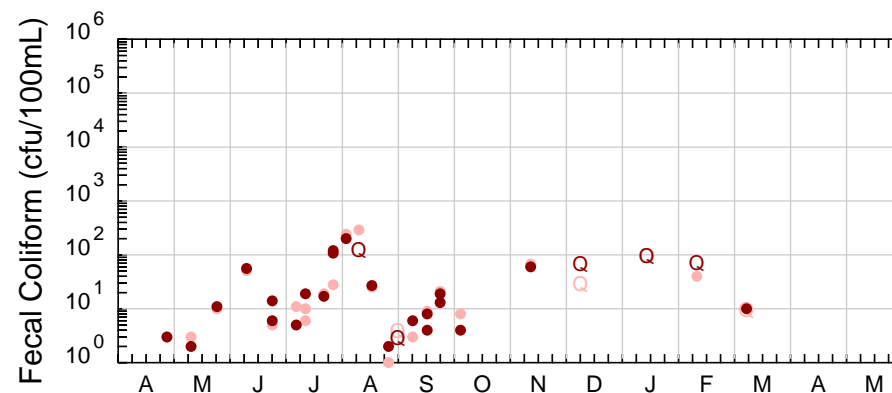
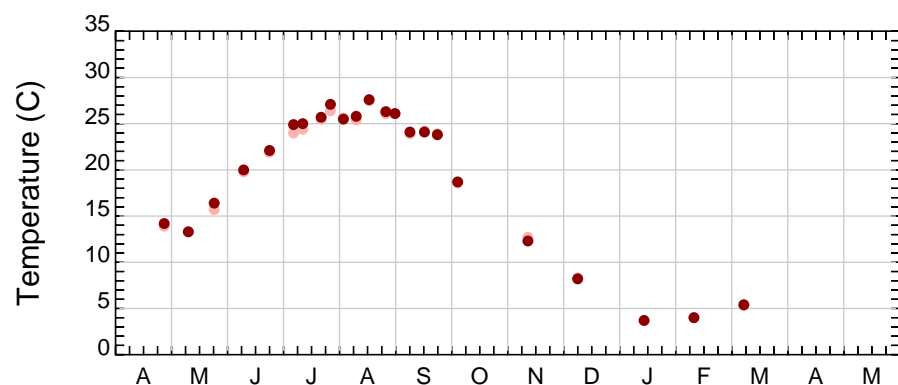
Time (Month)
2016 / 2017

June 30, 2018 (Revised 10/05/18)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
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Time (Month)
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Time (Month)
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● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG
Q See page 1 of attachment
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ATTACHMENT 3 – WET WEATHER EVENTS

EXPLANATION OF WET WEATHER EVENT DATA PRESENTATION

Graphs are presented here within of available receiving water data collected by HDR during the following four wet weather sampling events:

- June 6, 2016
- January 4, 2017
- January 24, 2017
- April 26, 2017

Temperature, salinity, Secchi depth, turbidity, fecal coliform, enterococci, and E. coli are plotted by station. Refer to Attachment 1 figures for sampling locations. The pages are ordered by event, then spatially by waterbody in a manner similar to the figures in Attachment 2. Figures are labeled with a waterbody grouping, specific waterbody name, station, and waterbody classification. Refer to the table below for relevant water quality standards. ~~Data collected during these events were meant to assess the trend of bacteria concentrations after a wet weather event for the purposes of water quality modeling, and not to assess attainment of geometric mean standards.~~

Data are presented as color-coded circles, with darker tones representing surface data and lighter tones representing mid-depth and bottom data. Secchi depth does not fall into a specific depth category, but is plotted with filled circles. Turbidity is shown on the same panel as Secchi depth and is presented with filled triangles following the same light/dark tone. Only the Data collected by HDR under this BCMP report includes laboratory qualifiers (either as estimated or as exceeding holding times) which are presented as a “Q”. These data still meet the needs of the program and can be used in the water quality analysis. Refer to Section 3.2 for details on data qualifiers. All planned receiving water data have been collected.

The post-collection review of the data indicates the data have met the goals of the QAPP and will be acceptable for use in baseline conditions assessment, and for use in the model calibration. Assessment of the data quality will continue through the model calibration process.

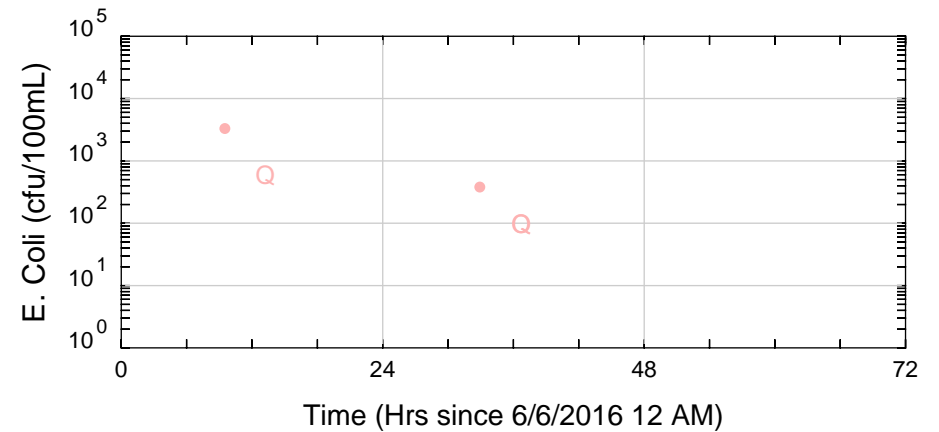
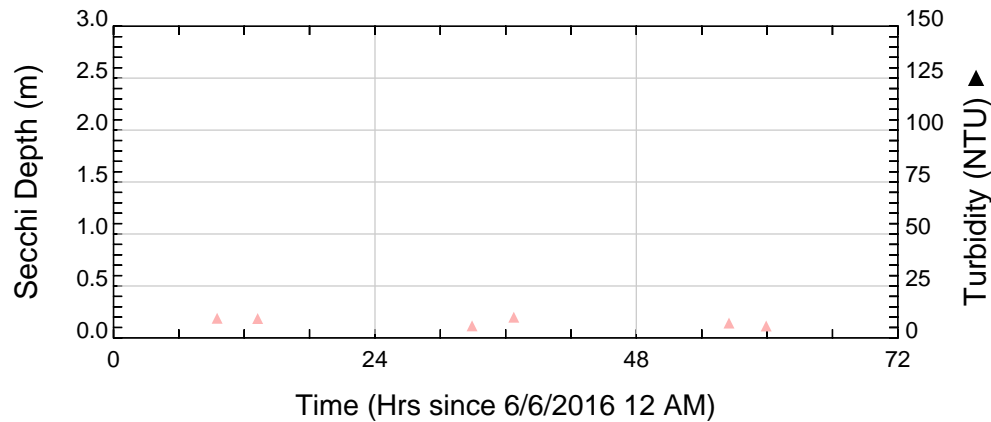
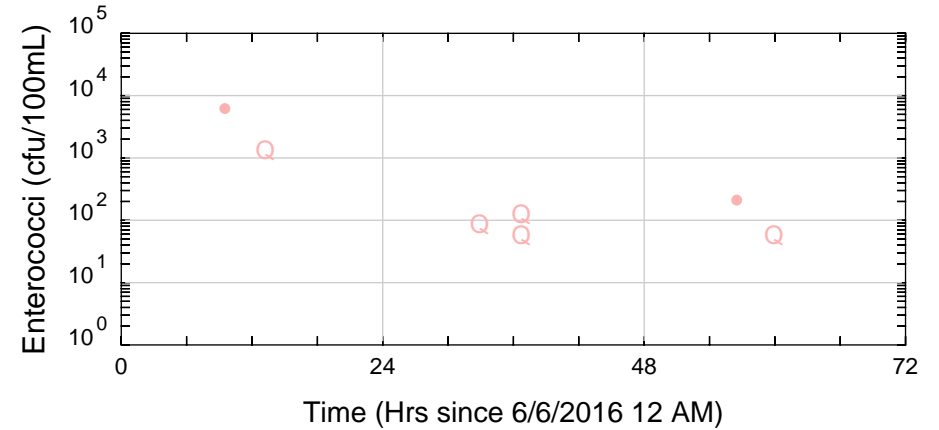
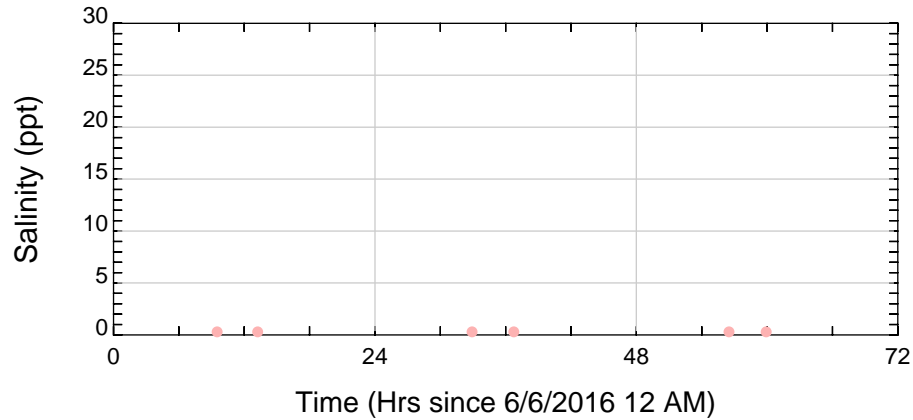
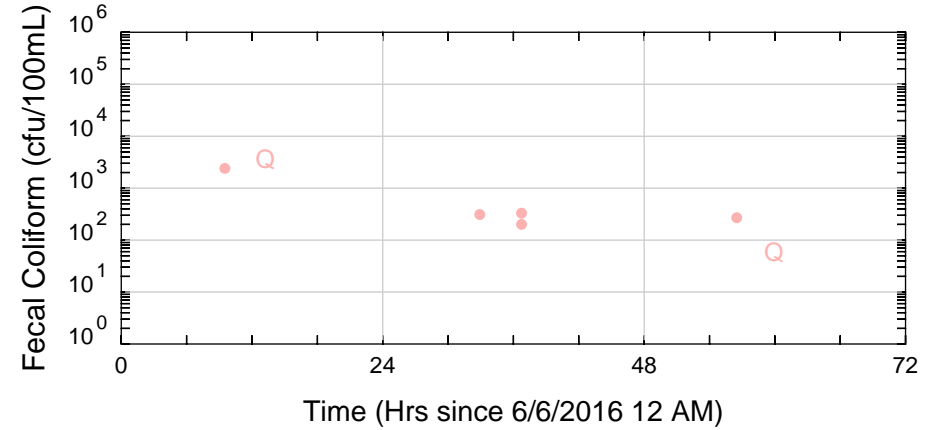
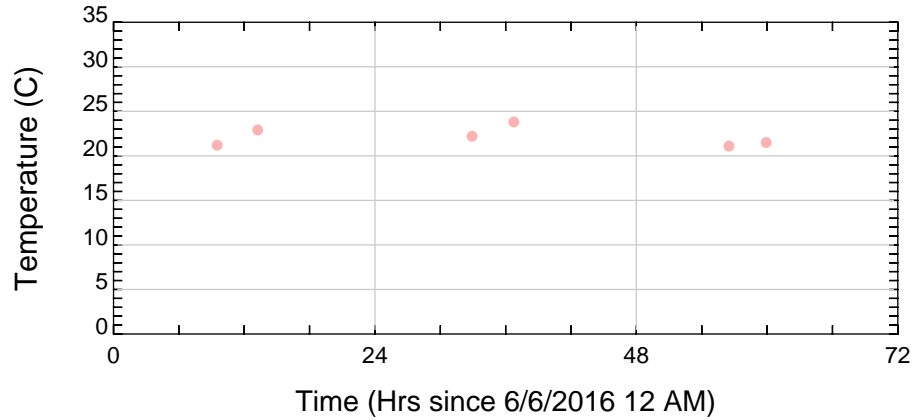
WATER QUALITY STANDARDS

Class	Type	Bacteria Standard			Highest Protected Uses	
		Path	GM	SSM	Recreational	Other
SC	Saline	Entero	35	104	Primary	Shellfishing*
SE1	Saline	Entero	35	104	Primary	Shellfishing*
SE2	Saline	Fecal	770	na	Secondary	Diadromous fish migration
SE3	Saline	Fecal	1500	na	Secondary	Diadromous fish migration
FW2	Fresh	Ecoli	126	235	Primary	Public water supply

*Shellfish Waters are subject to the National Shellfish Sanitation Program standard for approved shellfish waters

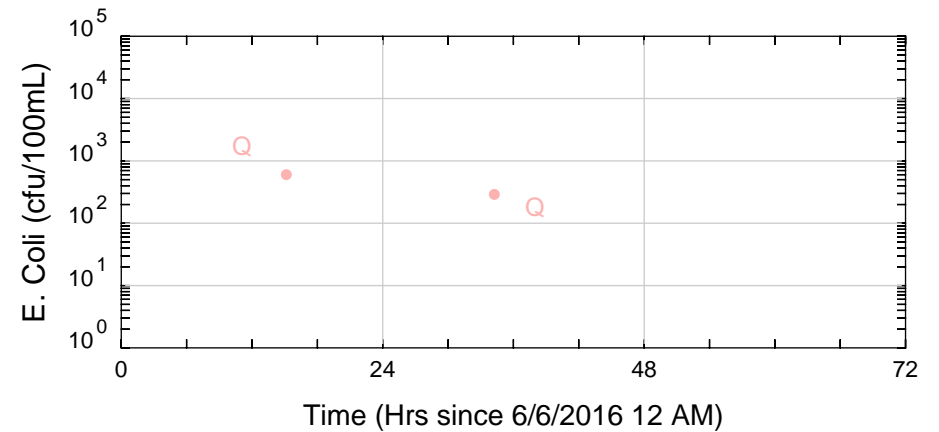
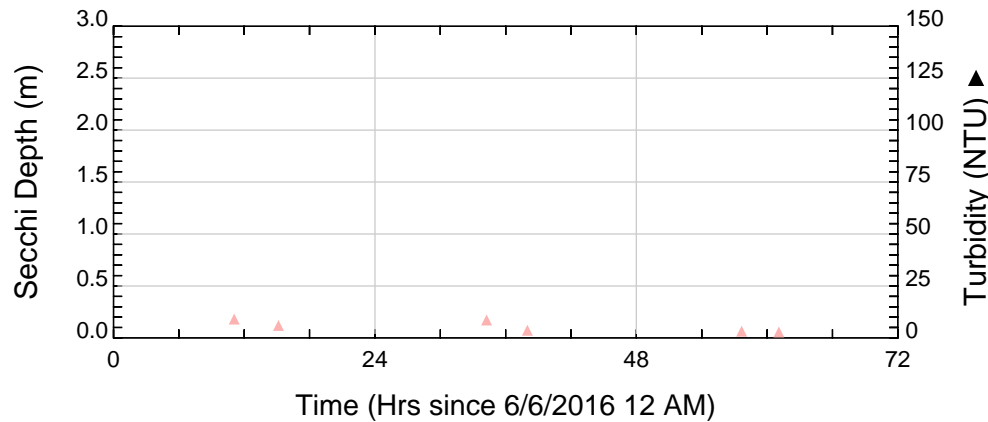
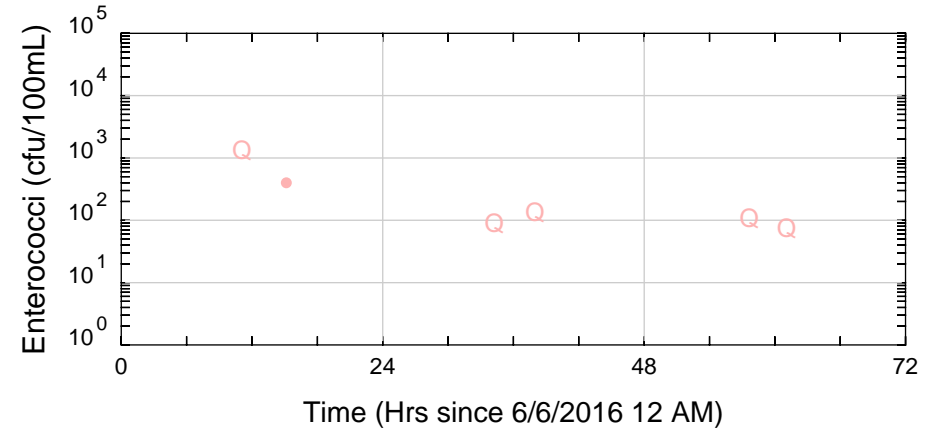
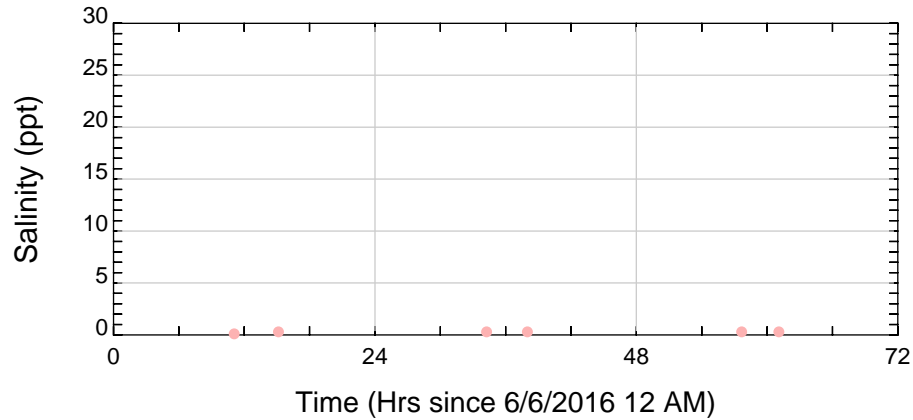
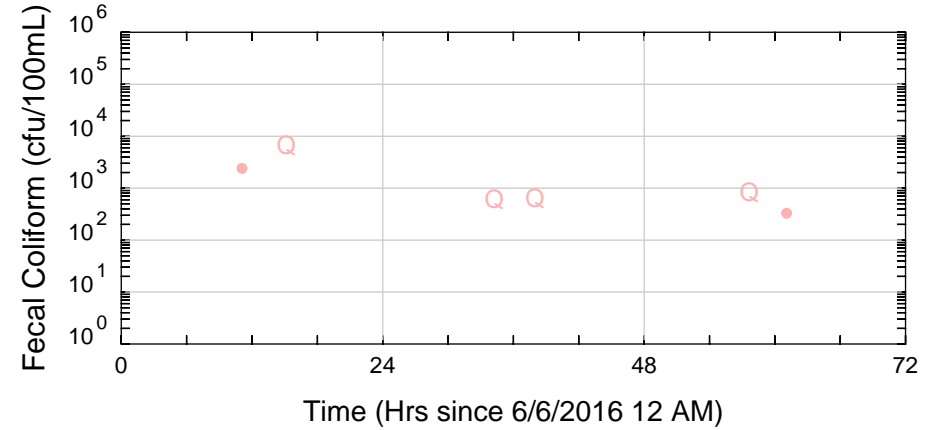
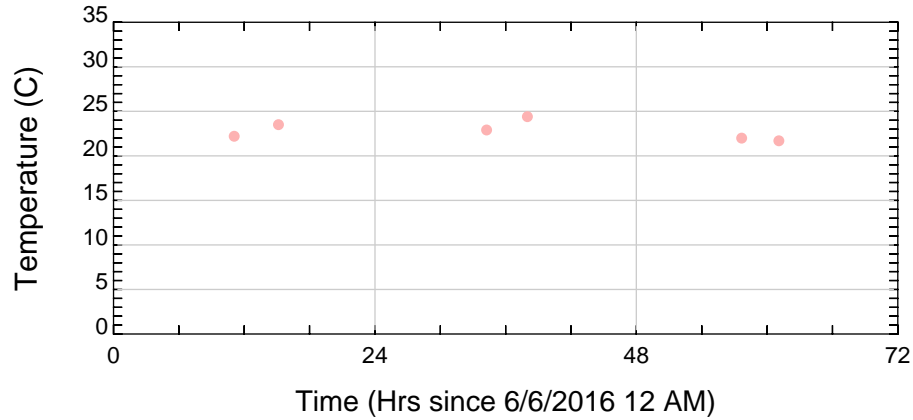
Passaic River & Tributaries, Passaic River, 1, (FW2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



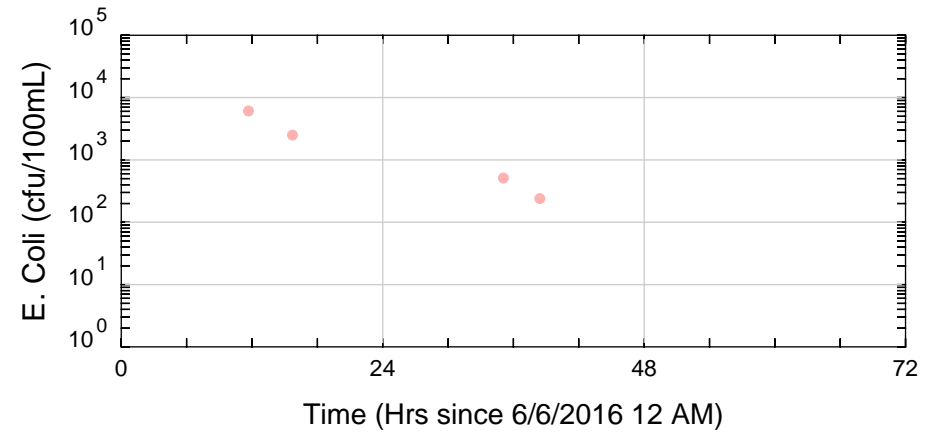
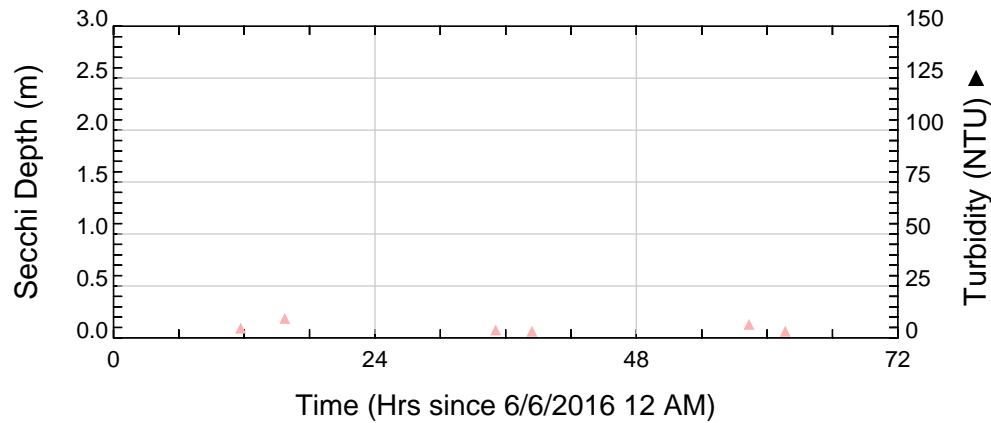
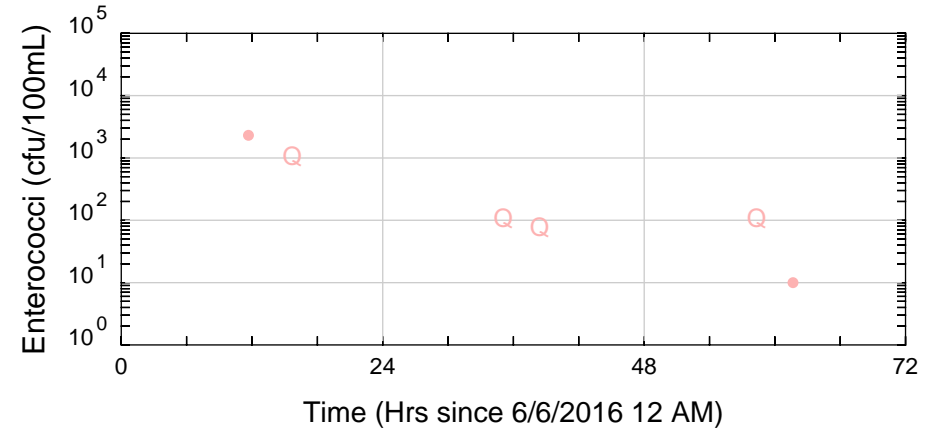
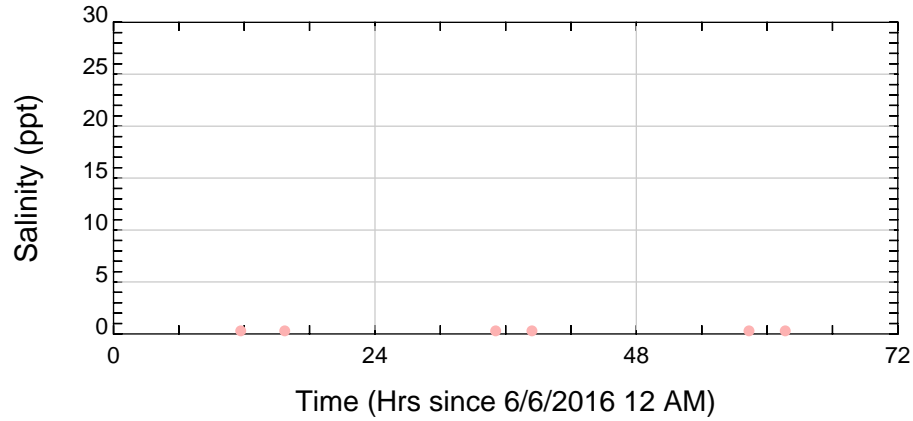
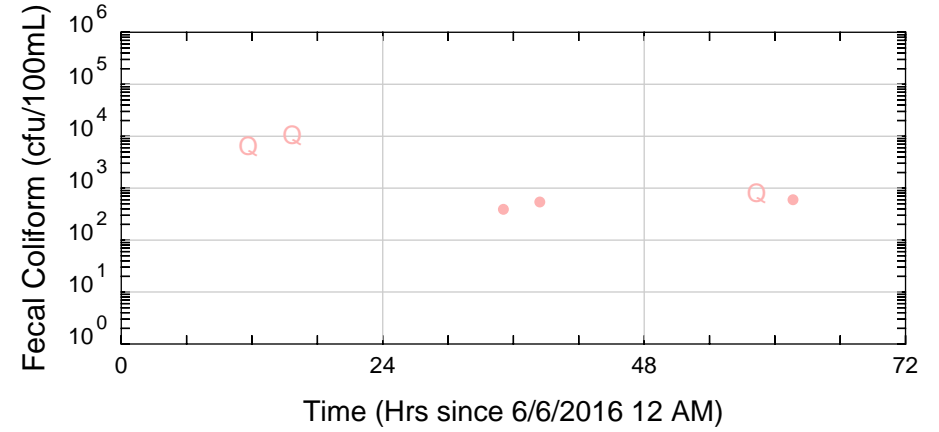
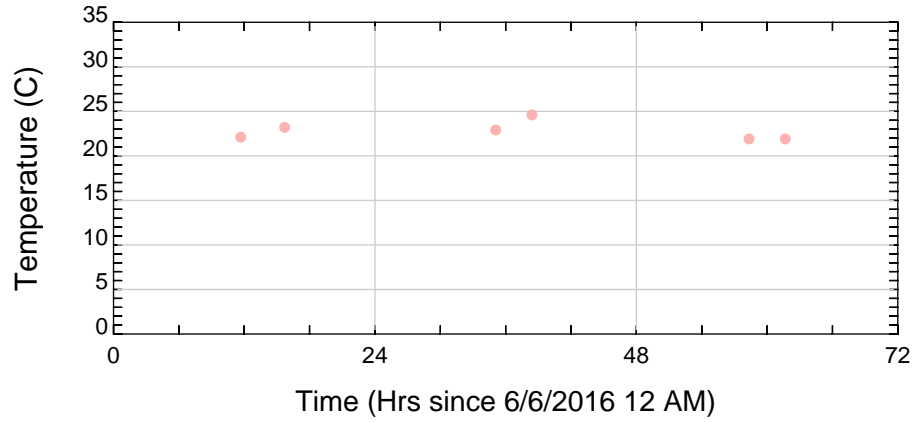
Passaic River & Tributaries, Passaic River, 3, (FW2)

● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG



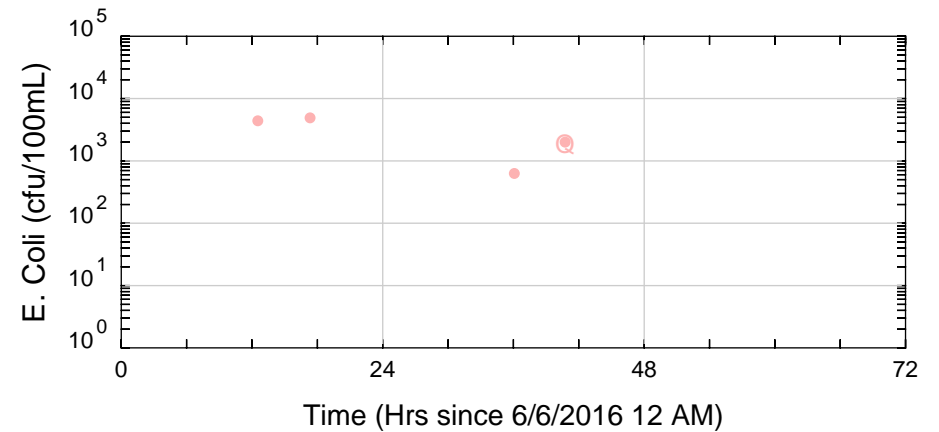
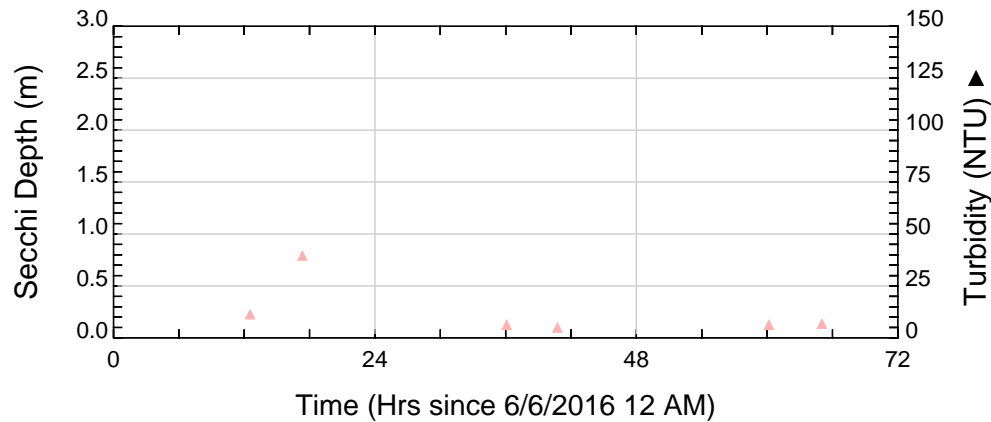
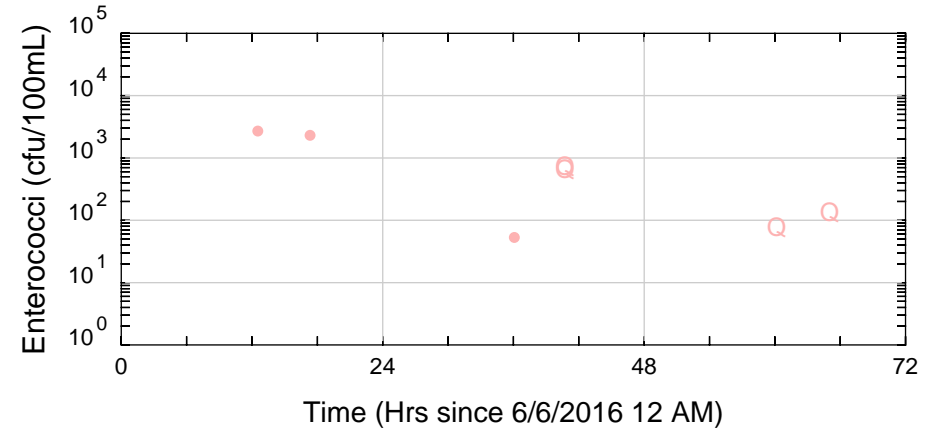
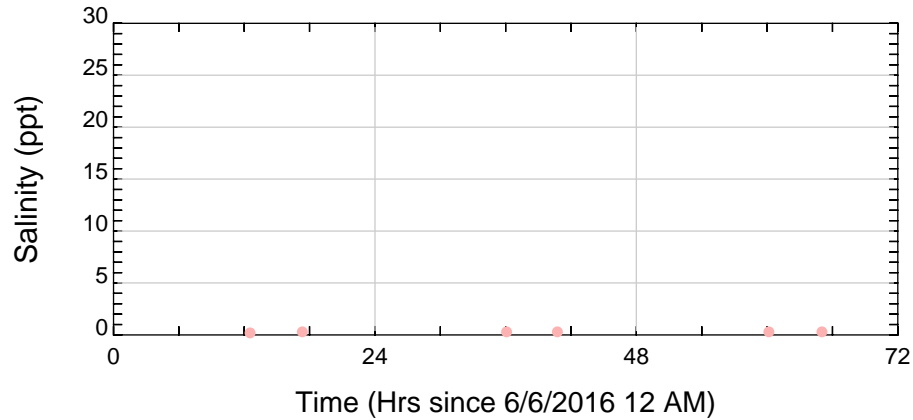
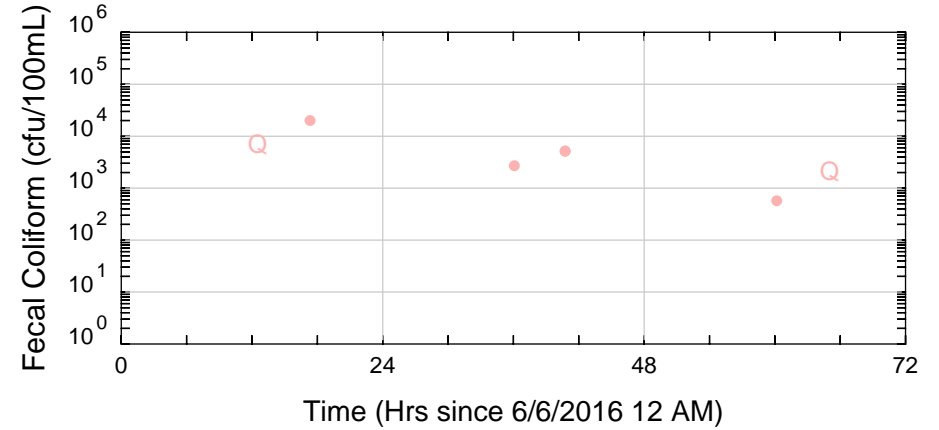
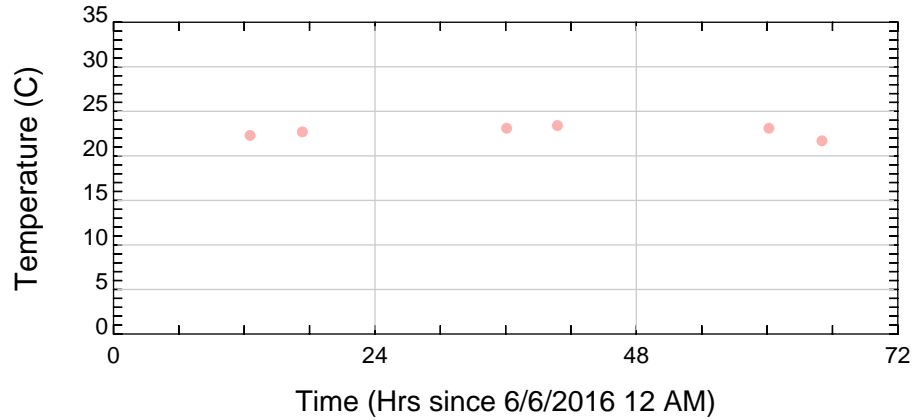
Passaic River & Tributaries, Passaic River, 4, (FW2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



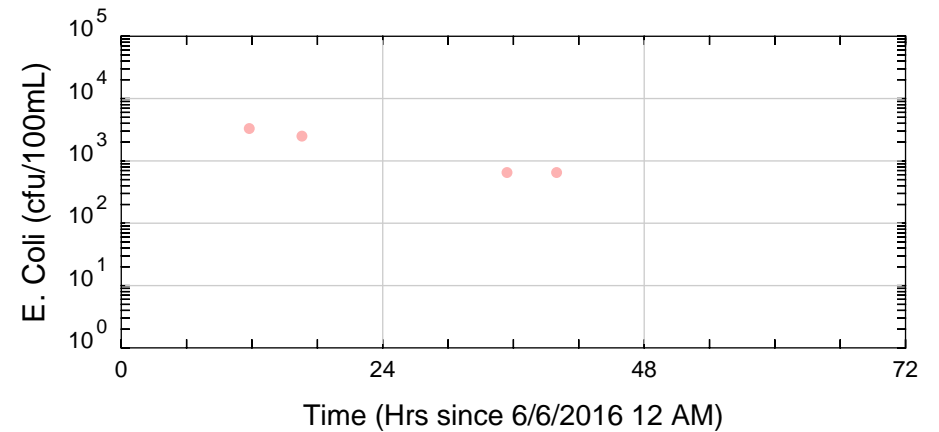
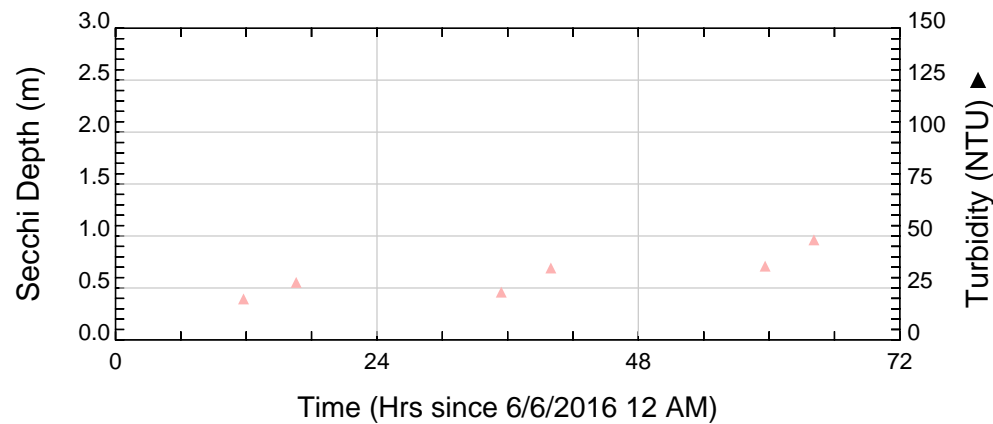
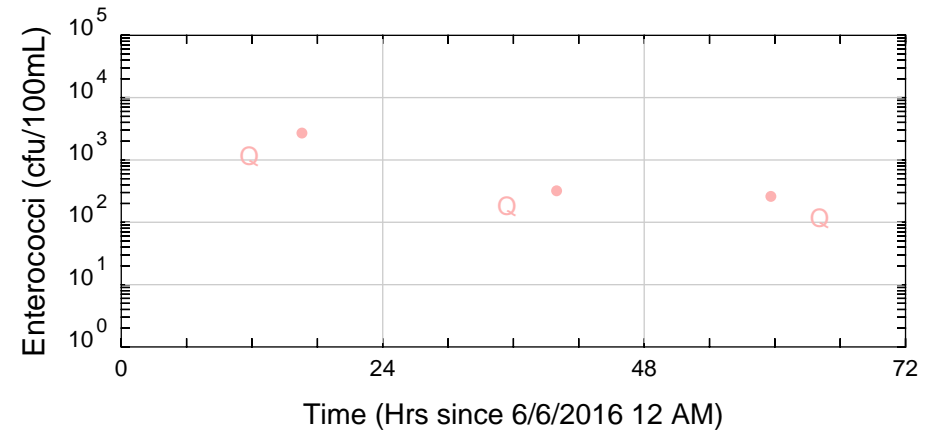
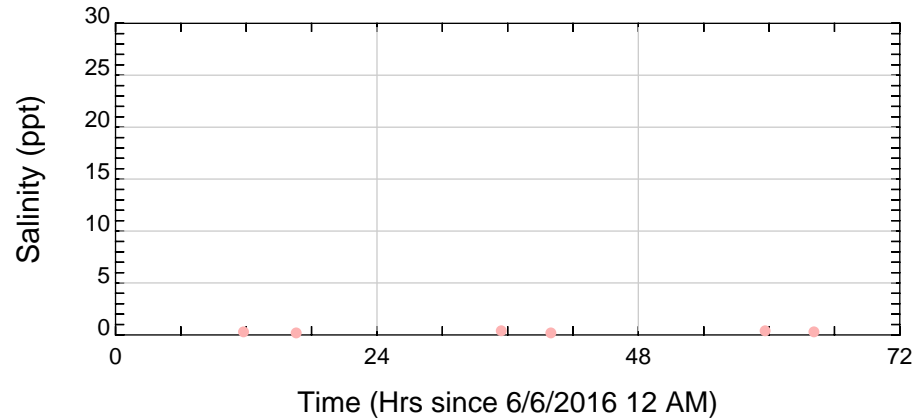
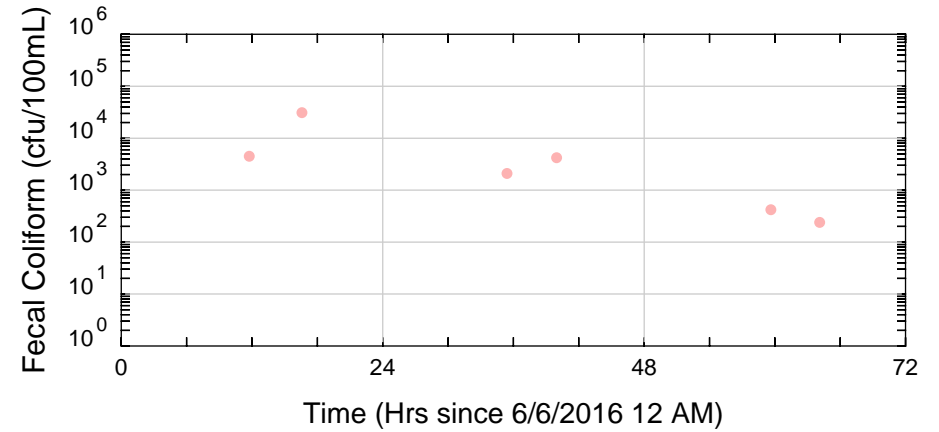
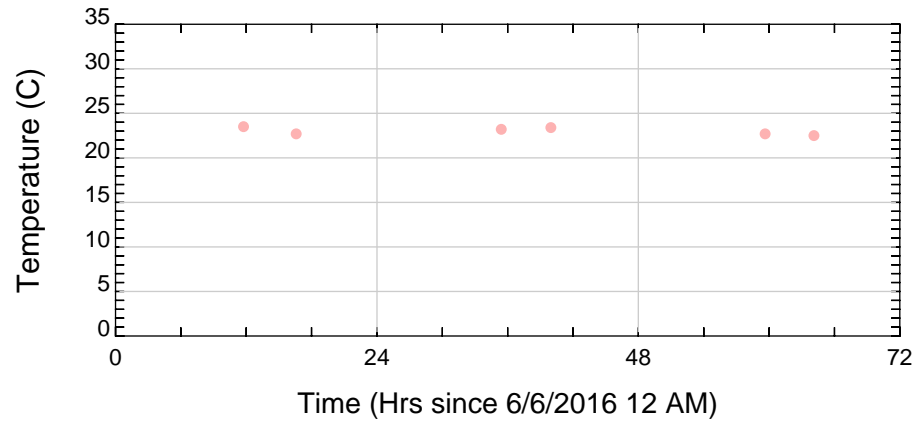
Passaic River & Tributaries, Passaic River, 7, (FW2/SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



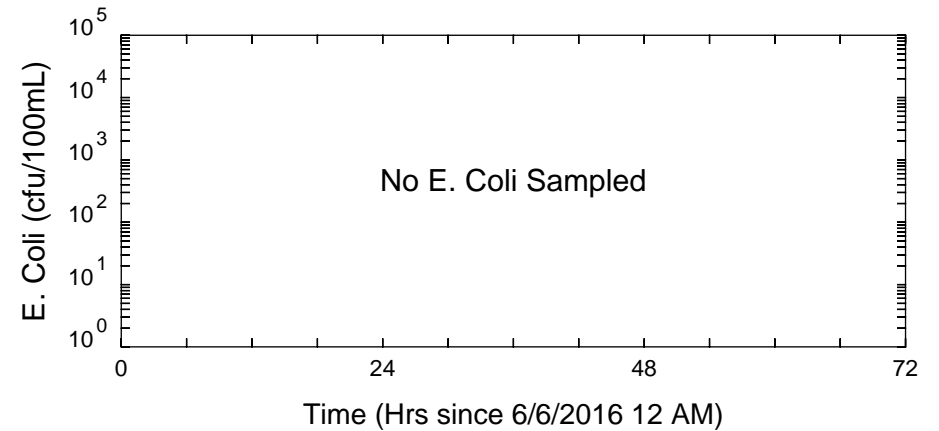
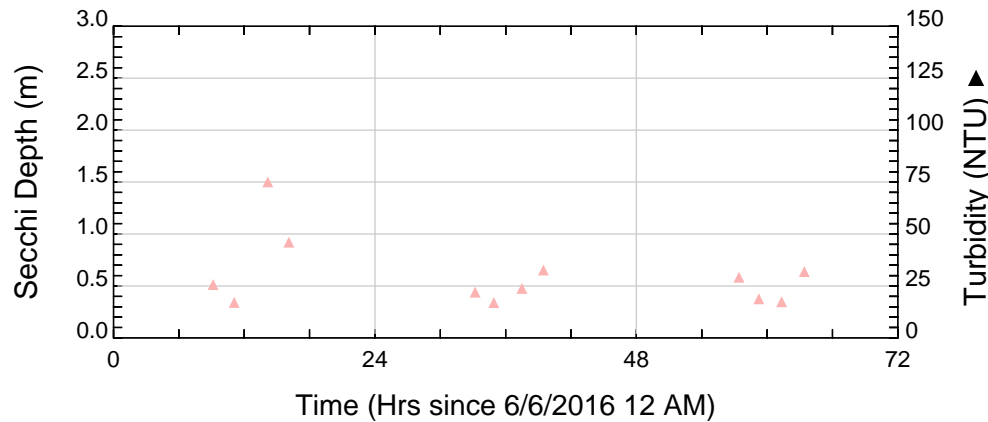
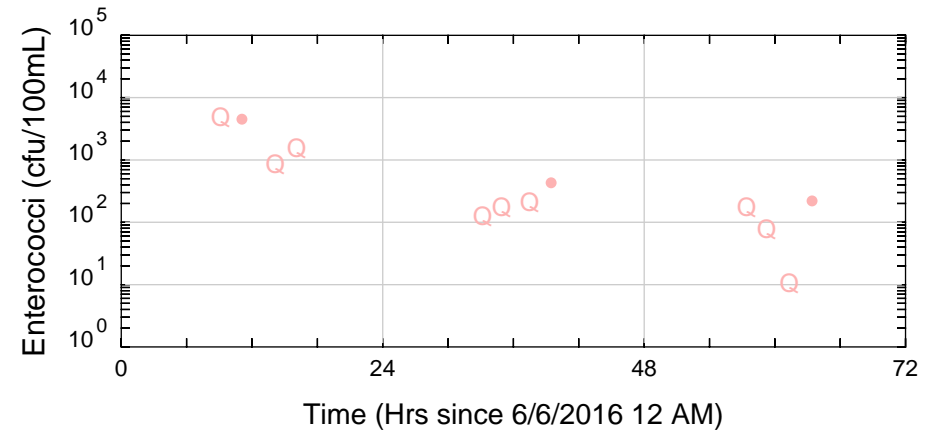
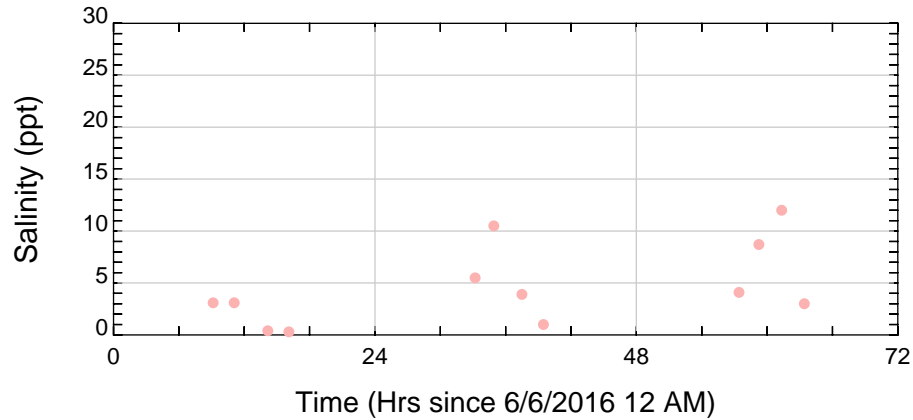
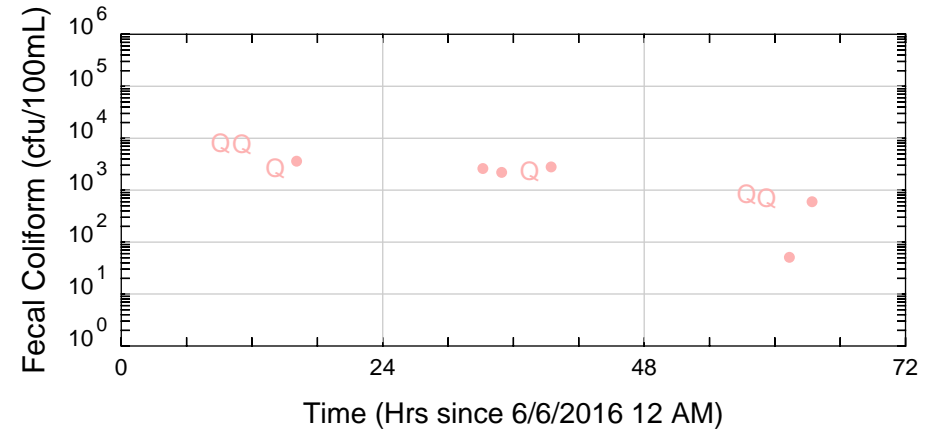
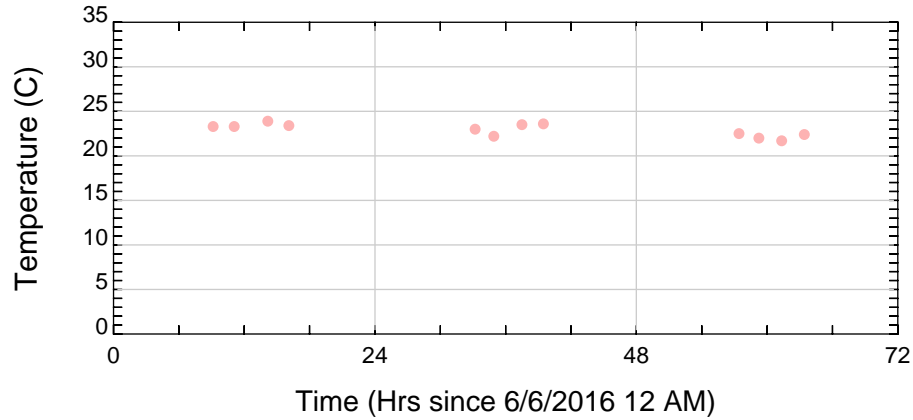
Passaic River & Tributaries, Passaic River, 8, (FW2/SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



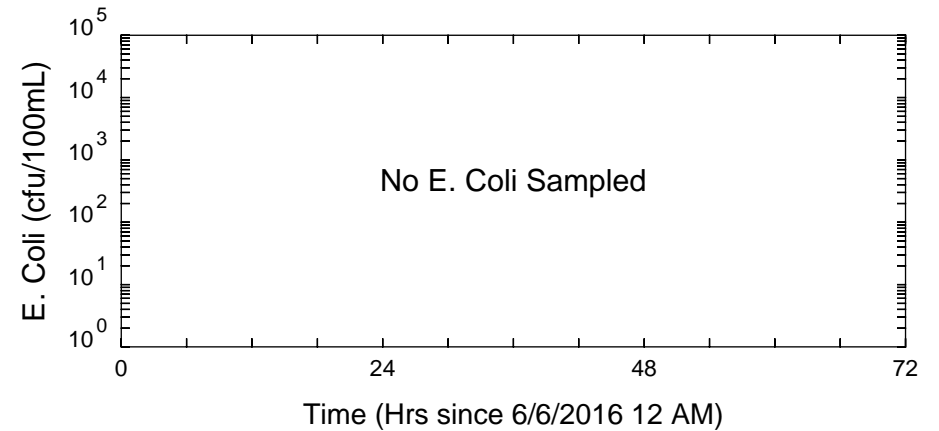
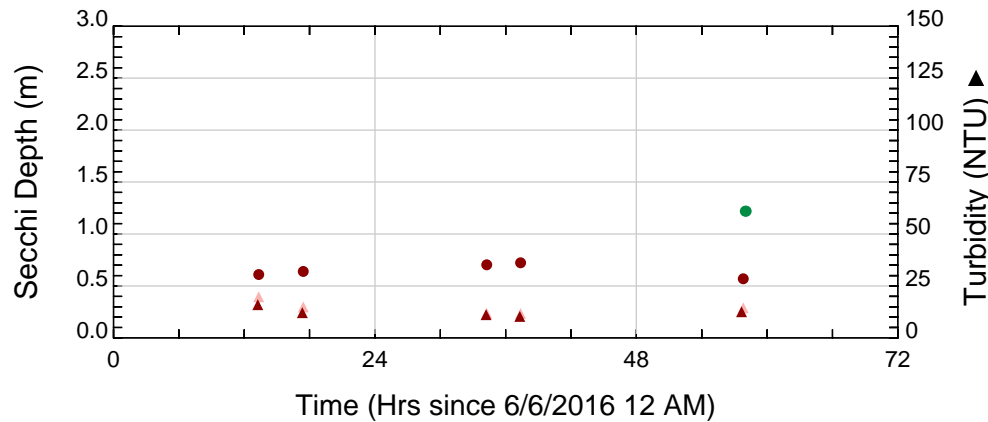
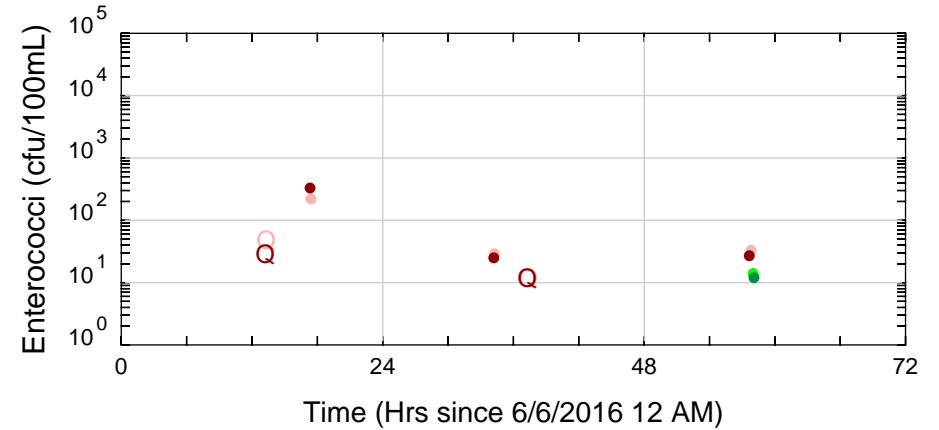
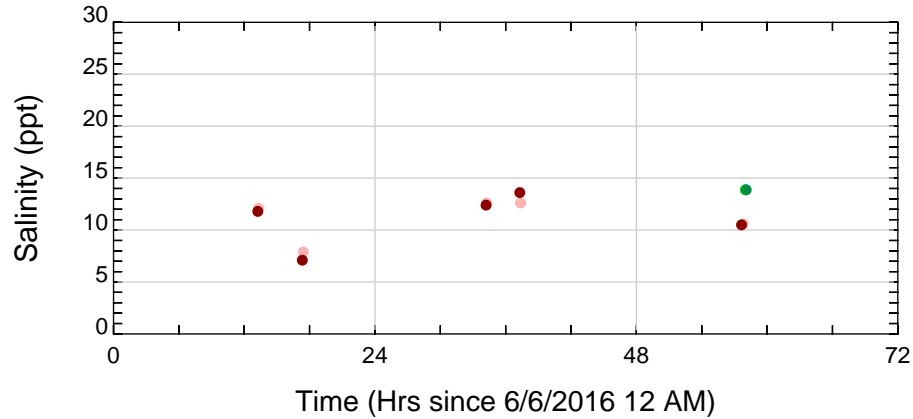
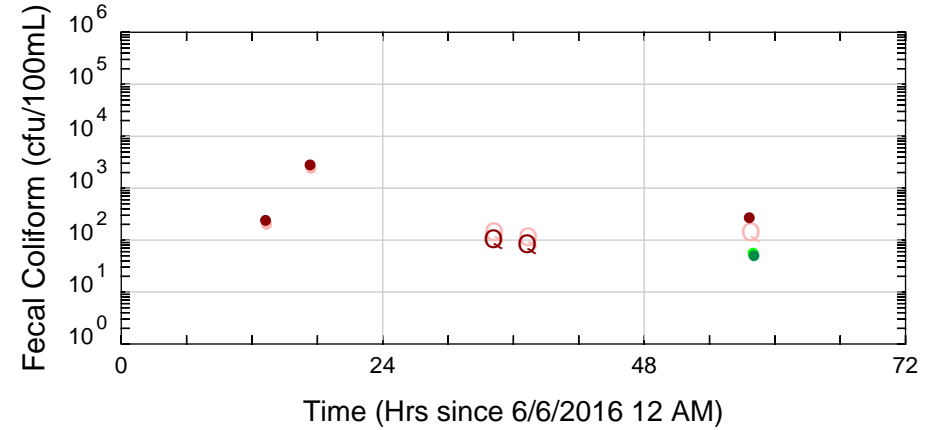
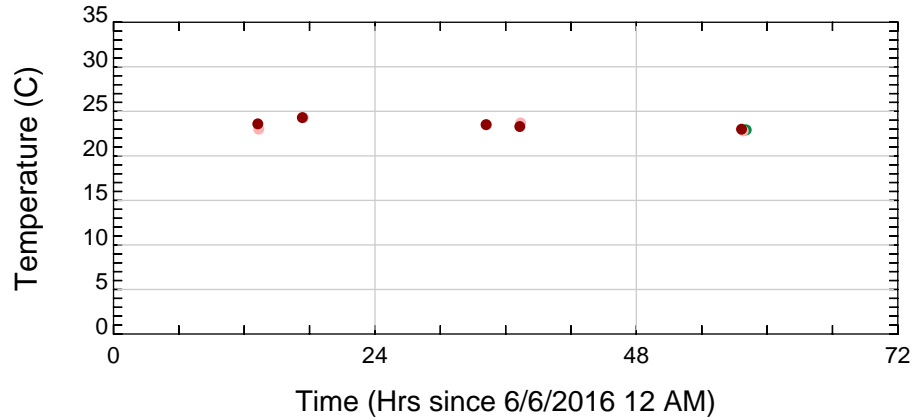
Passaic River & Tributaries, Passaic River, 10, (SE3)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



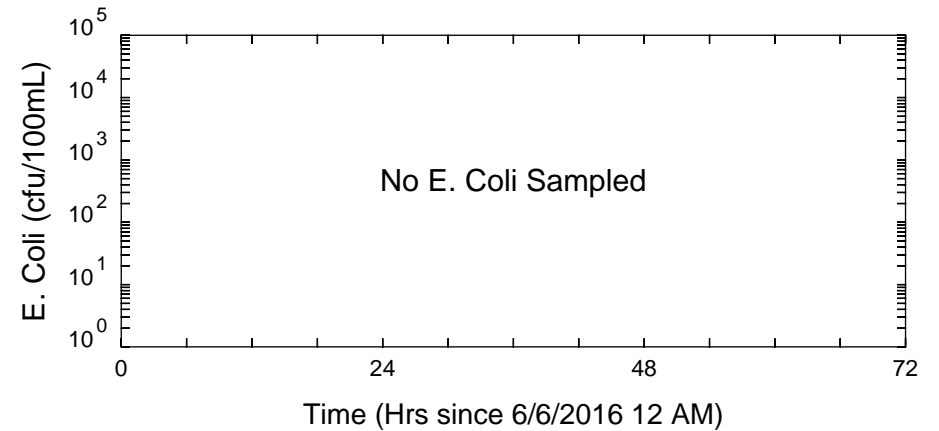
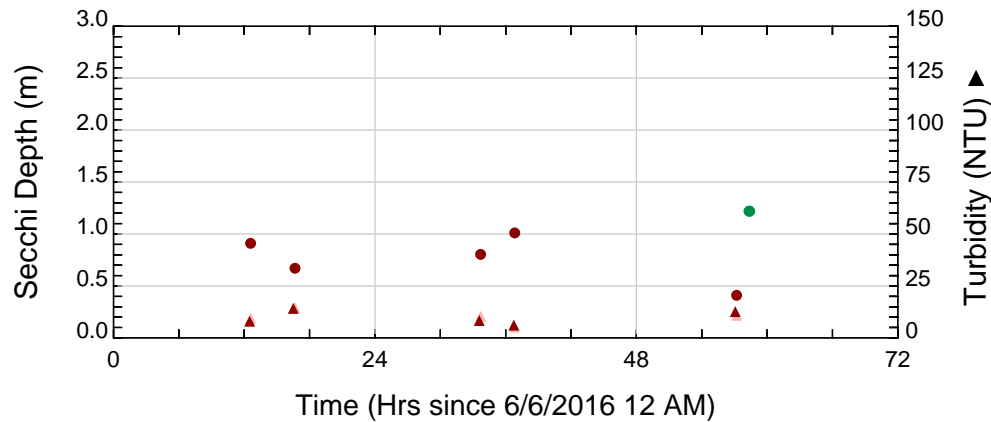
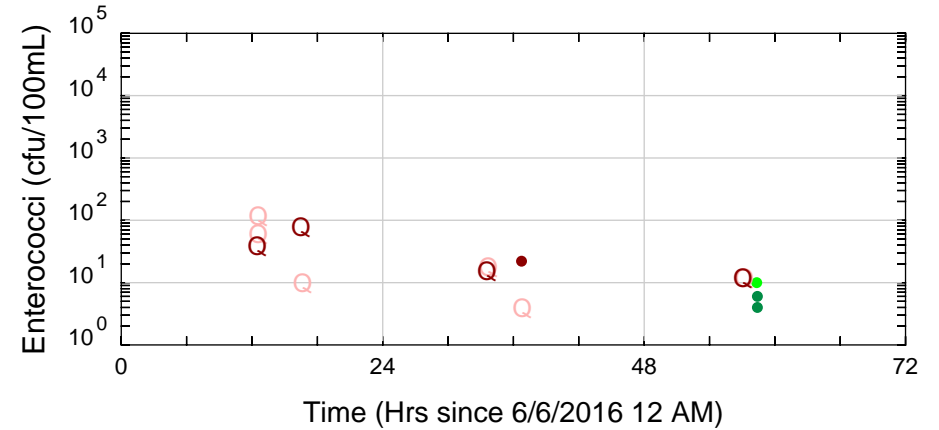
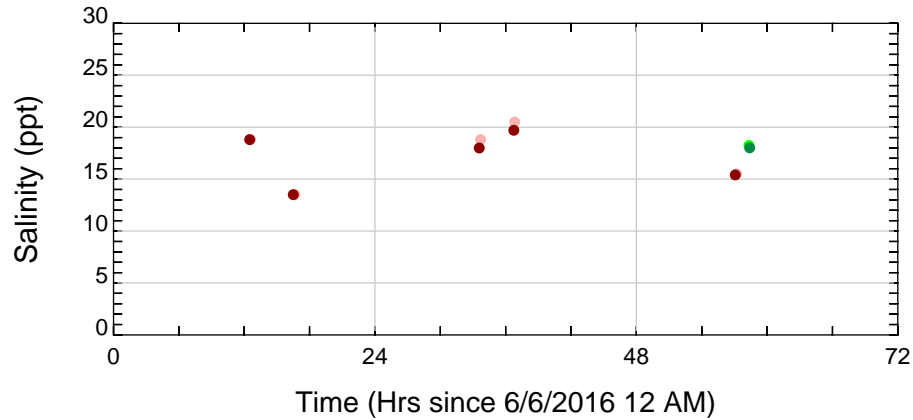
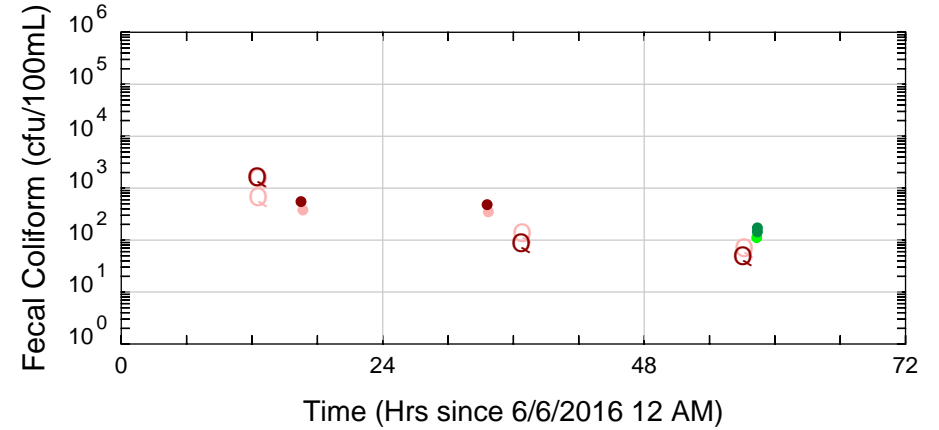
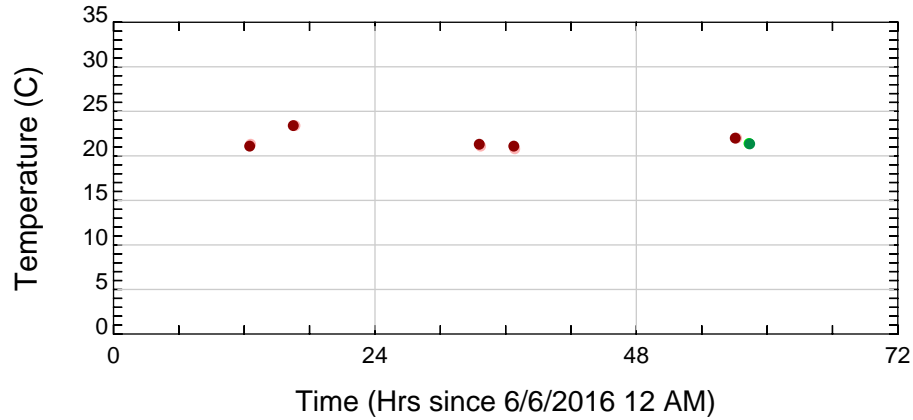
Hackensack River & Tributaries, Hackensack River, 14, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



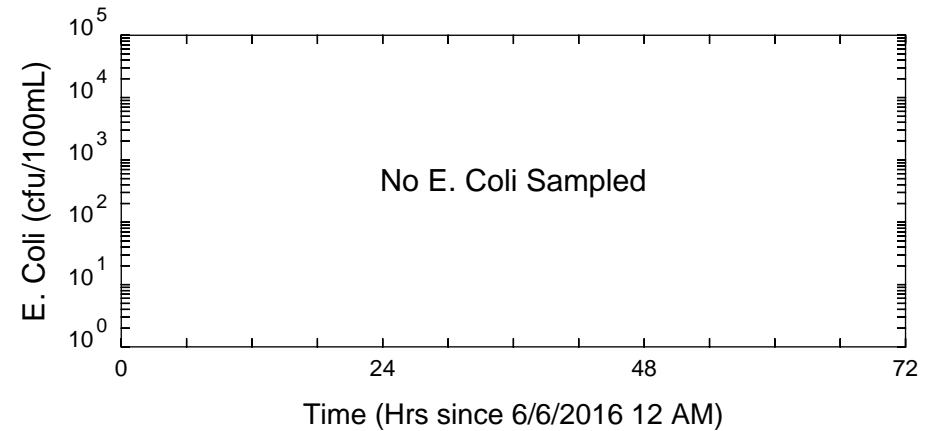
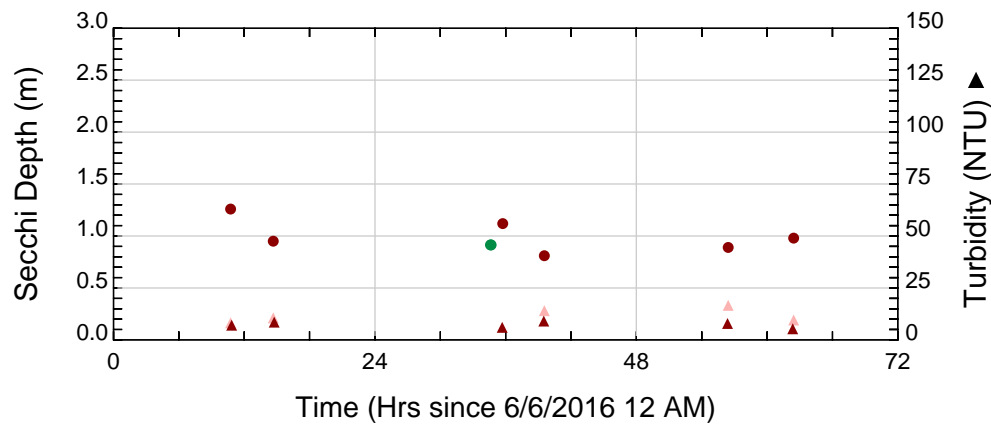
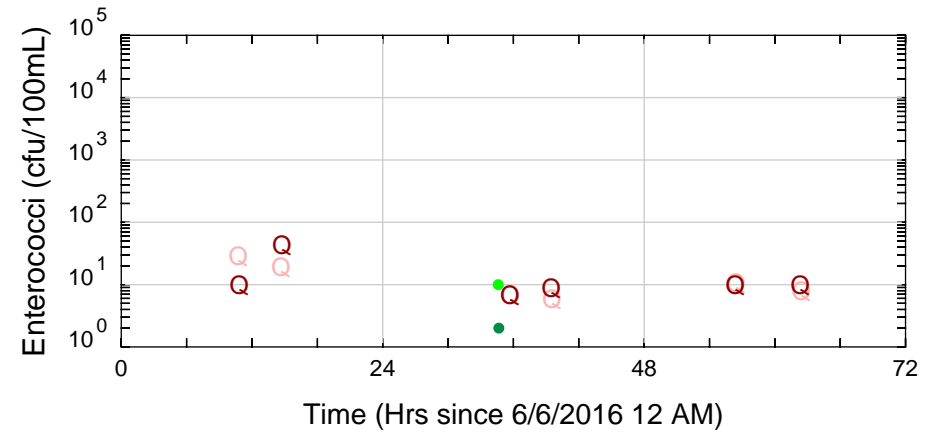
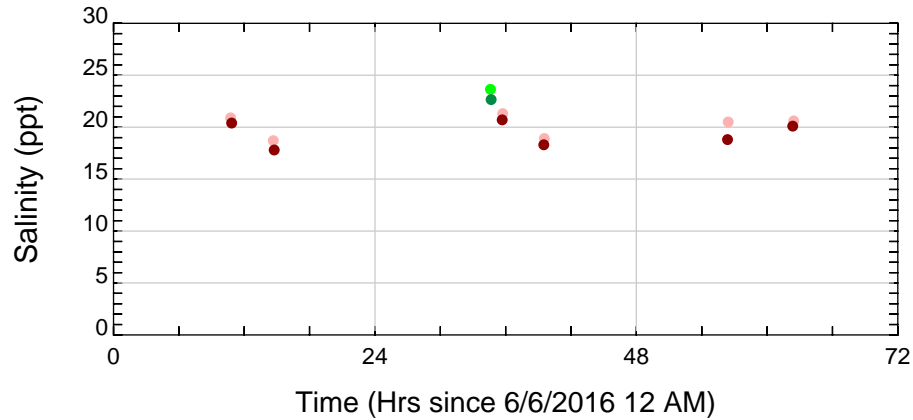
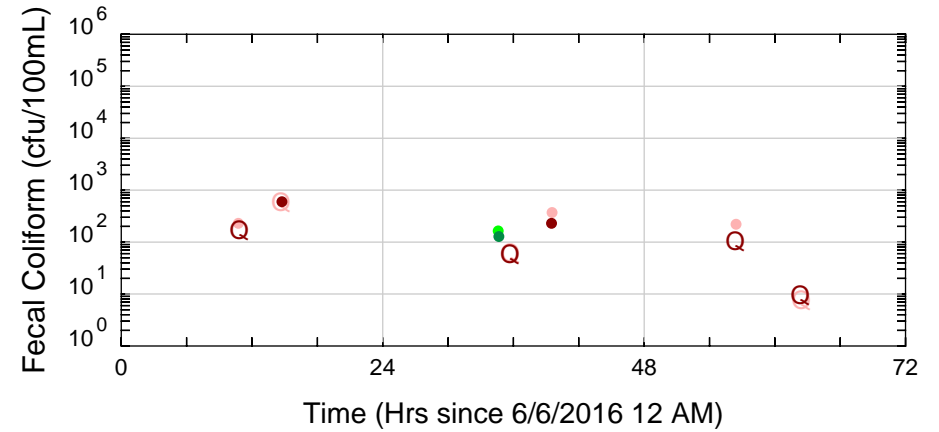
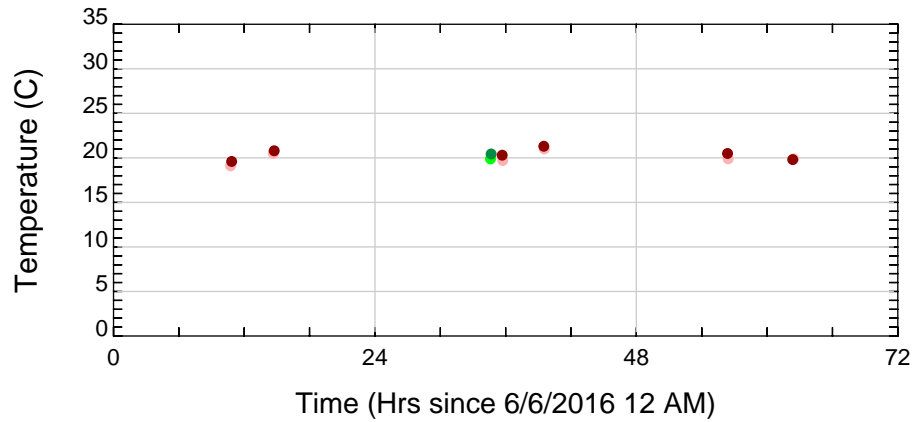
Hackensack River & Tributaries, Hackensack River, 15, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



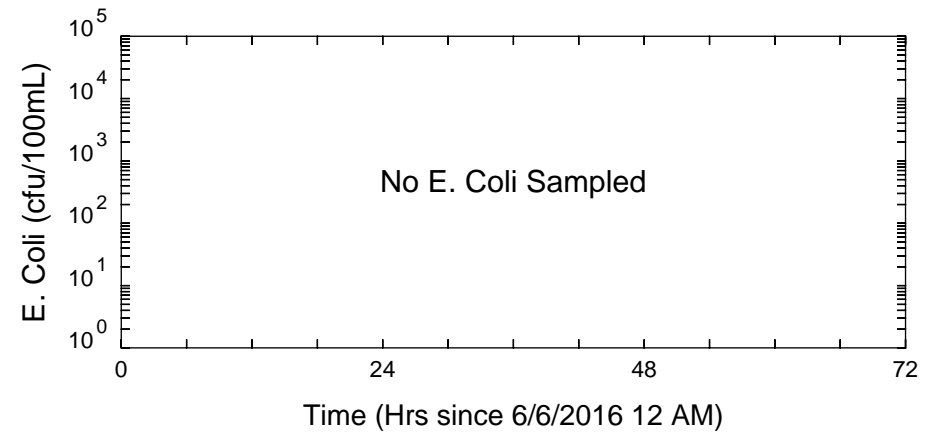
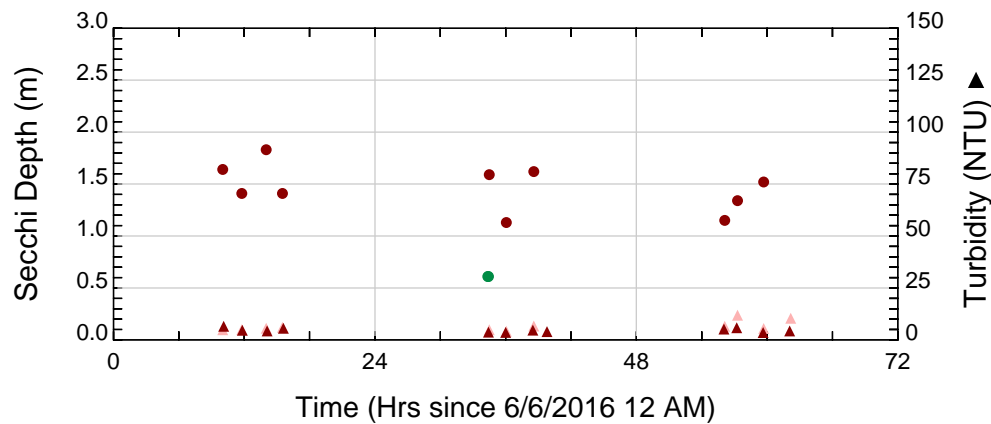
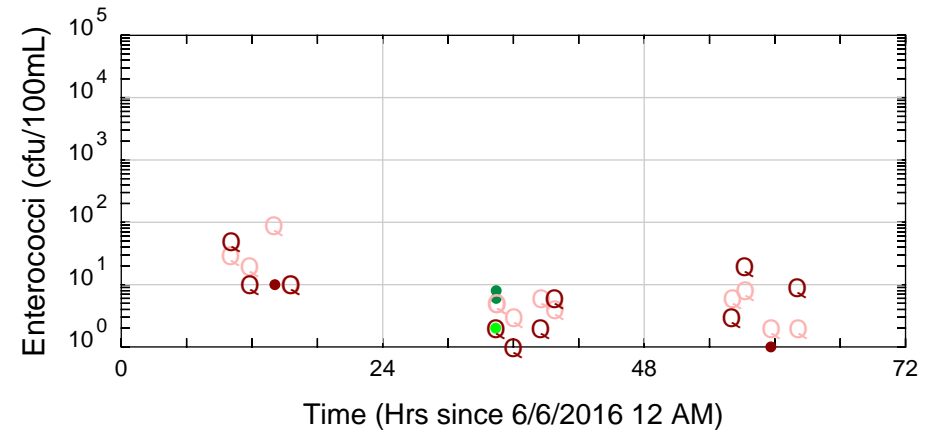
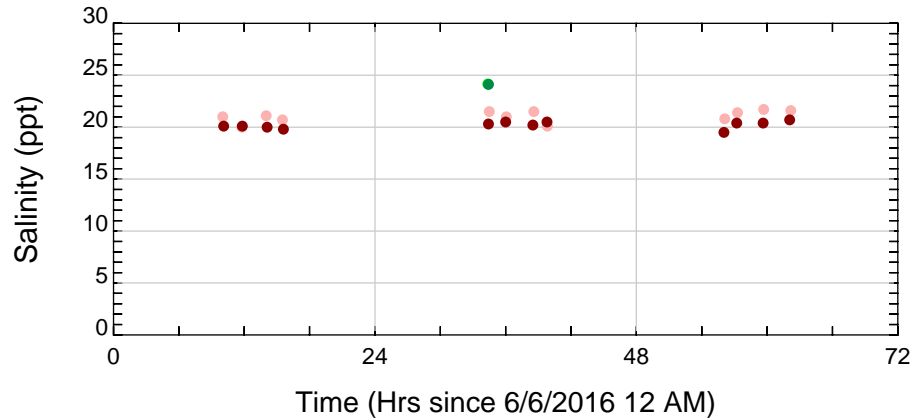
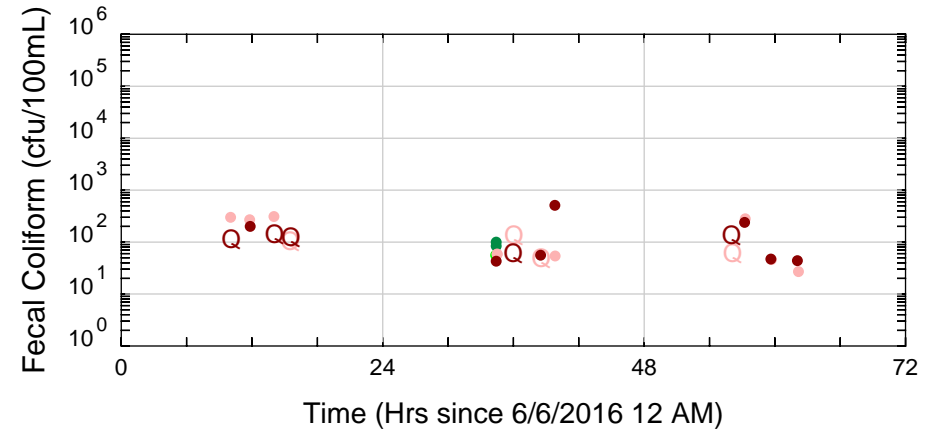
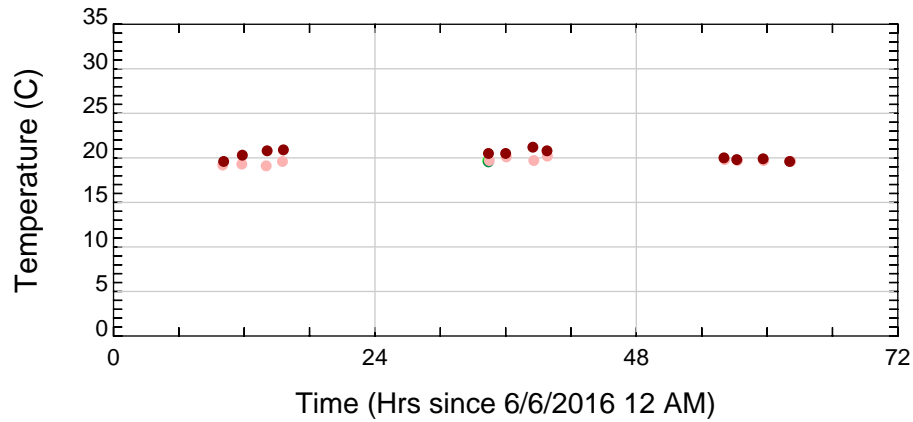
Newark Bay & Tributaries, Newark Bay, 17, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



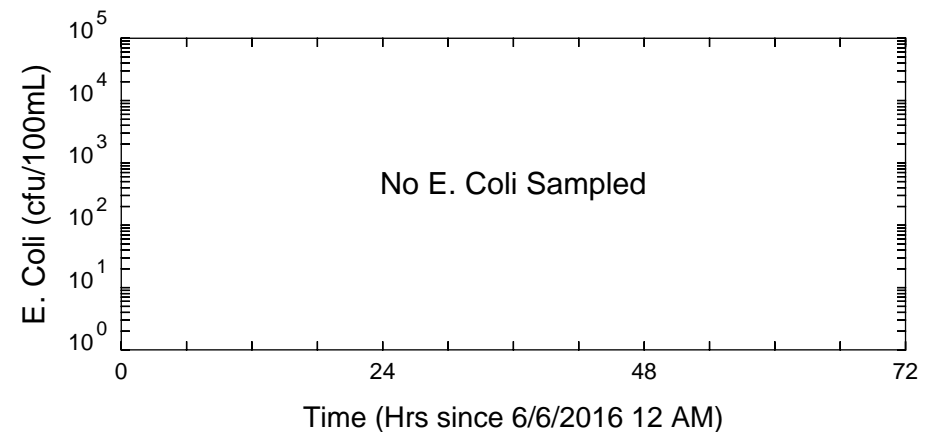
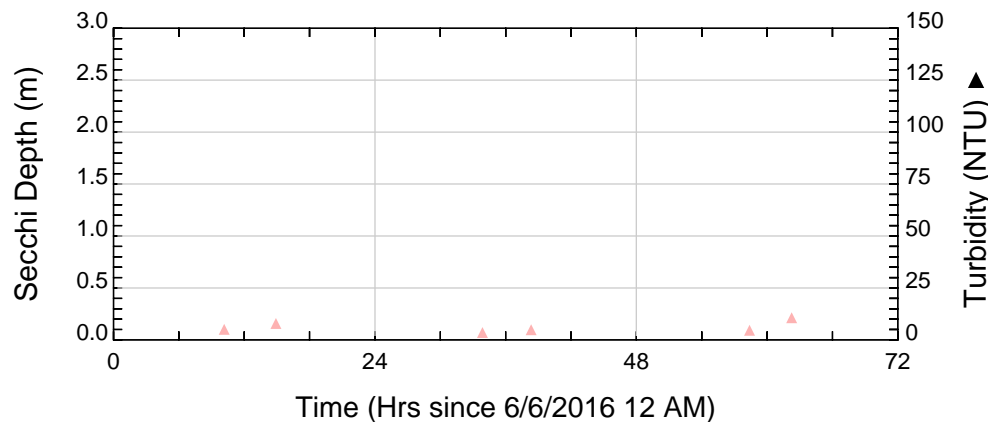
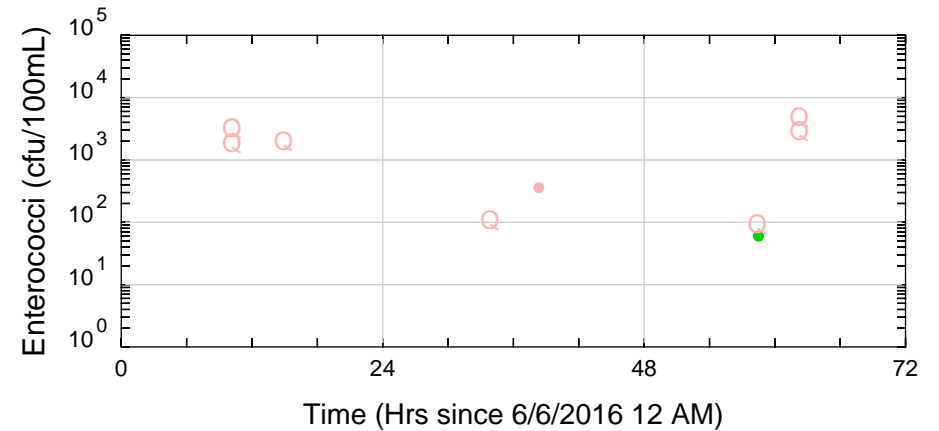
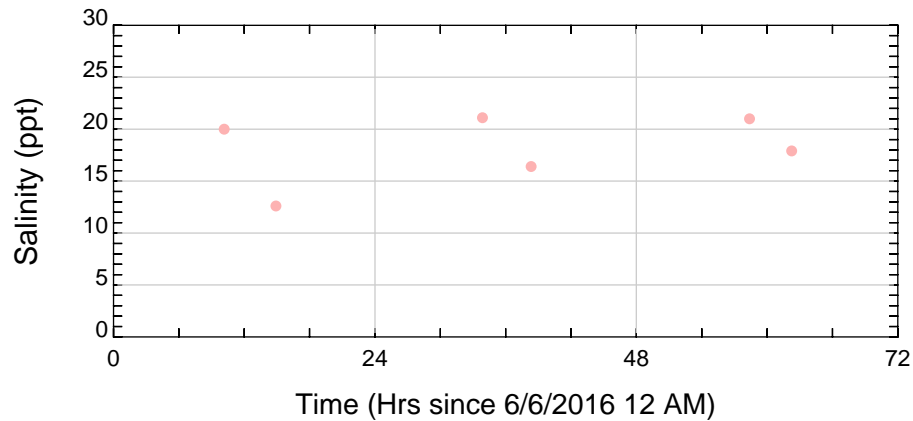
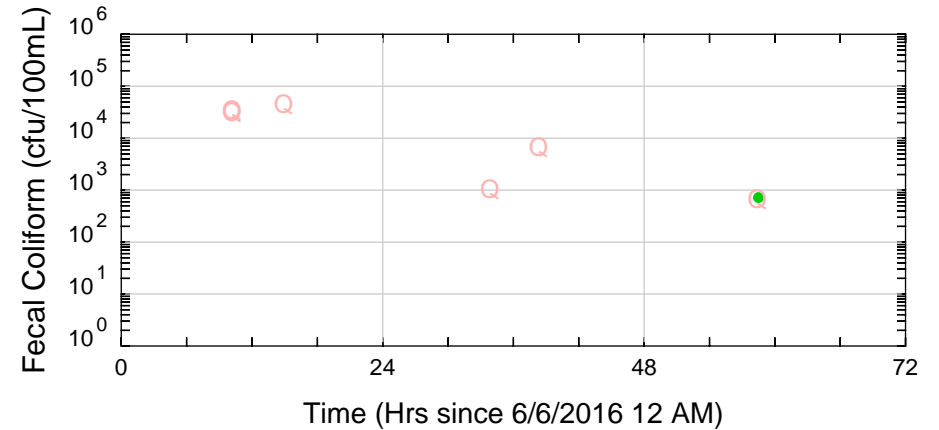
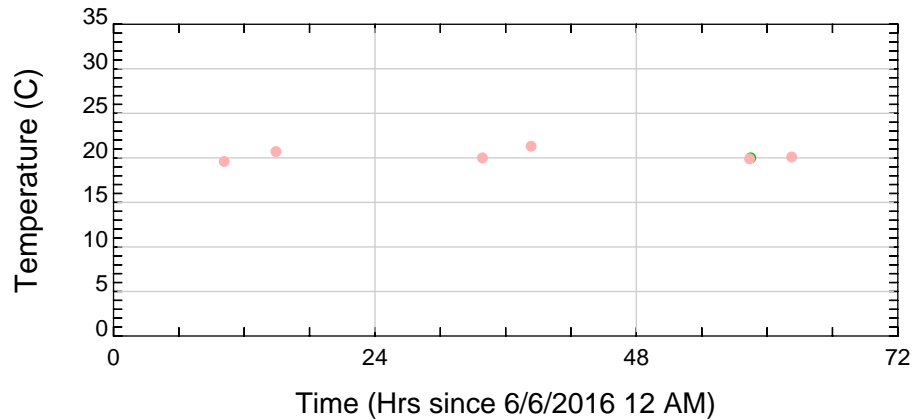
Newark Bay & Tributaries, Newark Bay, 18, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



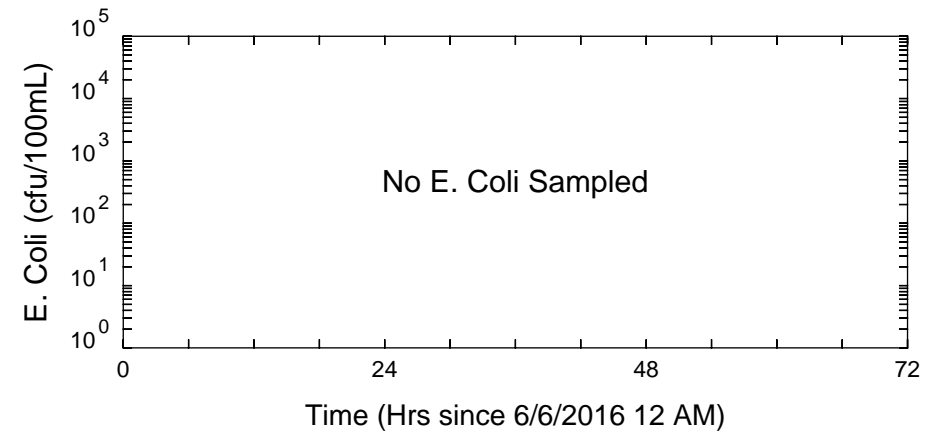
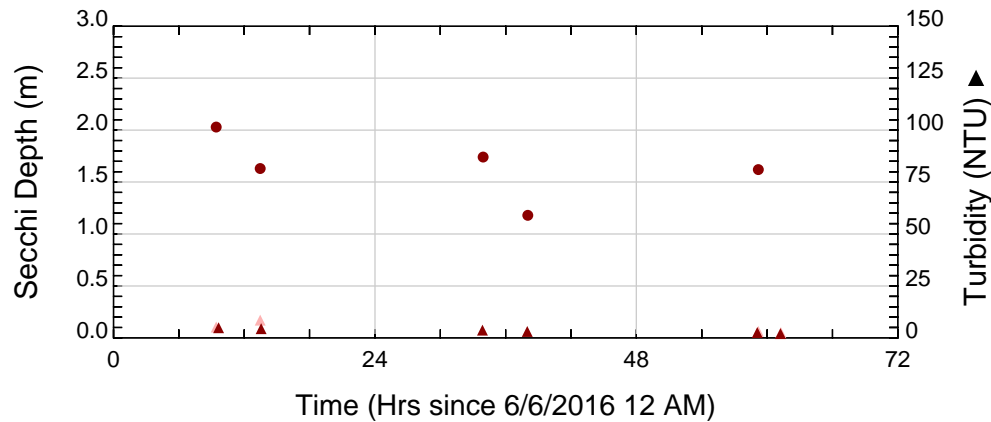
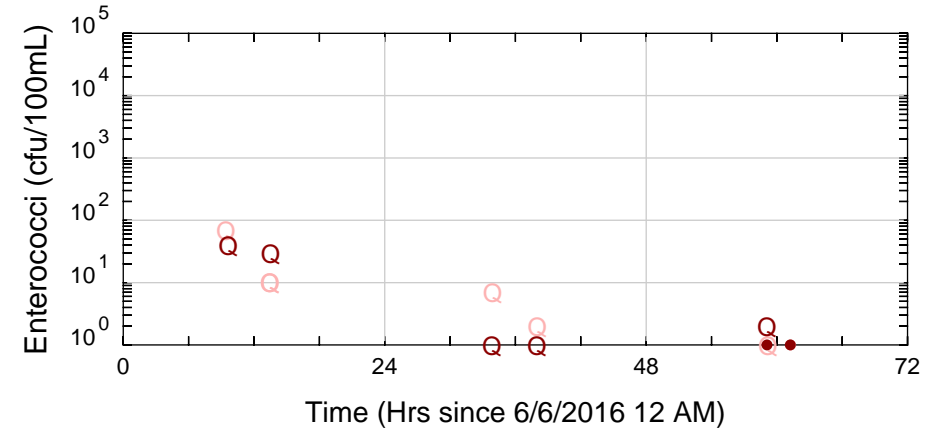
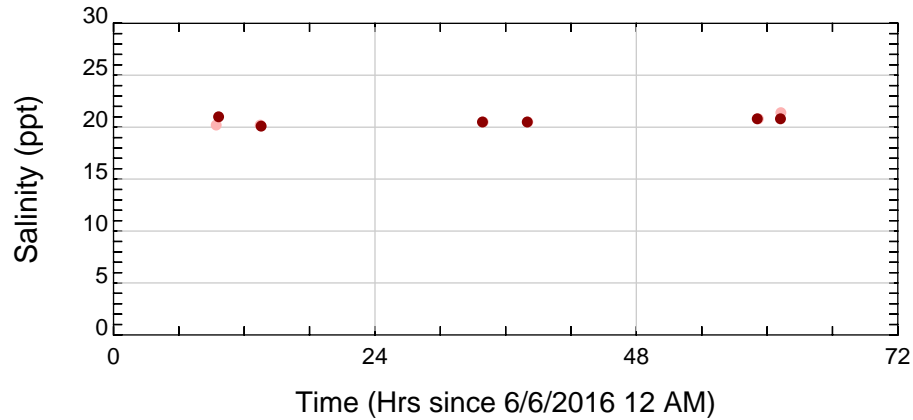
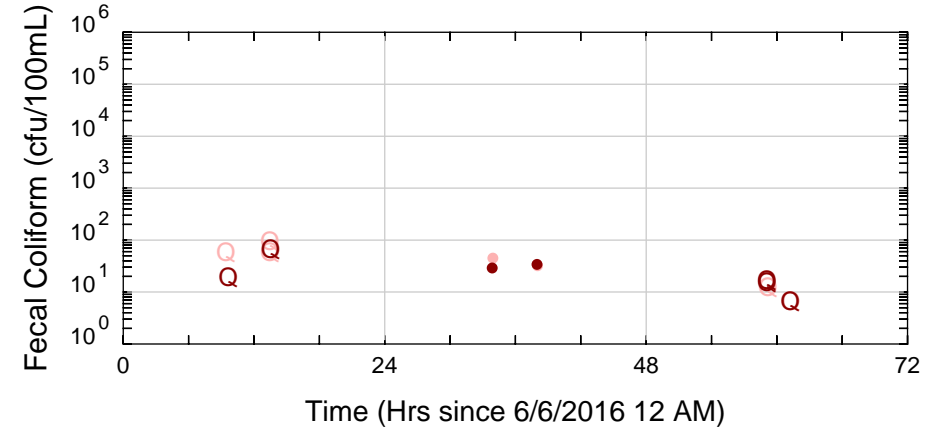
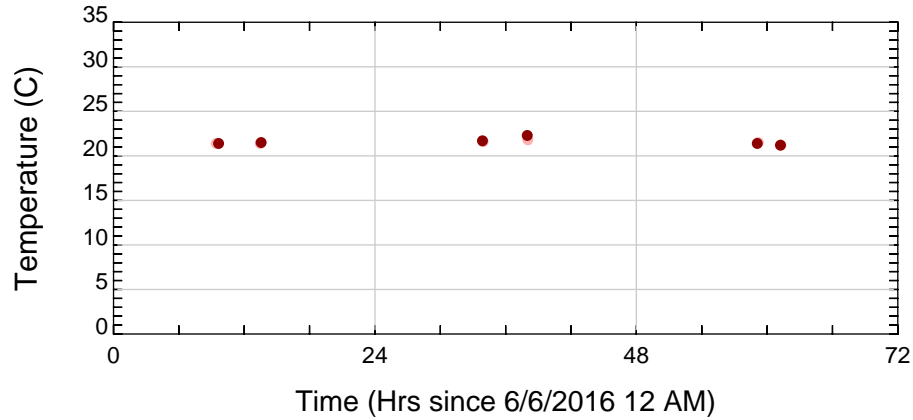
Newark Bay & Tributaries, Elizabeth River, 20, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



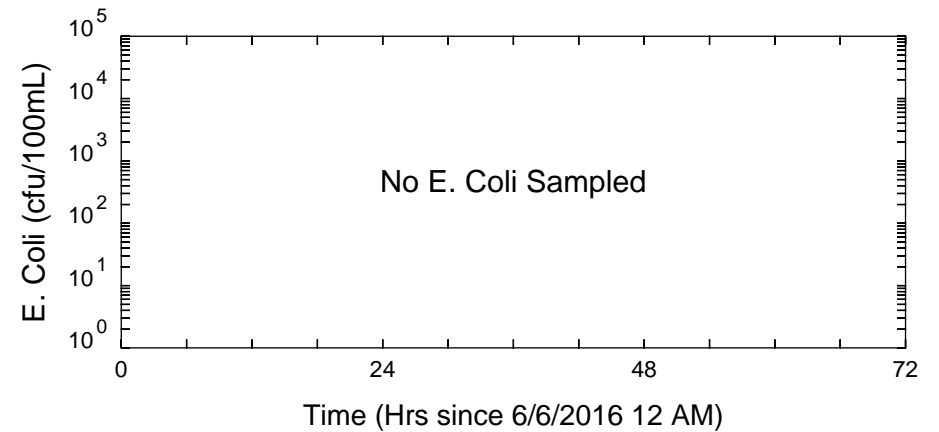
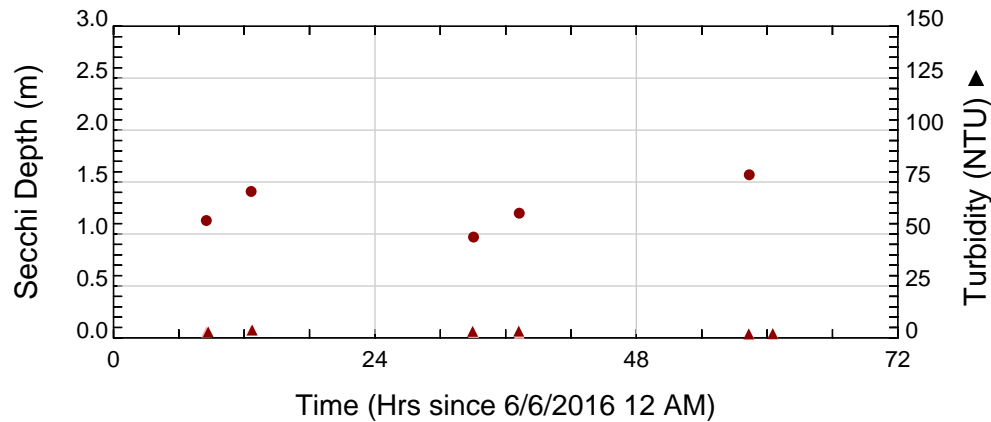
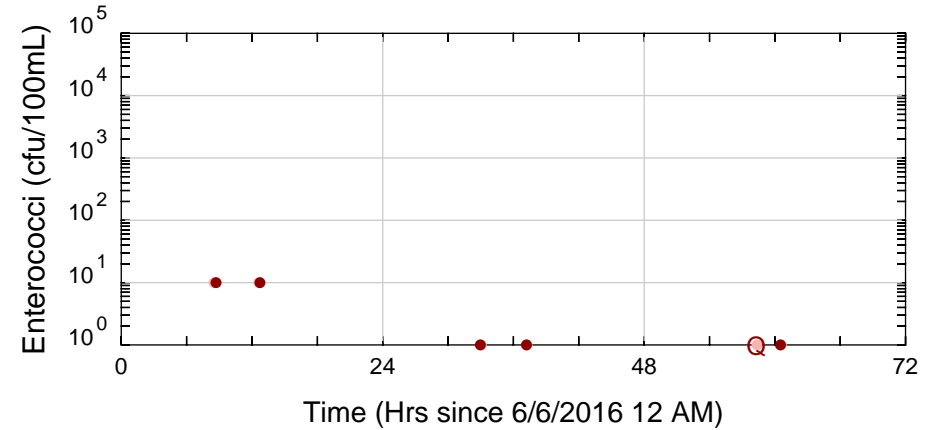
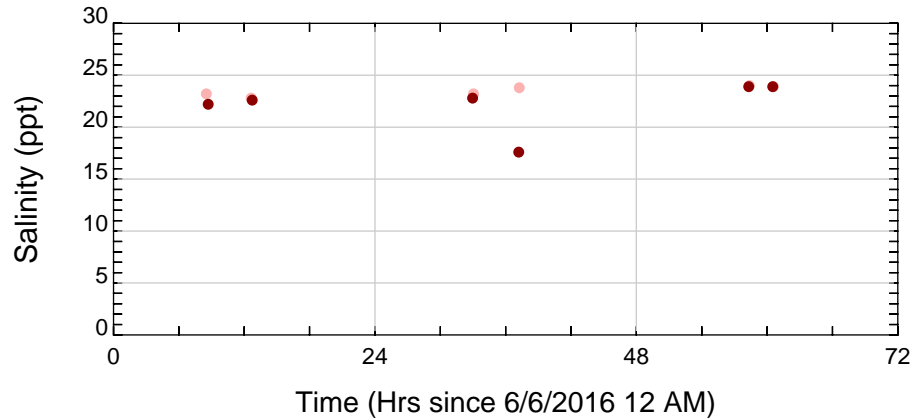
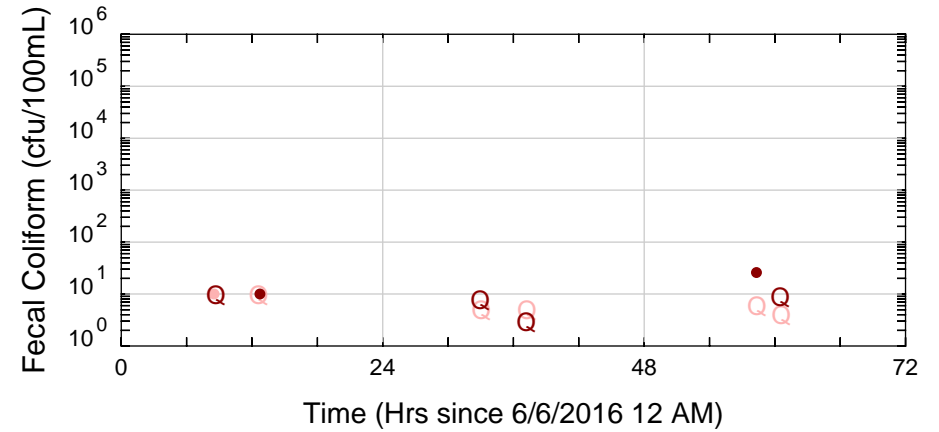
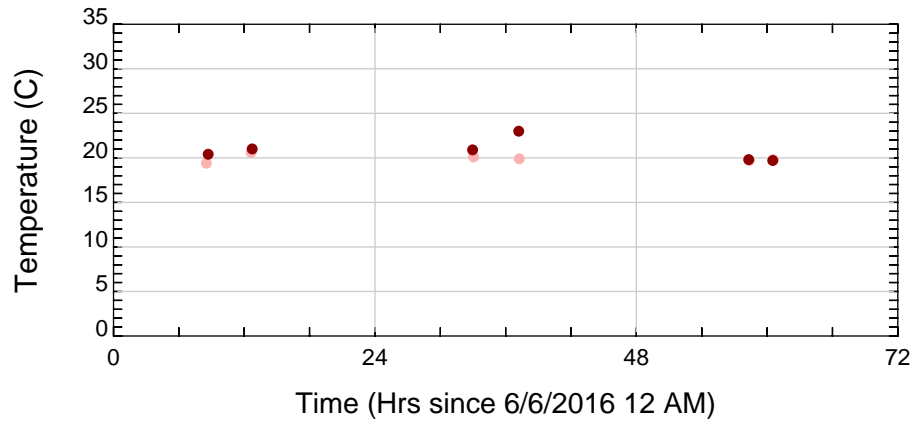
Arthur Kill, Raritan River/Bay & Tributaries, Arthur Kill, 24, (SE3)

- ● Surface/Mid-depth HDR
- ● ● Surface/Mid/Bottom NJHDG



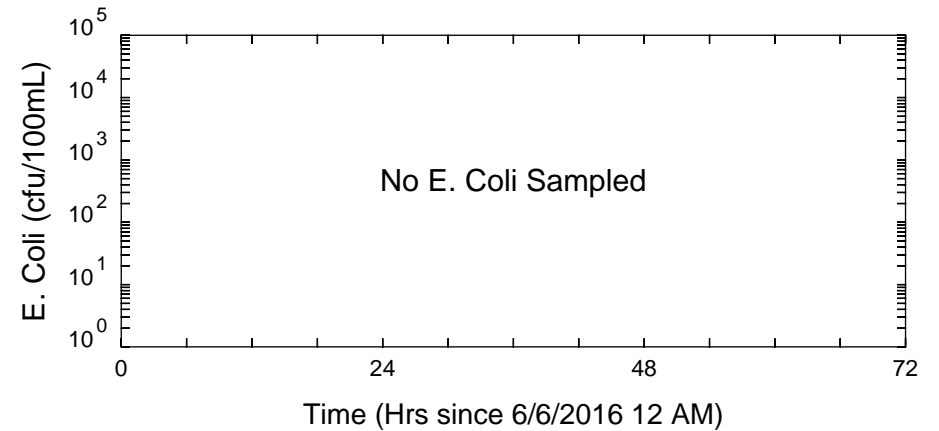
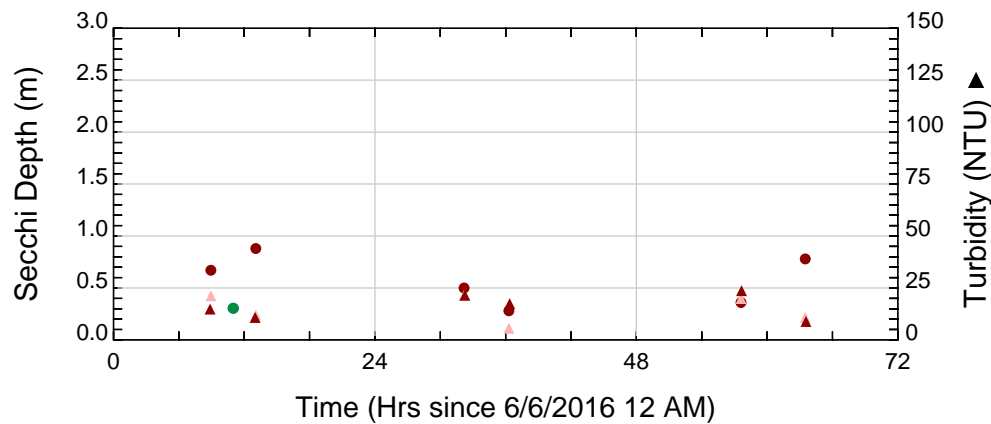
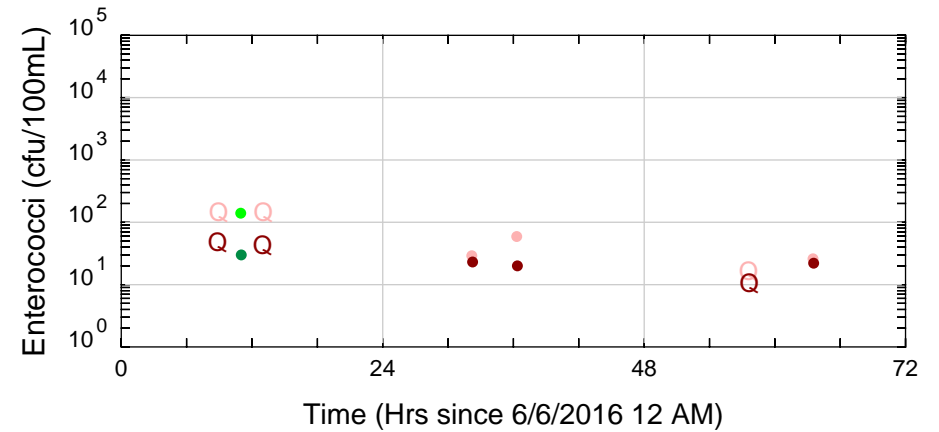
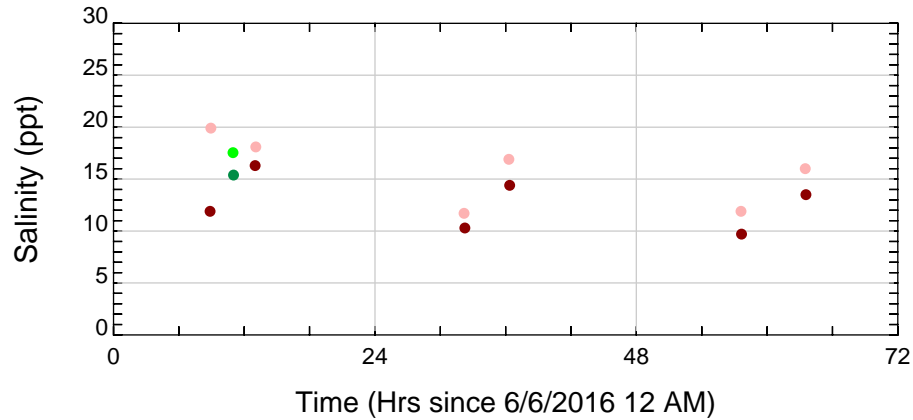
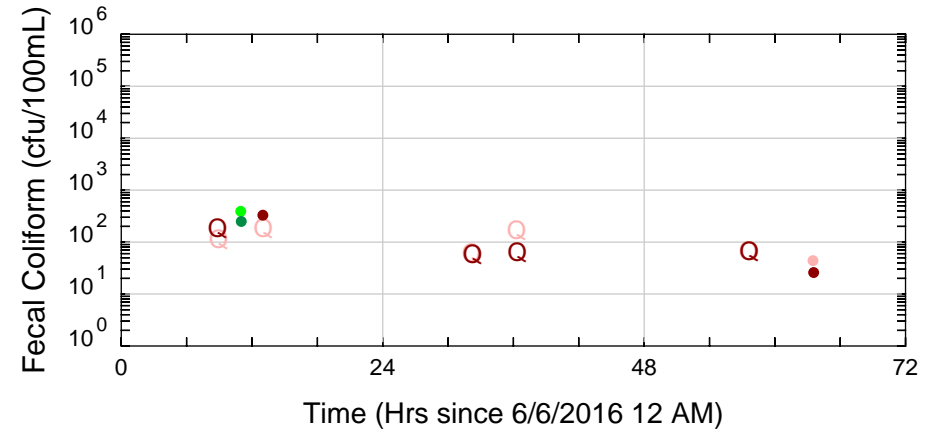
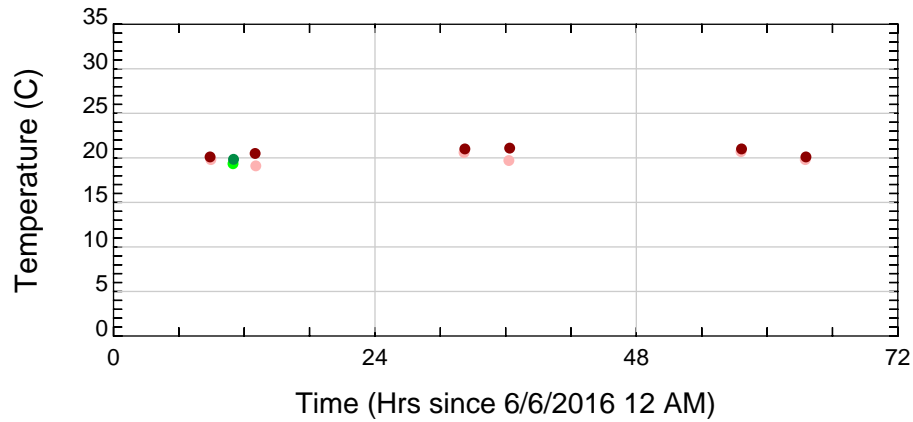
Arthur Kill, Raritan River/Bay & Tributaries, Raritan Bay, 29, (Shellfish)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



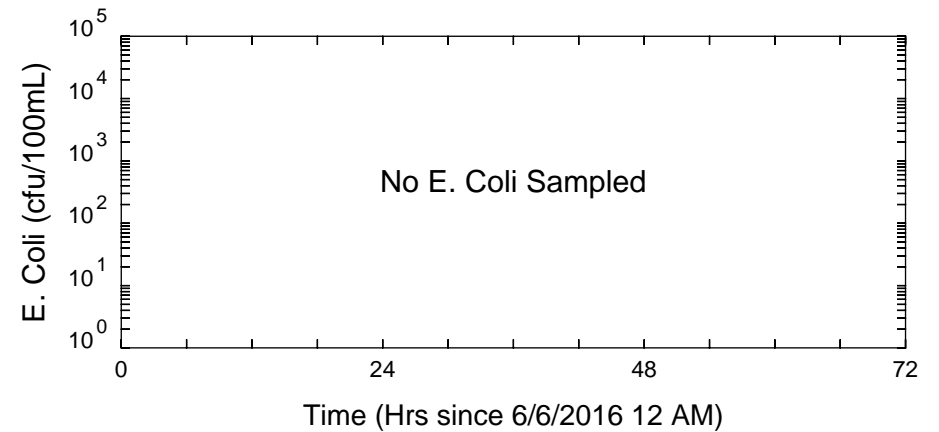
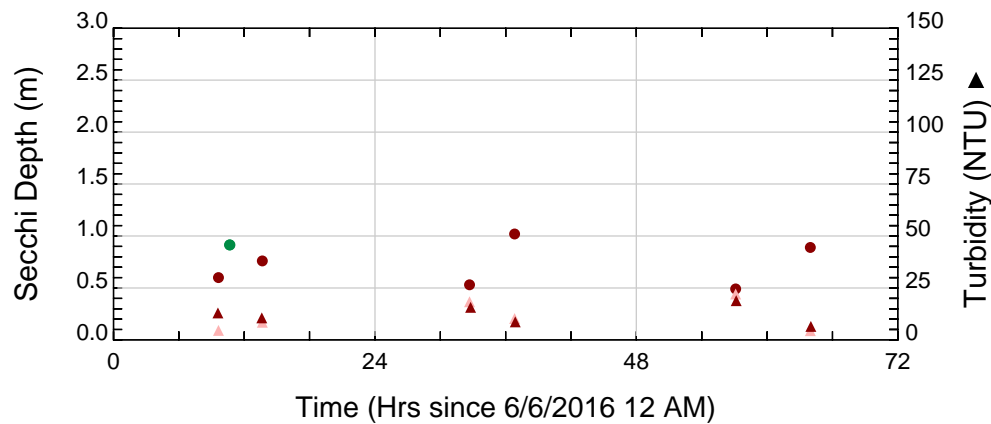
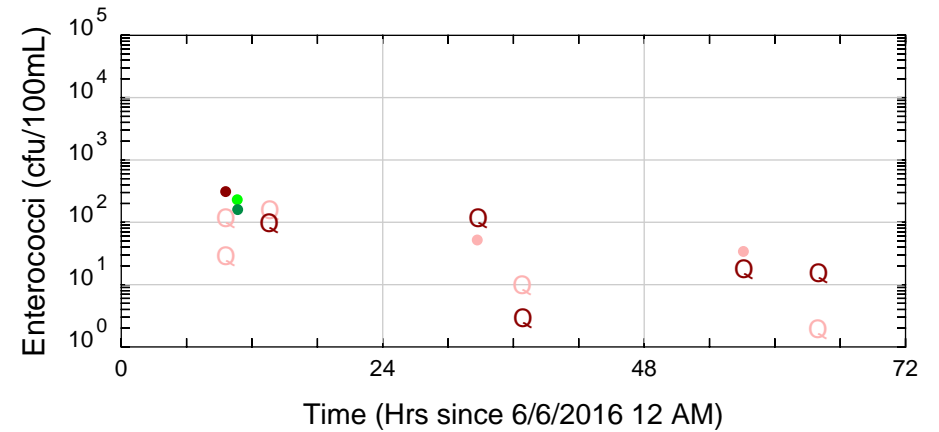
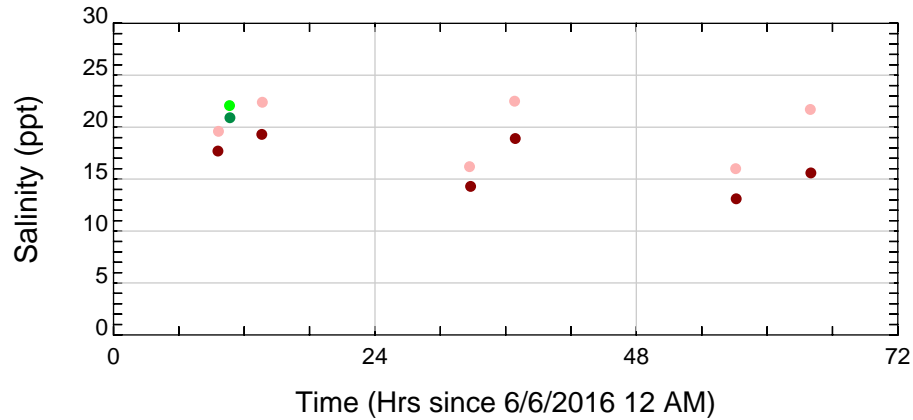
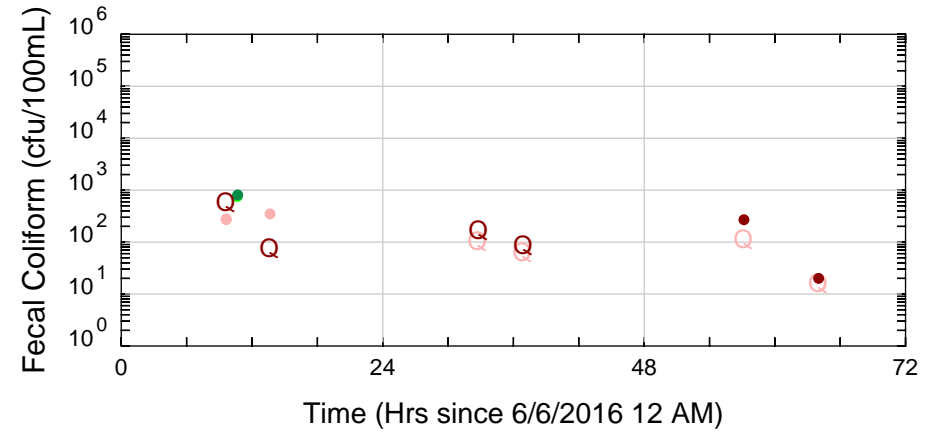
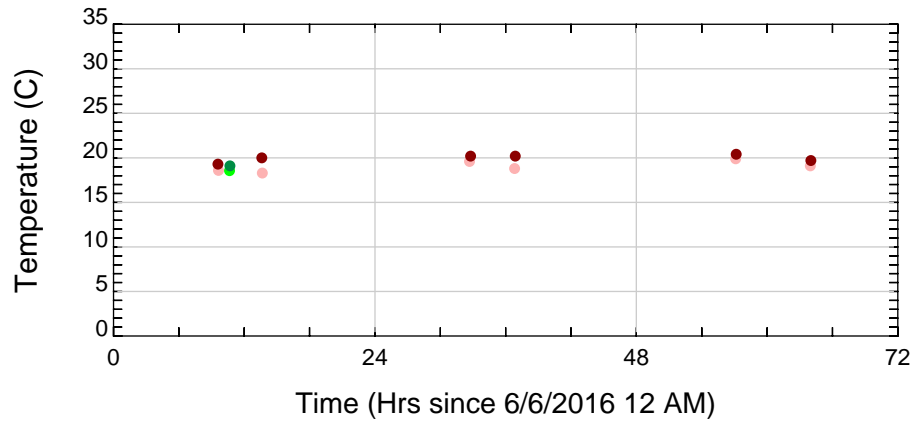
Hudson River, Upper Bay, Hudson River, 31, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



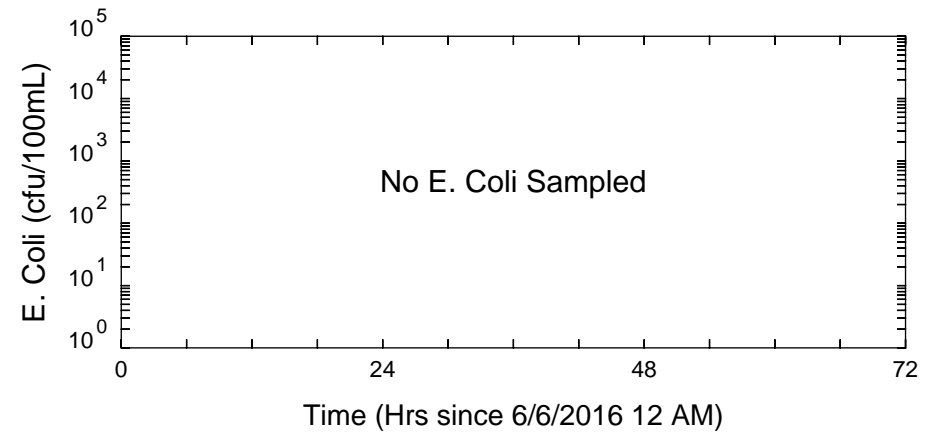
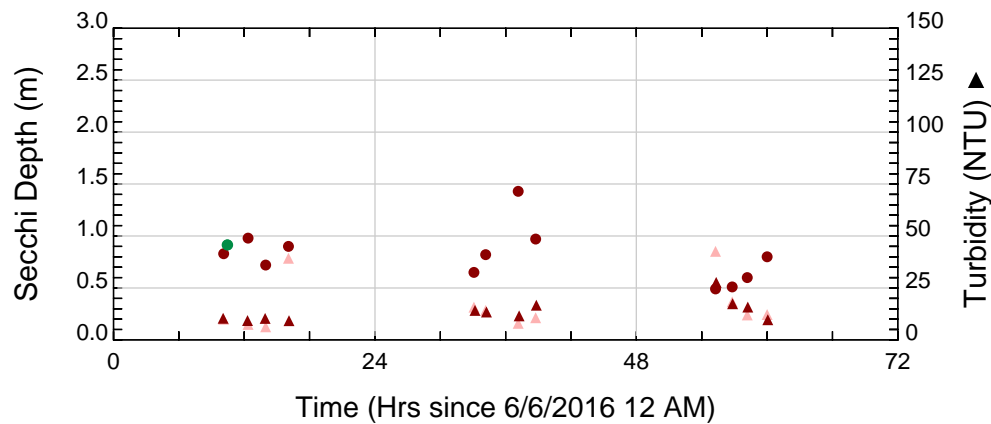
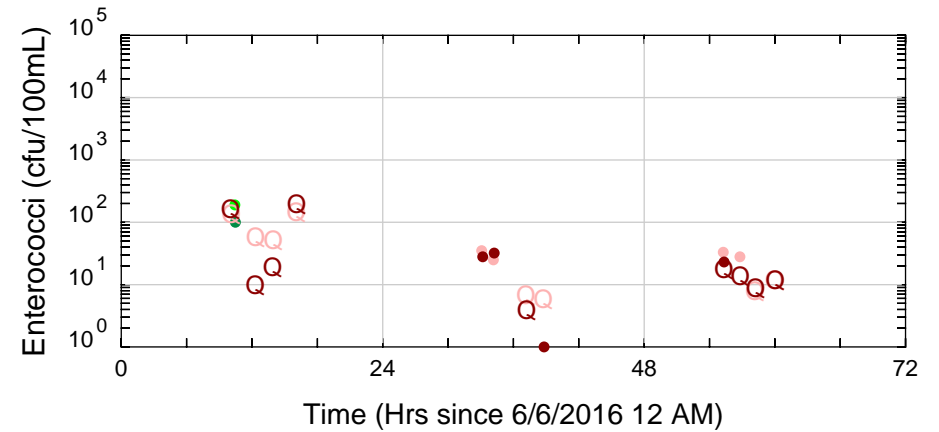
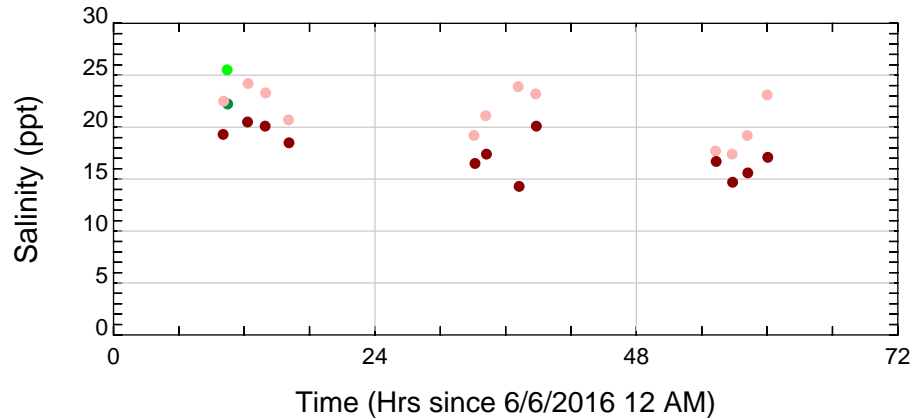
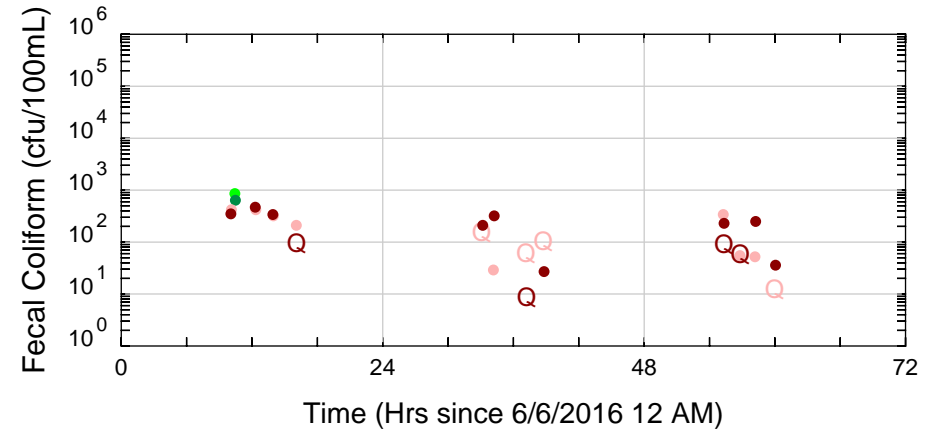
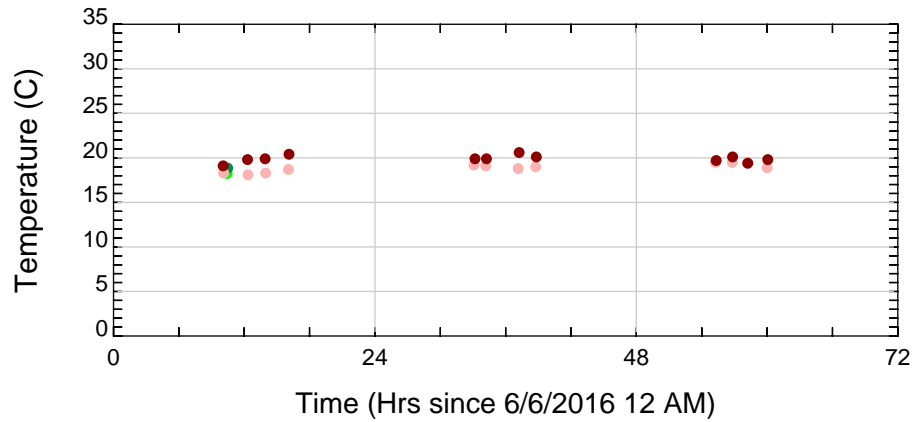
Hudson River, Upper Bay, Hudson River, 32, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



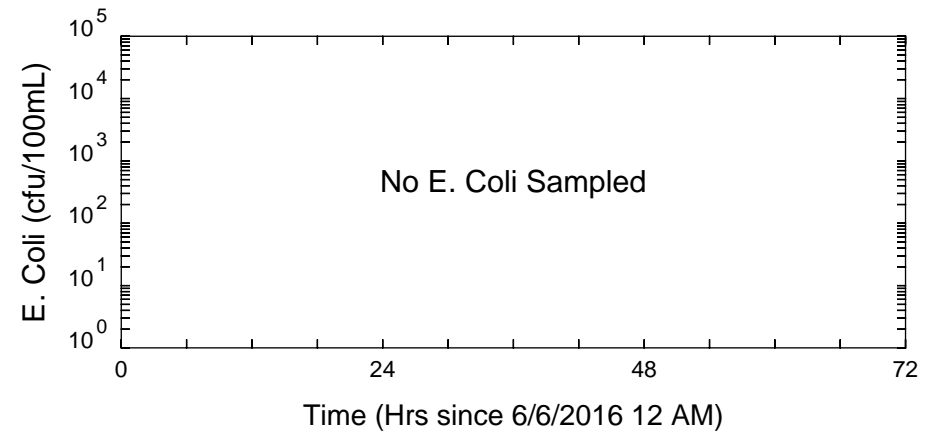
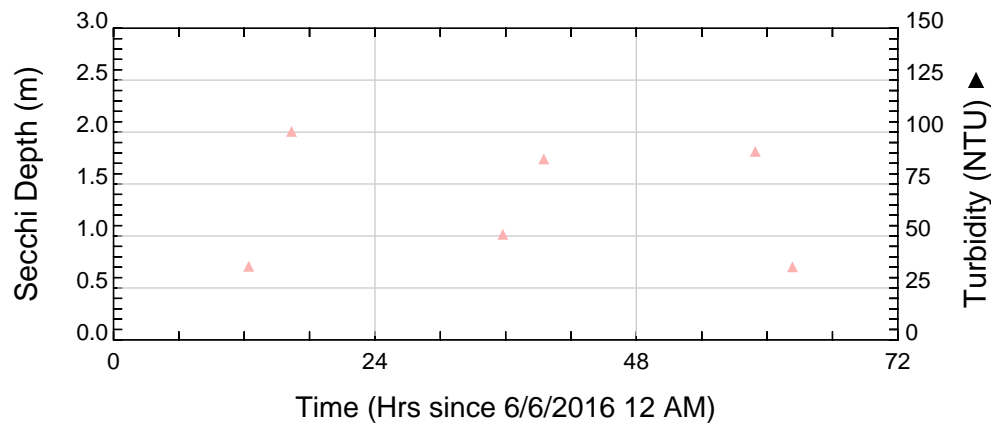
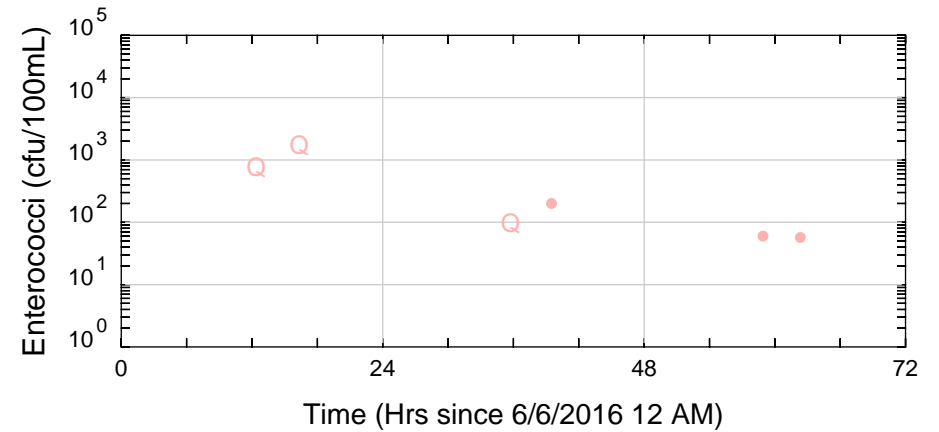
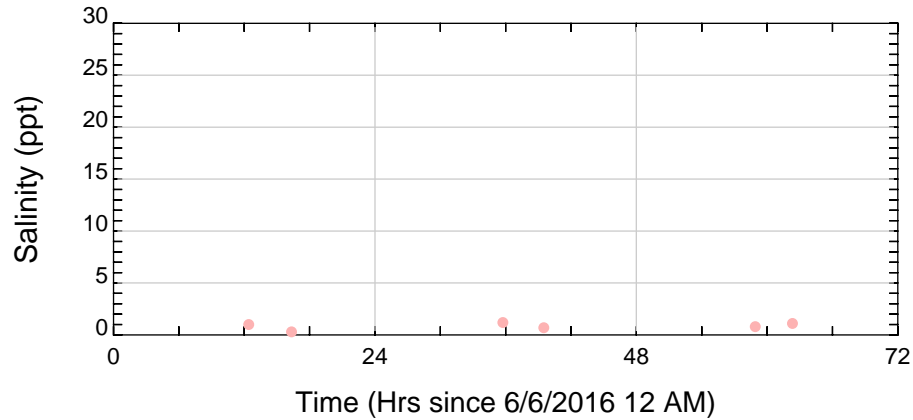
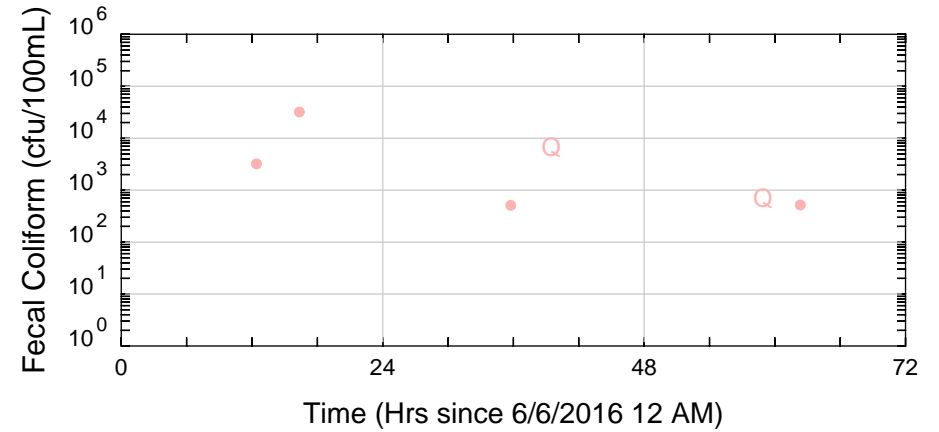
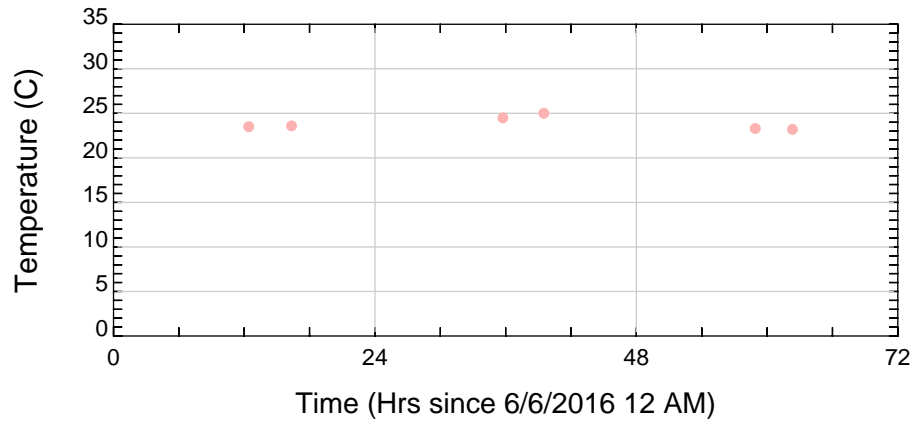
Hudson River, Upper Bay, Hudson River, 33, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



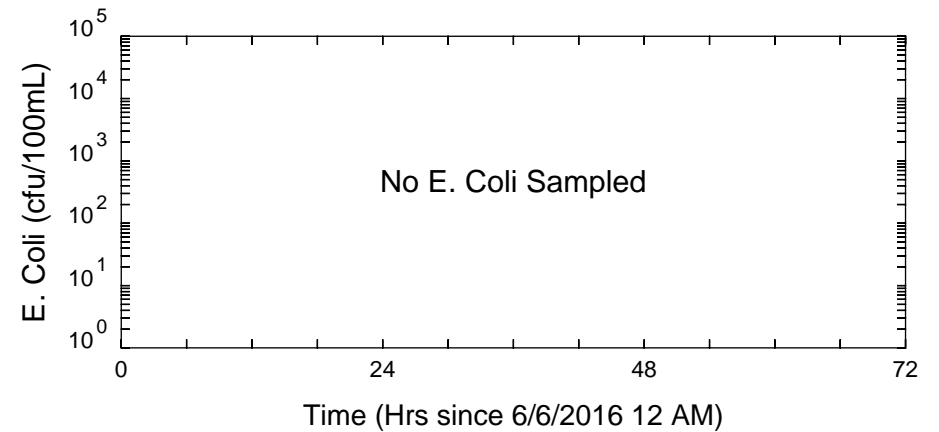
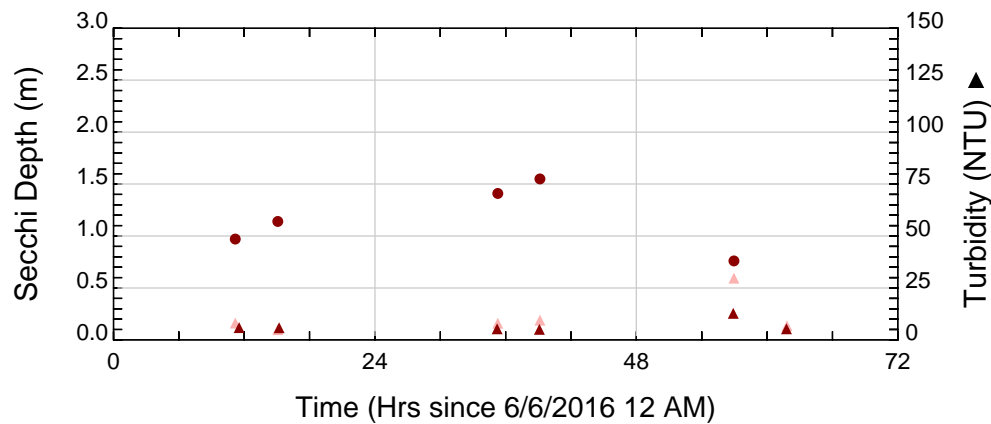
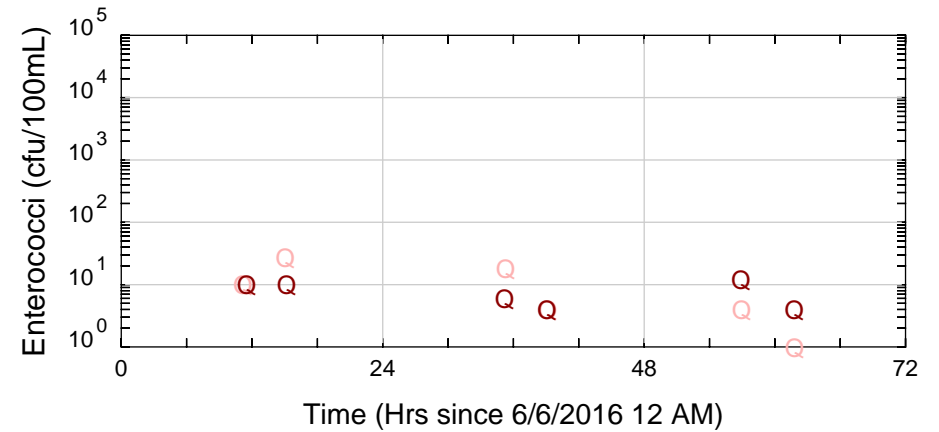
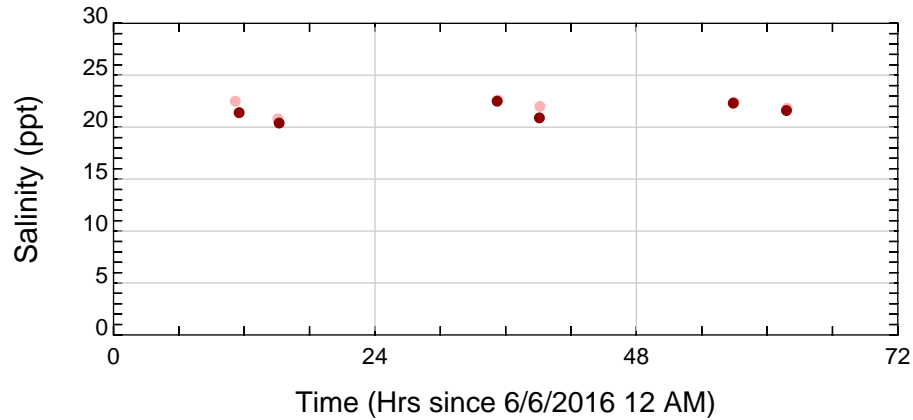
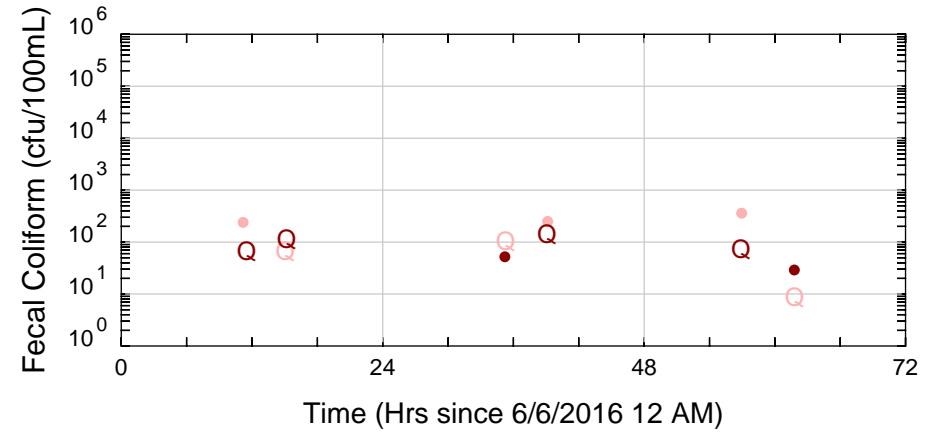
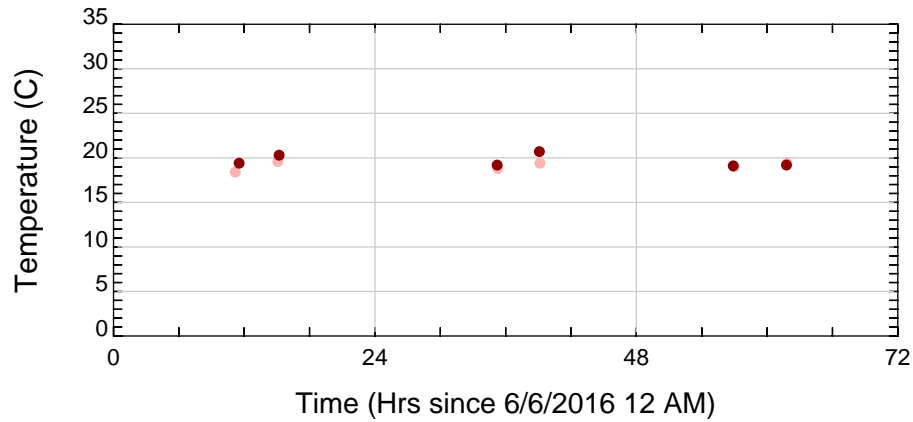
Hackensack River & Tributaries, Hackensack River, B1, (SE1)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



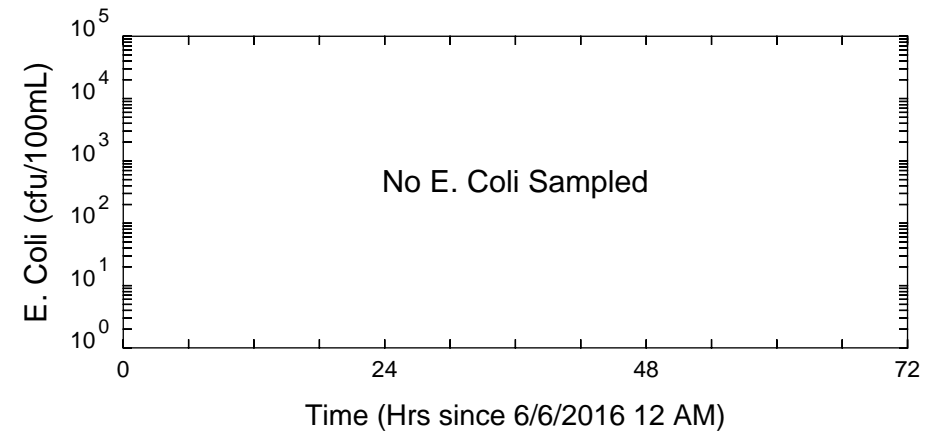
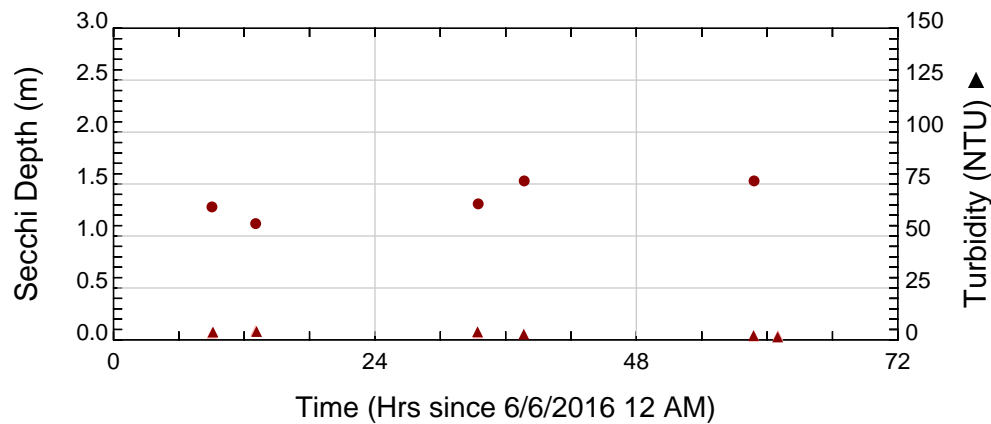
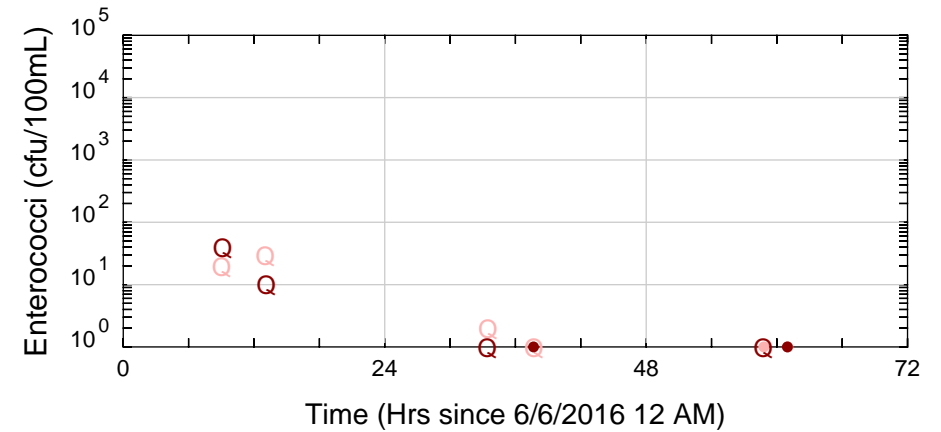
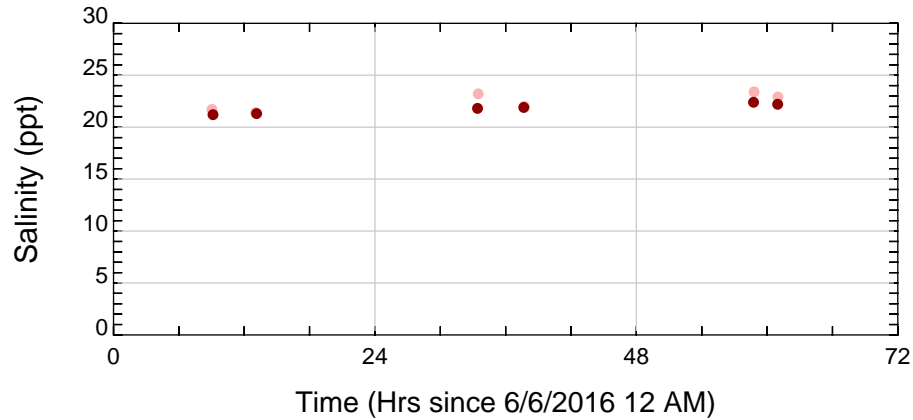
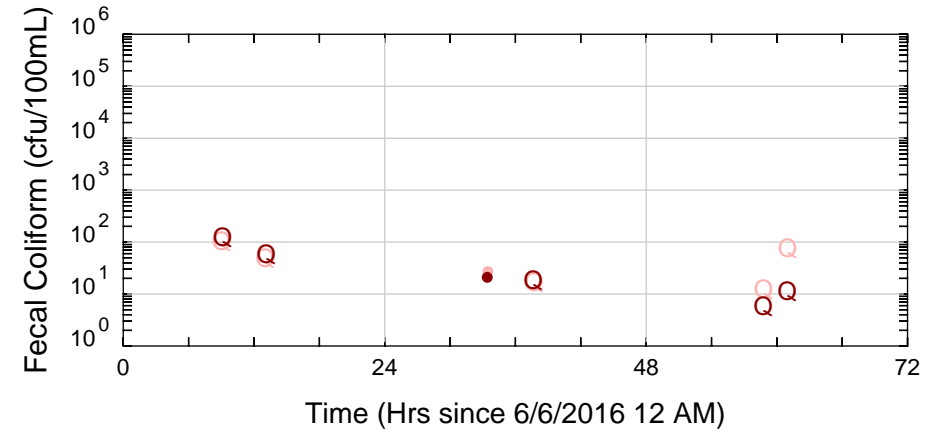
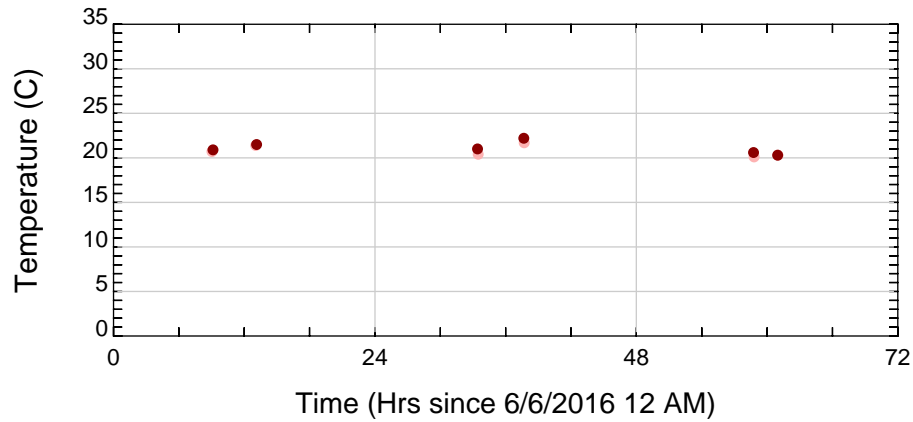
Hudson River, Upper Bay, Kill Van Kull, B12, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



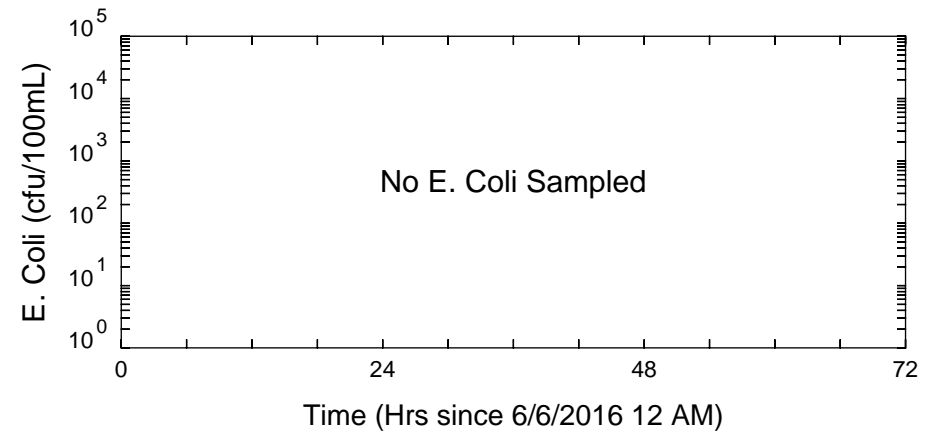
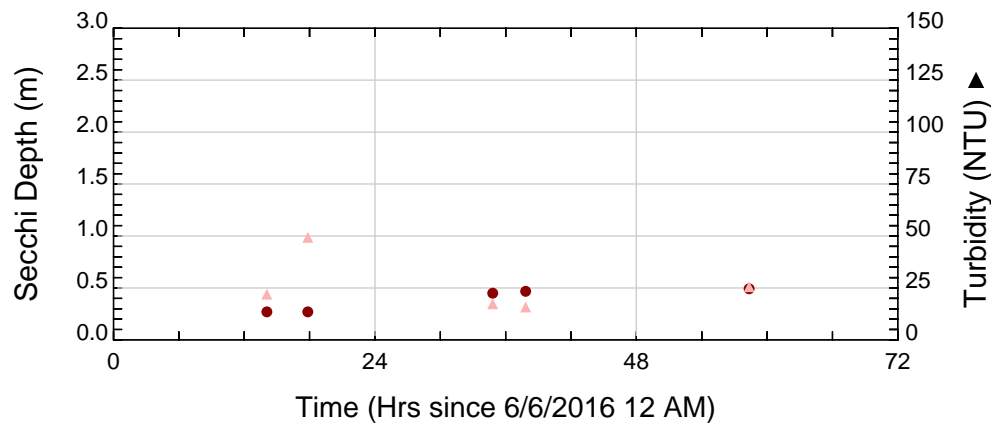
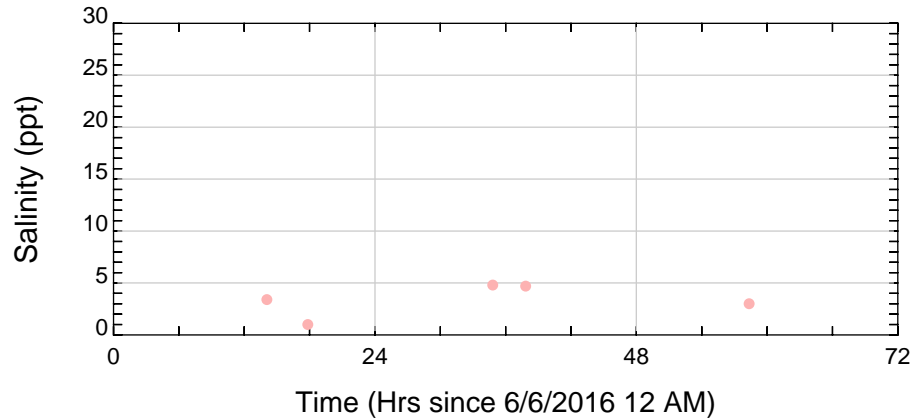
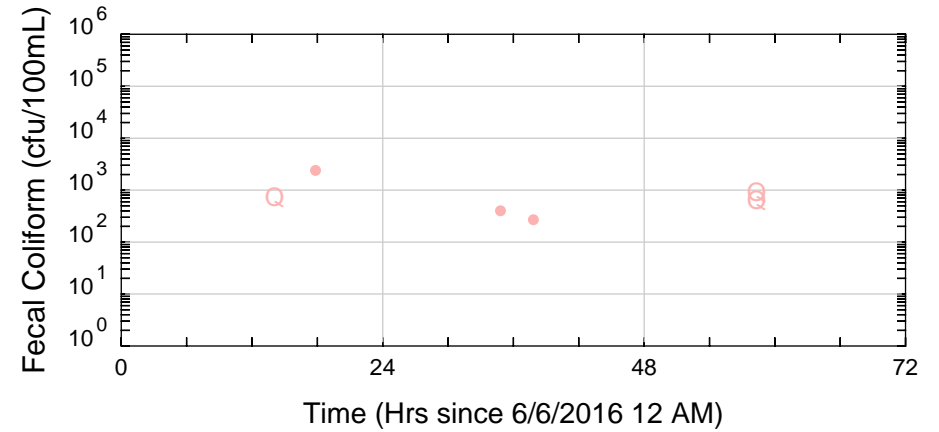
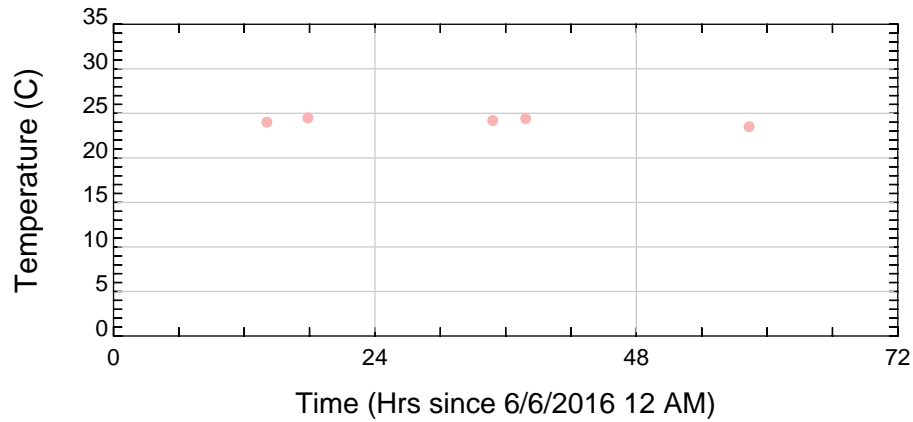
Arthur Kill, Raritan River/Bay & Tributaries, Arthur Kill, B15, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



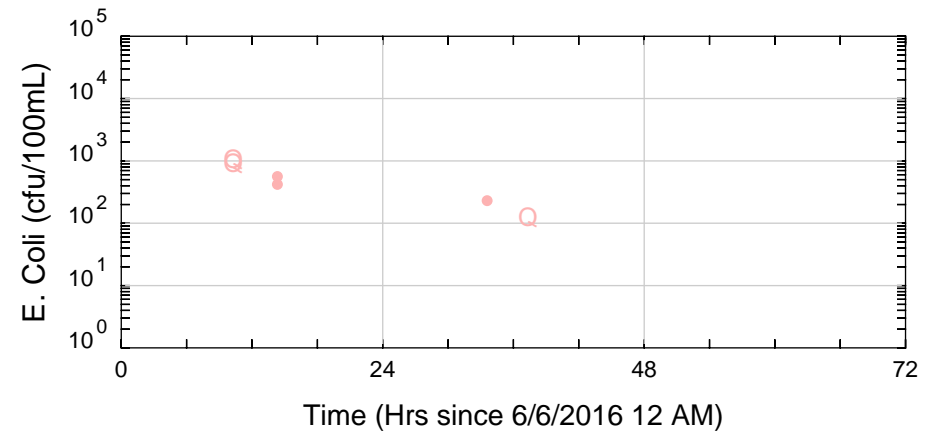
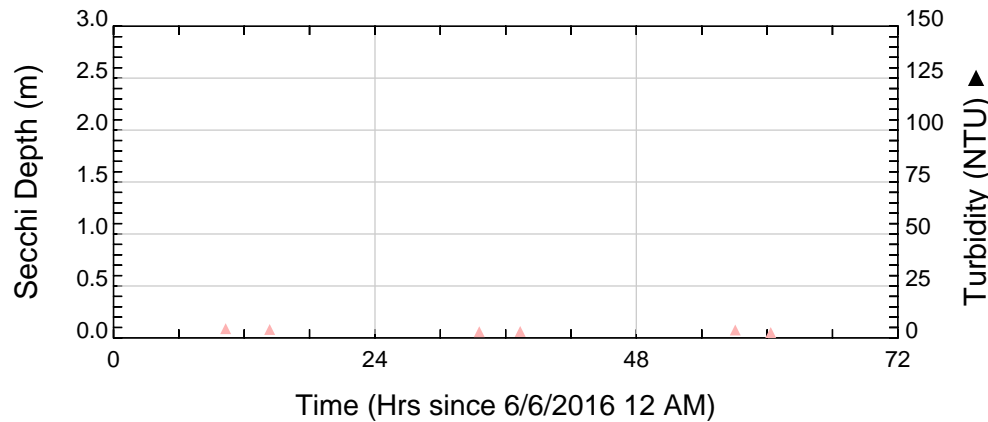
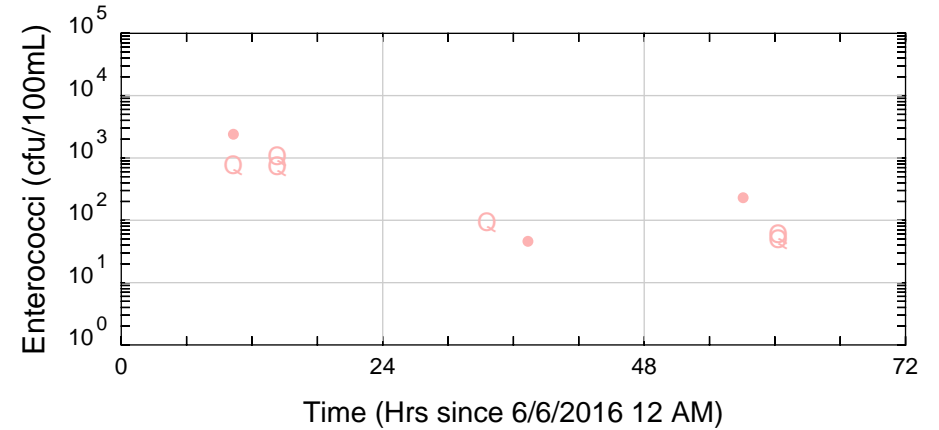
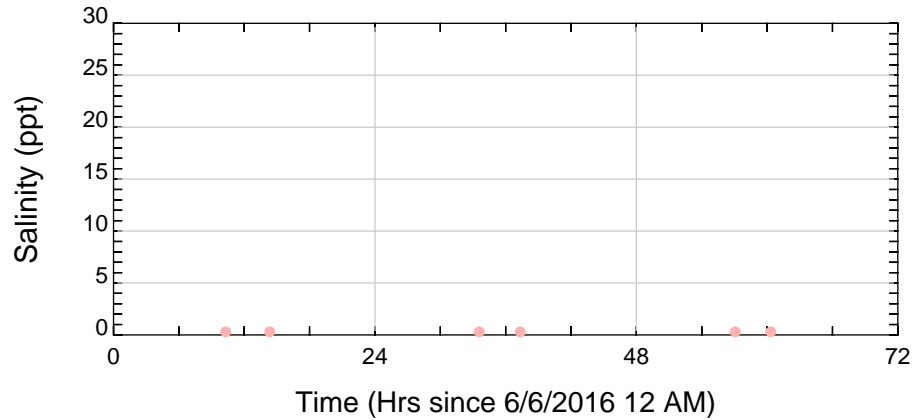
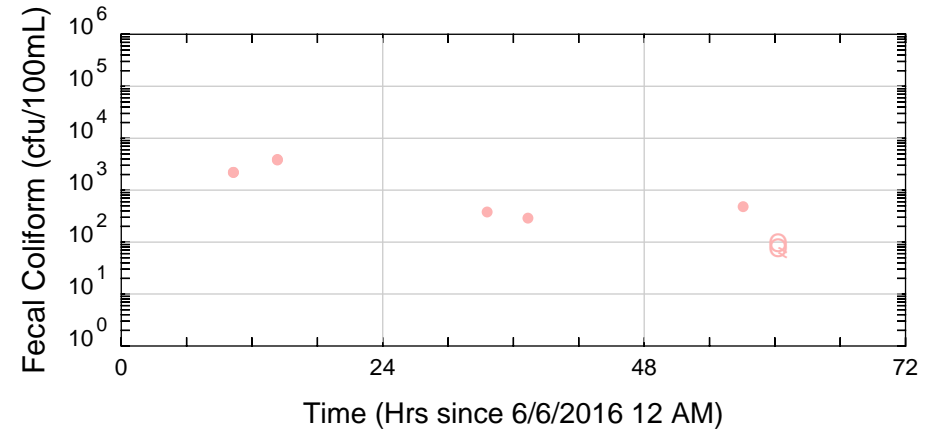
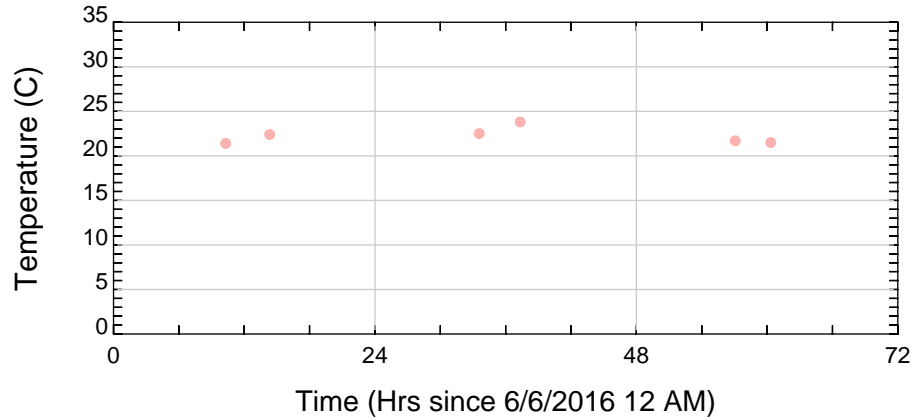
Hackensack River & Tributaries, Hackensack River, B2, (SE1)

● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG



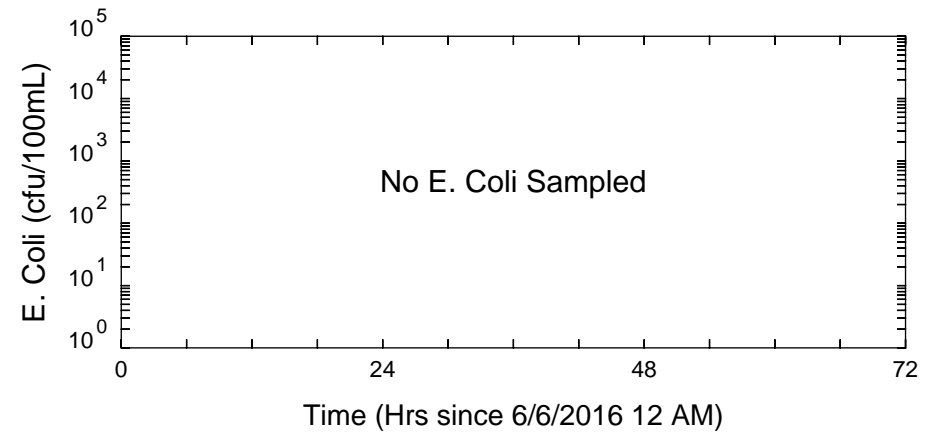
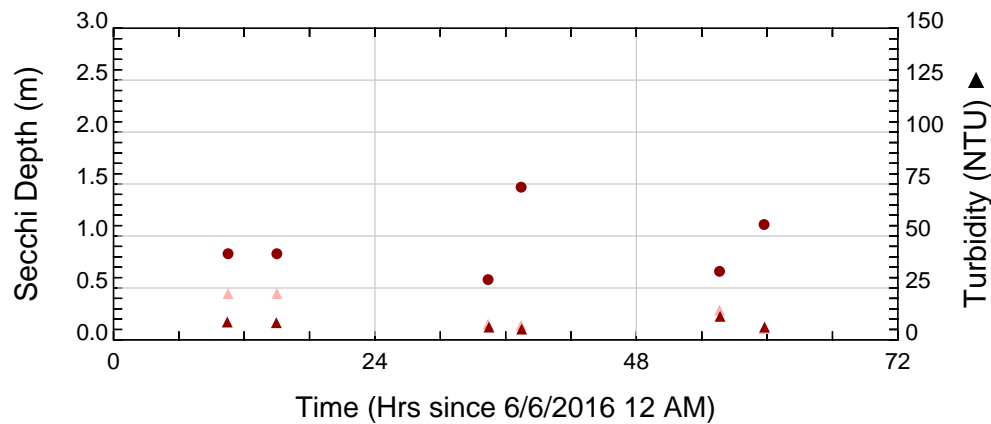
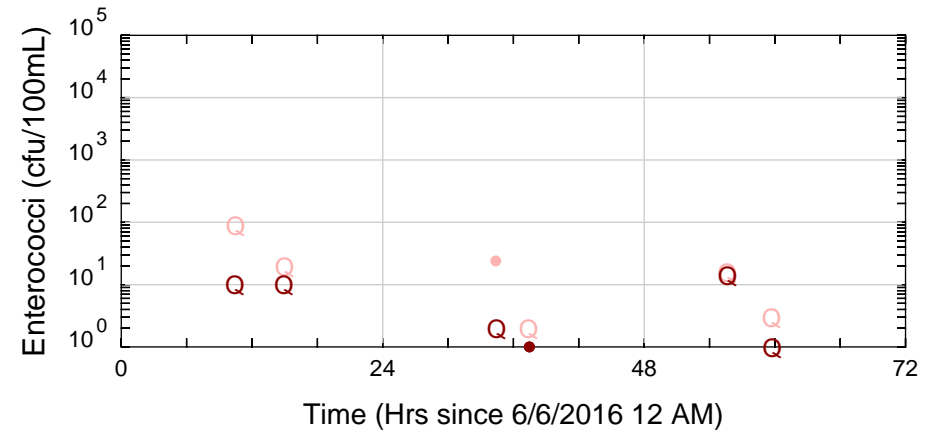
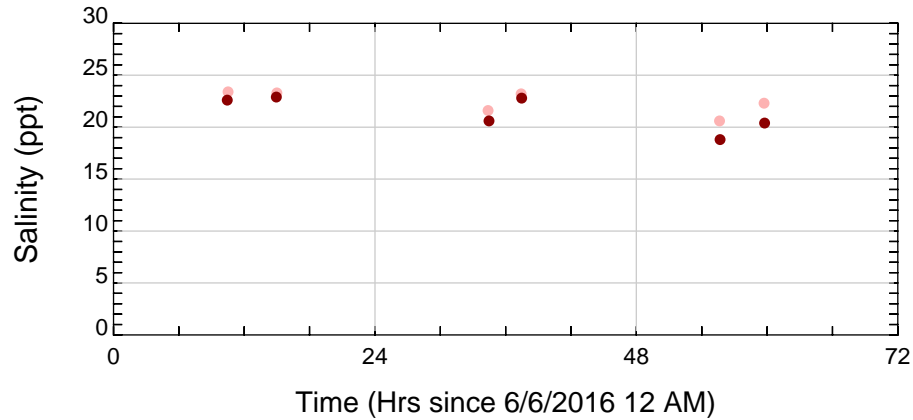
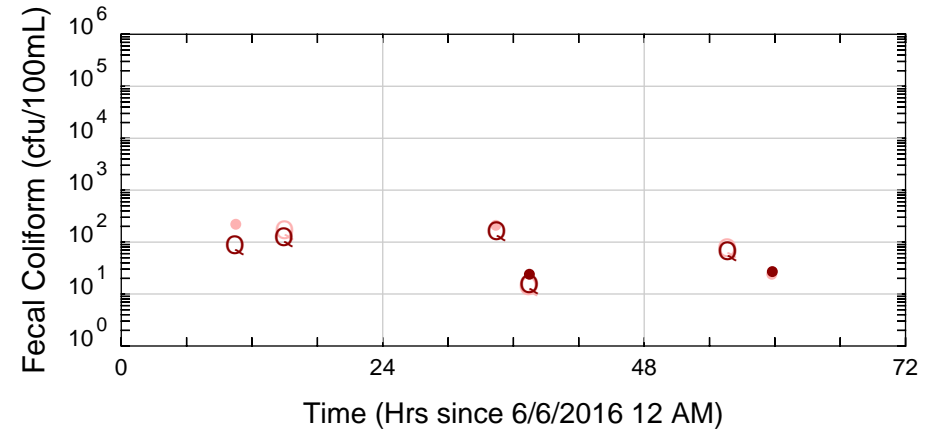
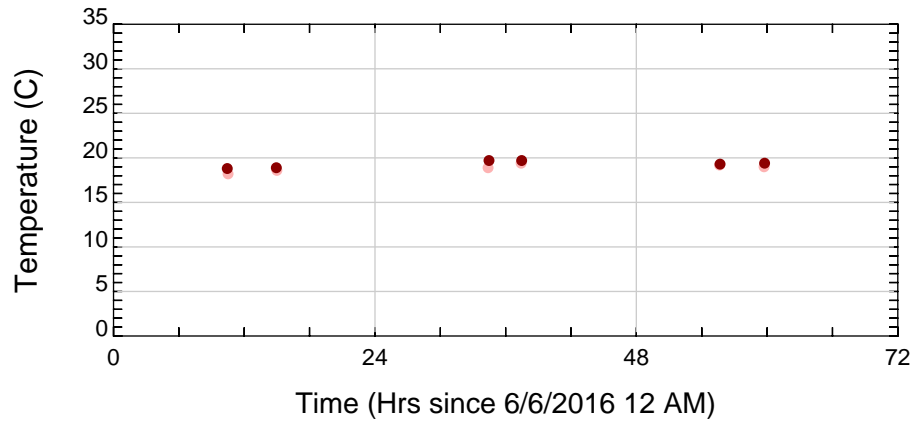
Passaic River & Tributaries, Passaic River, B24, (FW2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



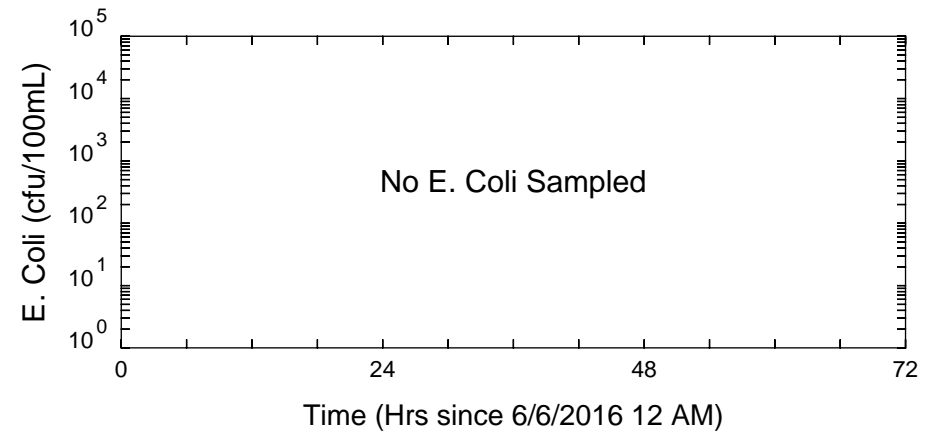
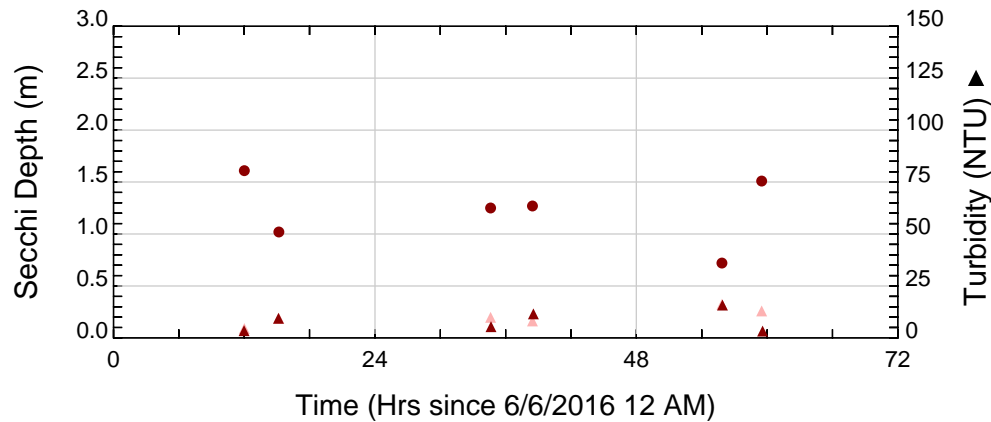
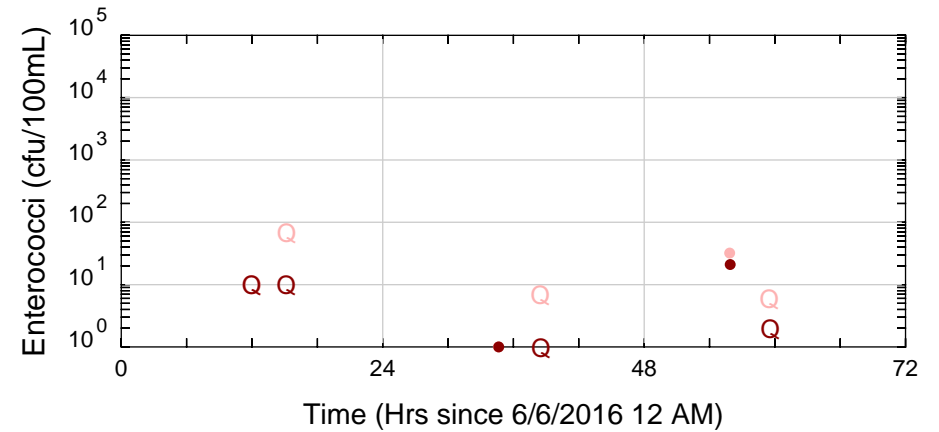
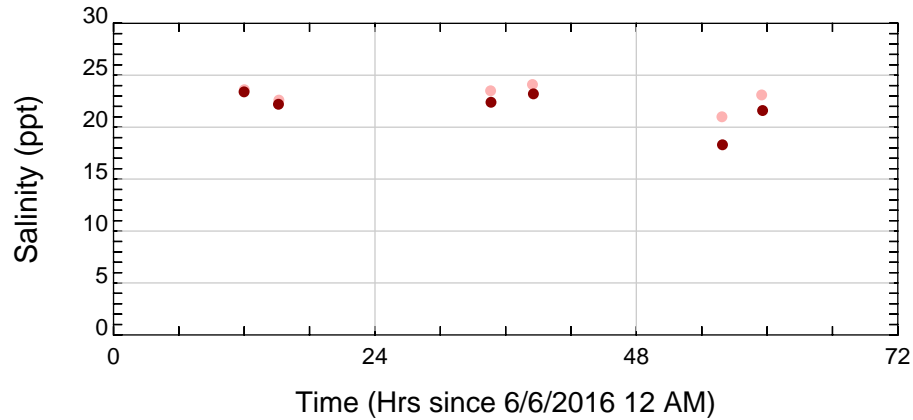
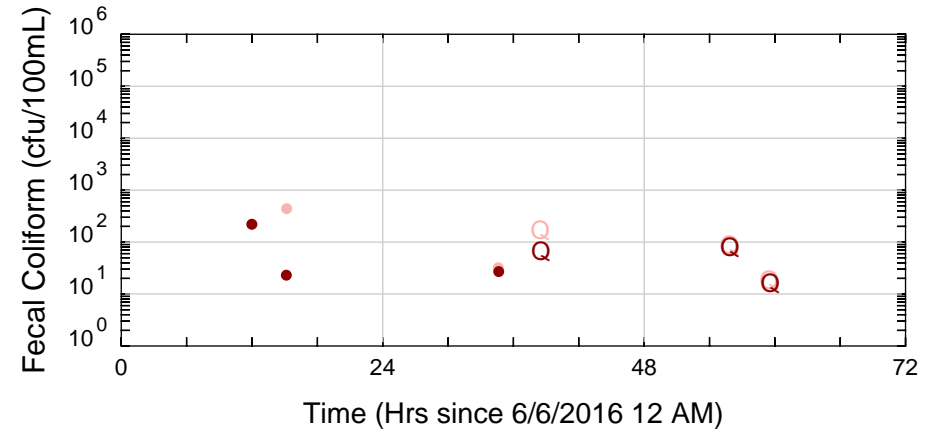
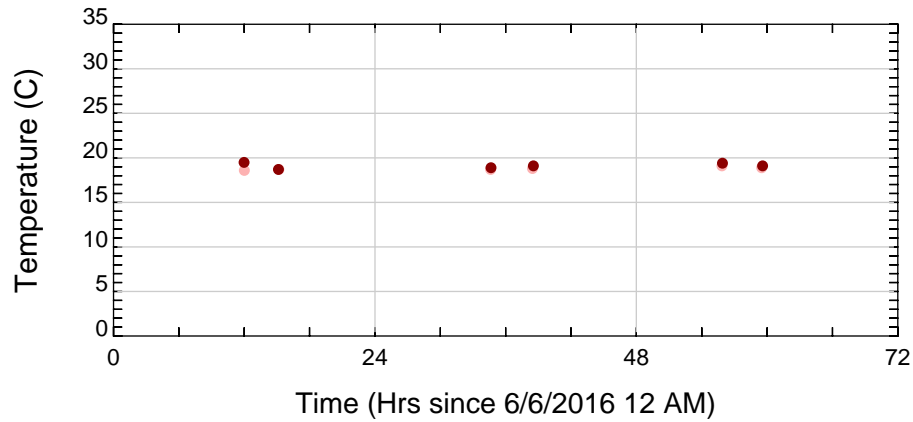
Hudson River, Upper Bay, Upper Bay, B26, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



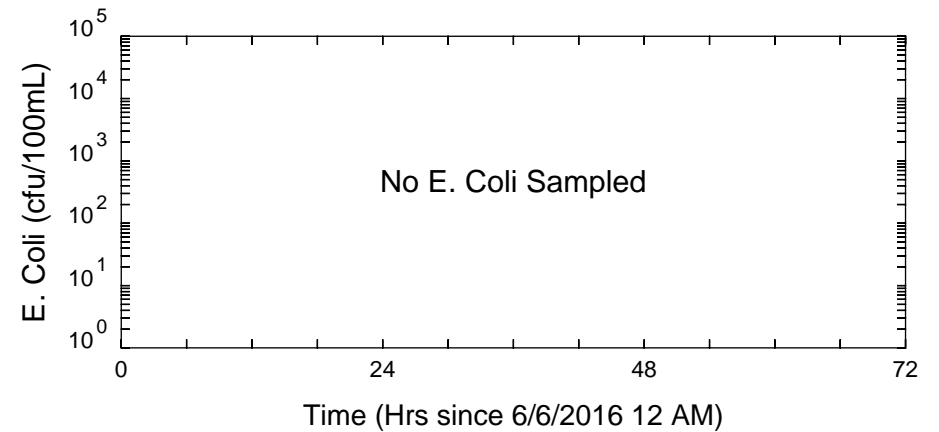
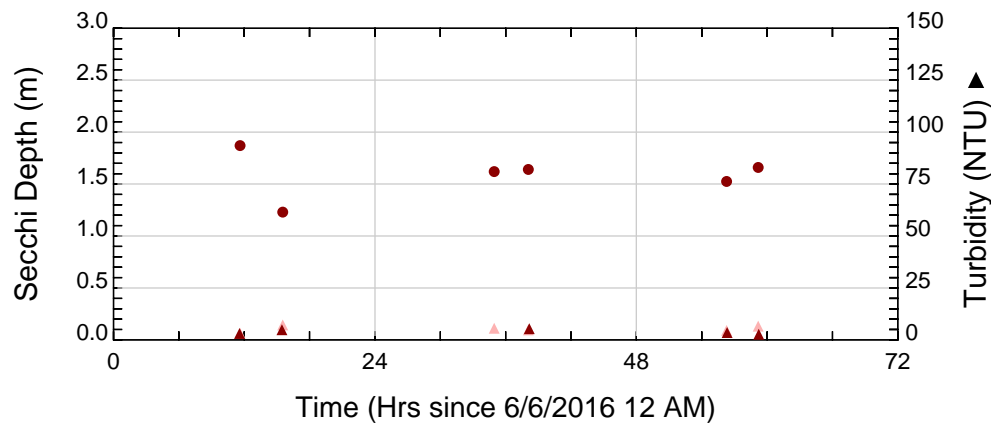
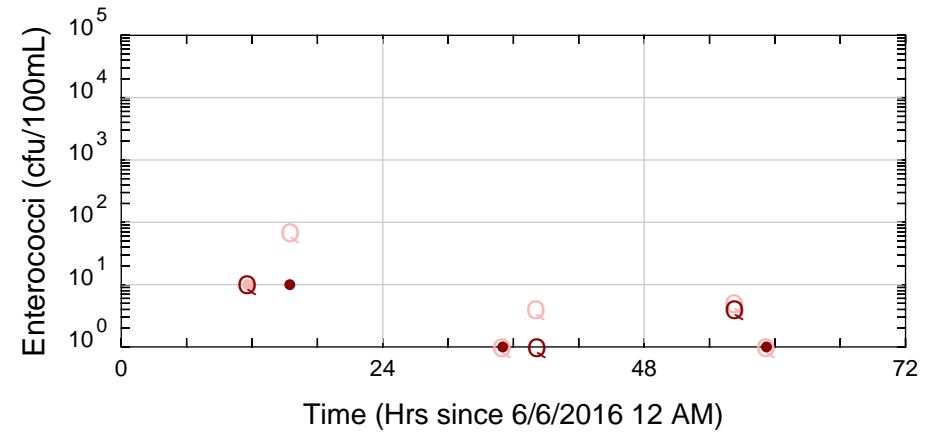
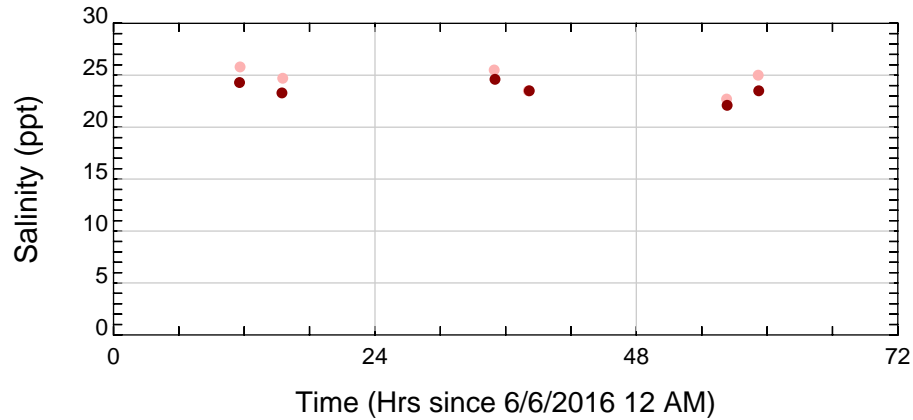
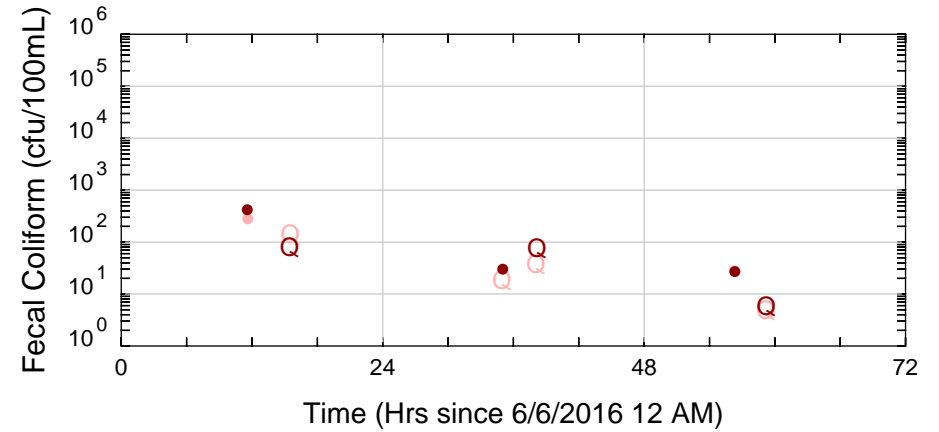
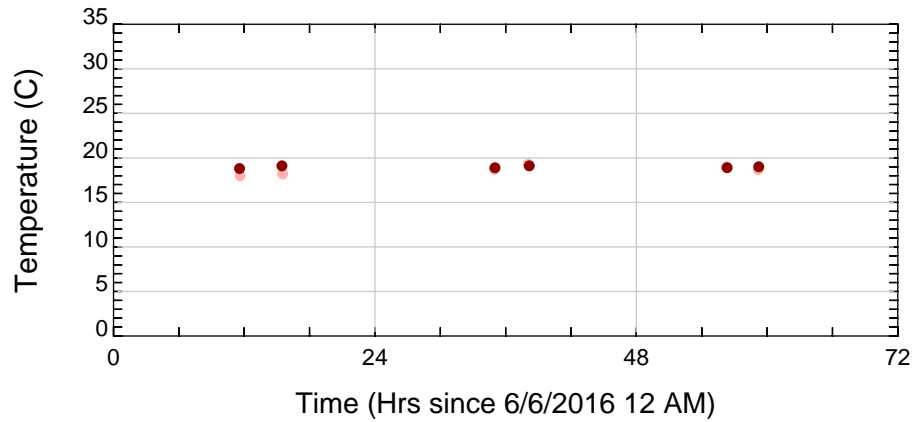
Hudson River, Upper Bay, Upper Bay, B27, (SE2)

- ● Surface/Mid-depth HDR
- ● ● Surface/Mid/Bottom NJHDG



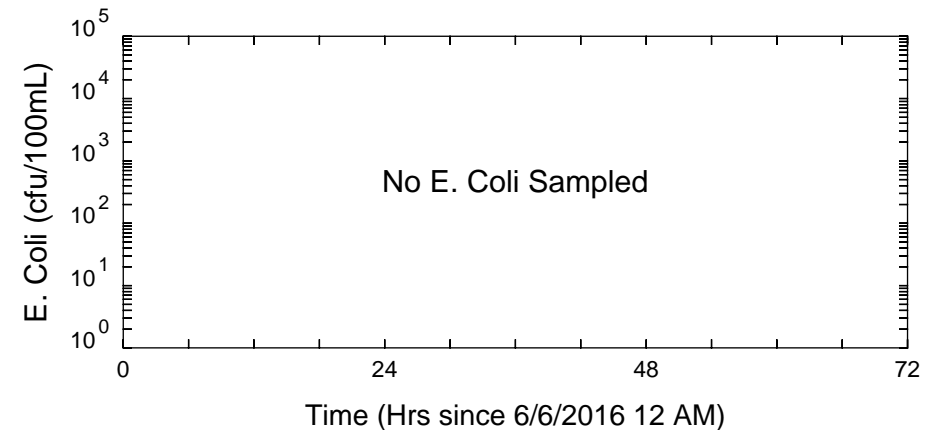
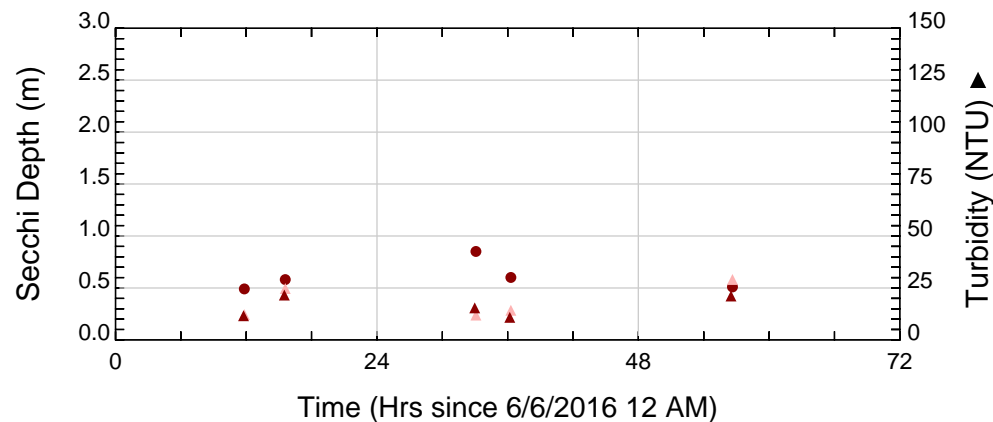
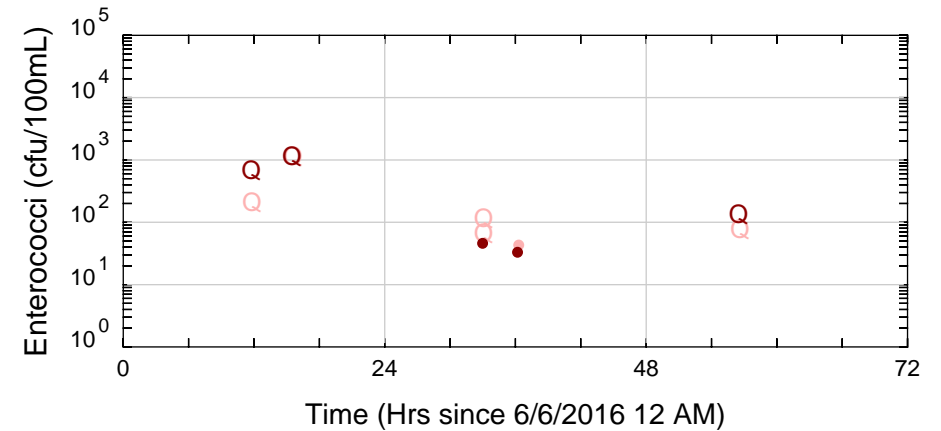
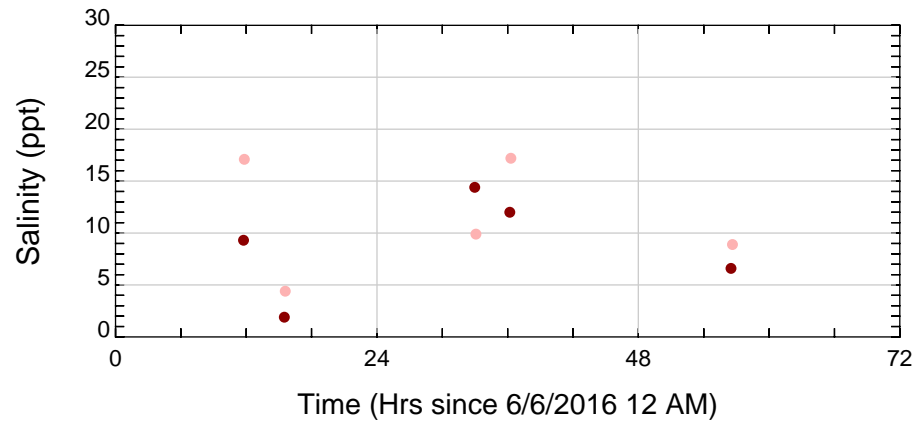
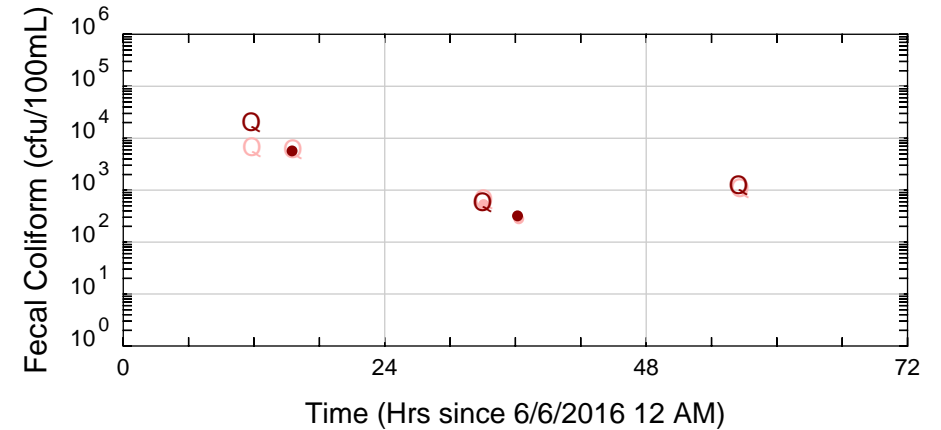
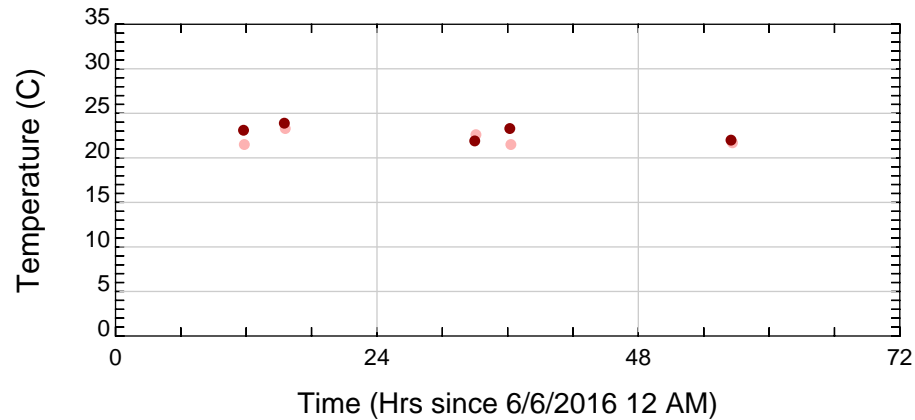
Hudson River, Upper Bay, Upper Bay, B28, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



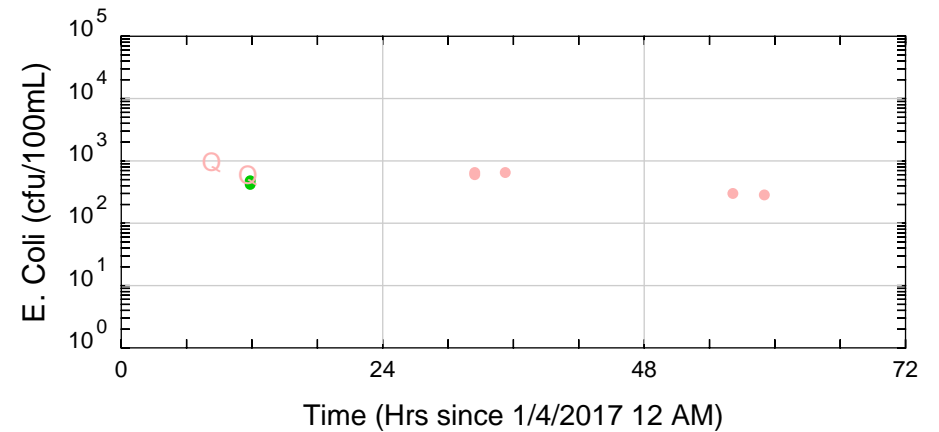
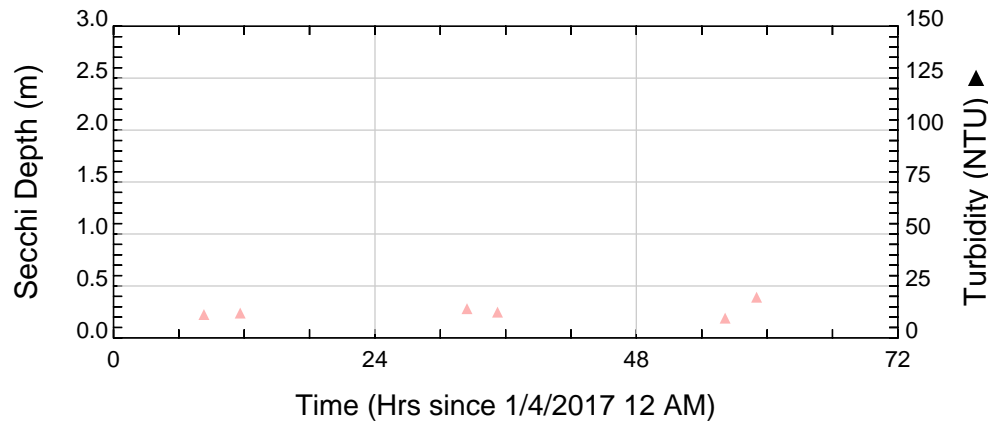
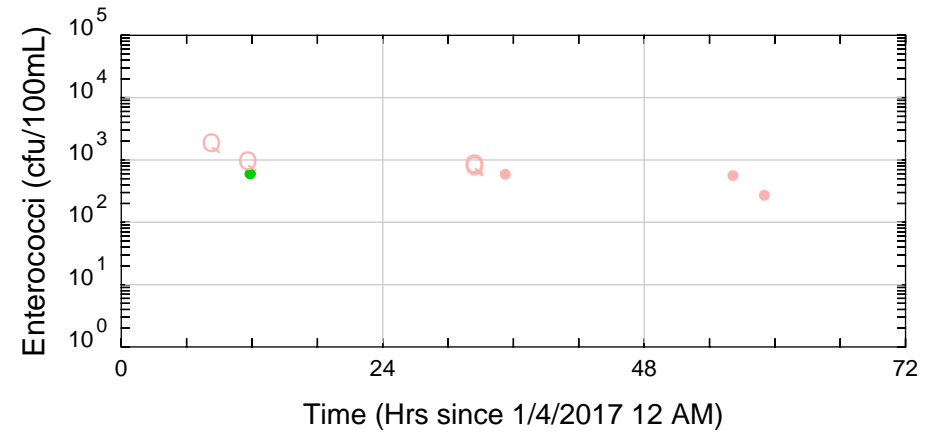
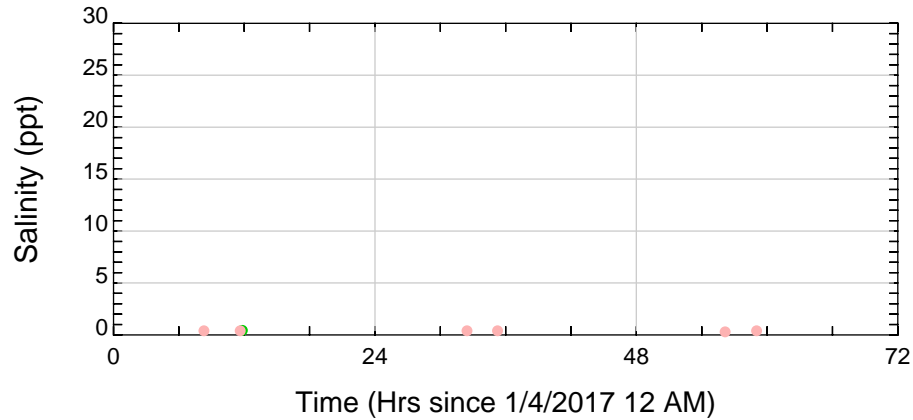
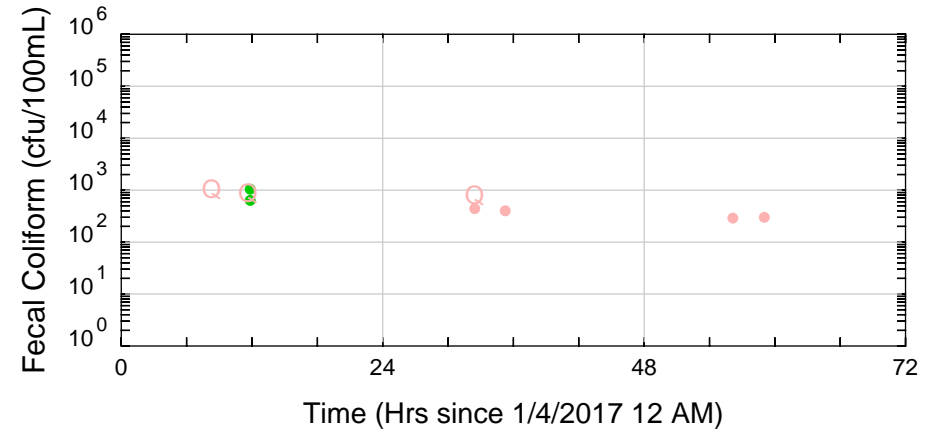
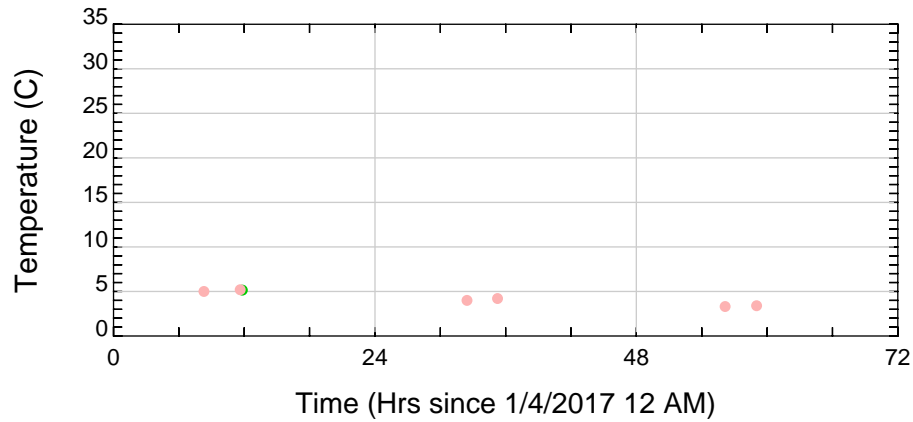
Passaic River & Tributaries, Passaic River, B6, (SE3)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



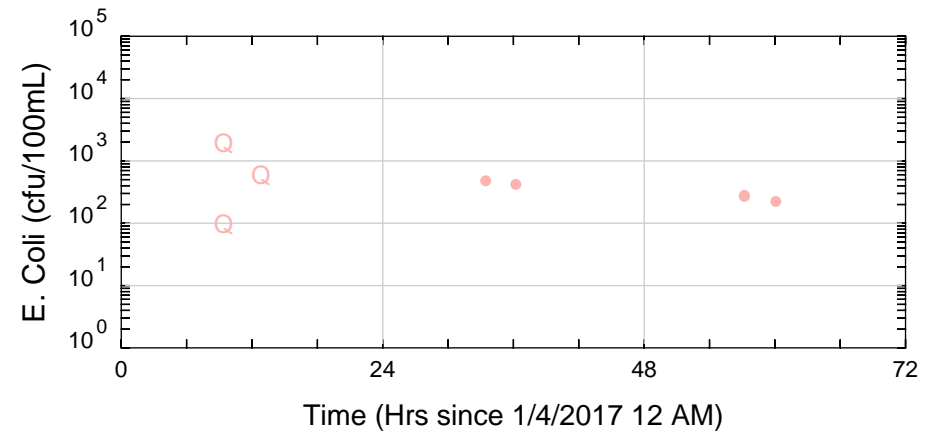
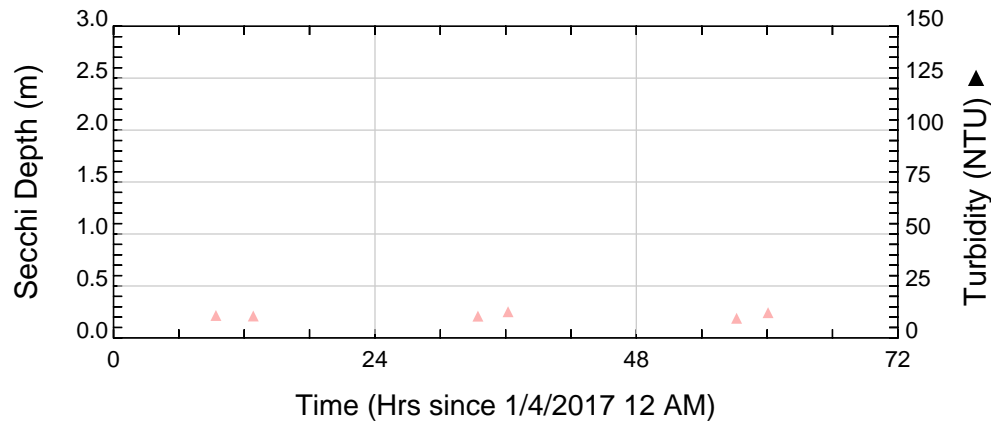
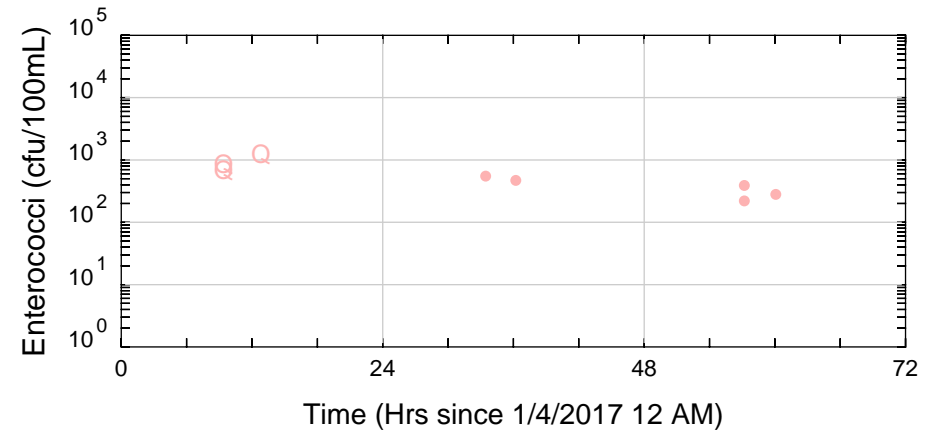
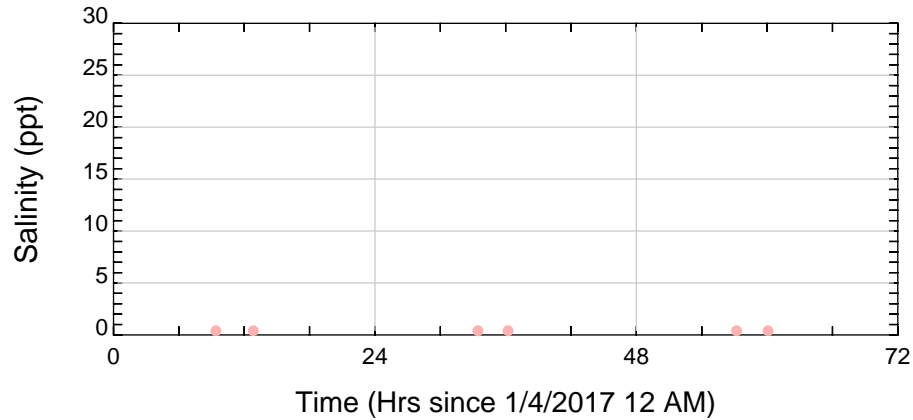
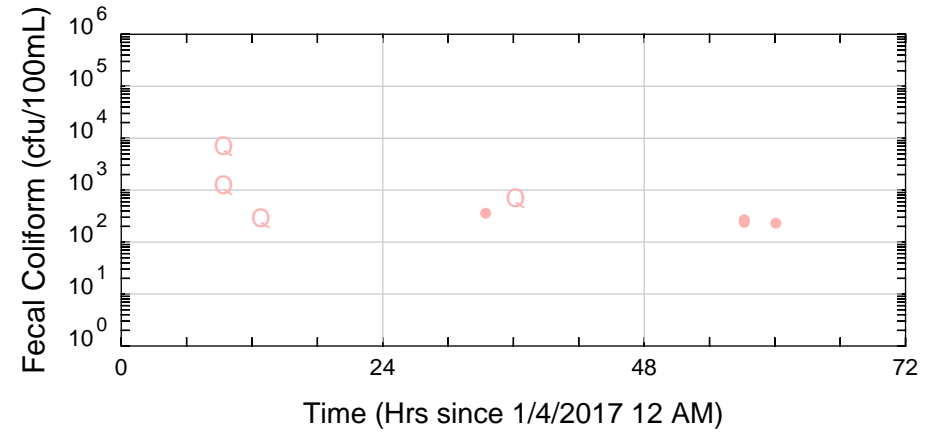
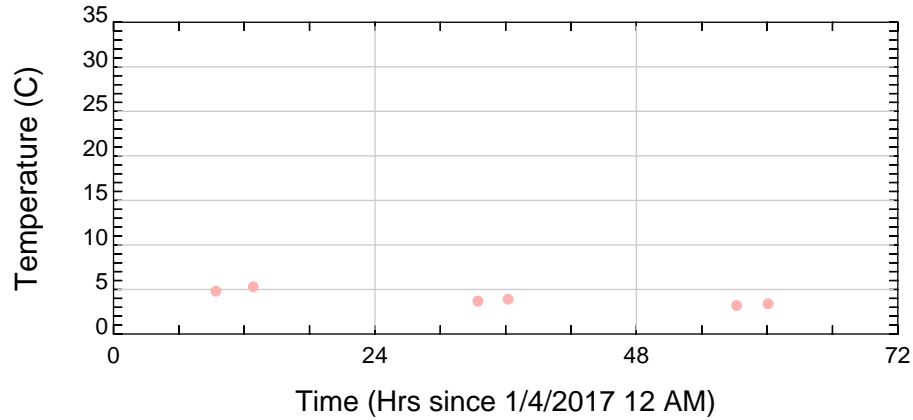
Passaic River & Tributaries, Passaic River, 1, (FW2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



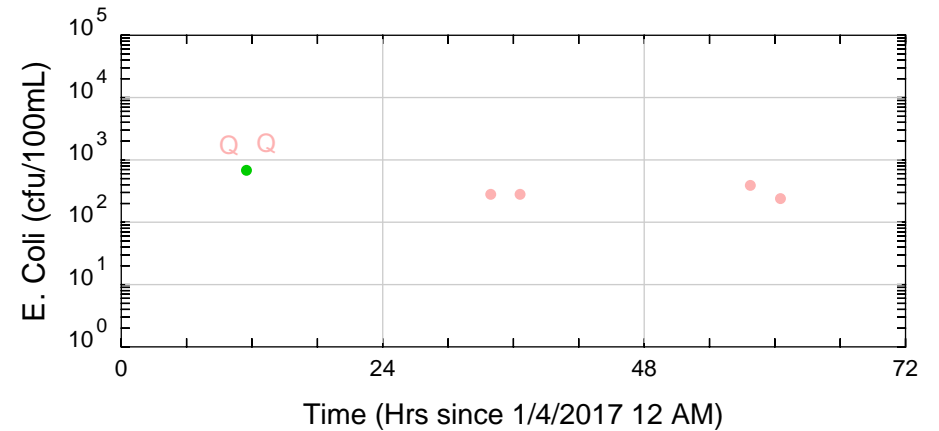
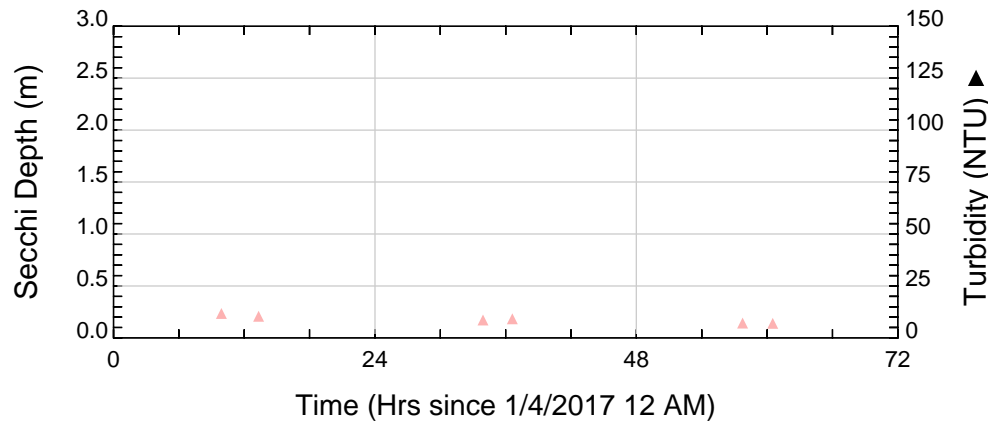
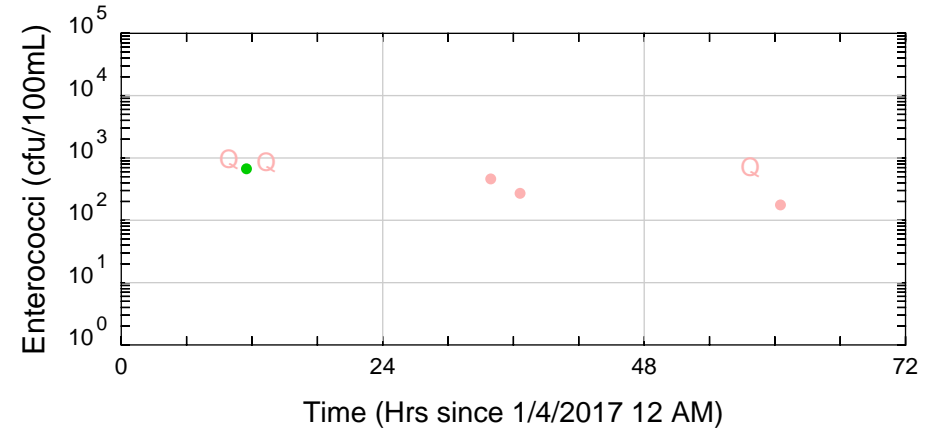
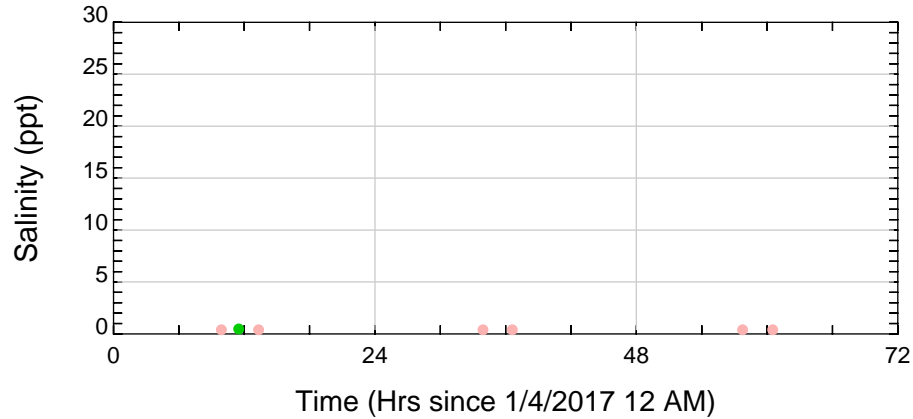
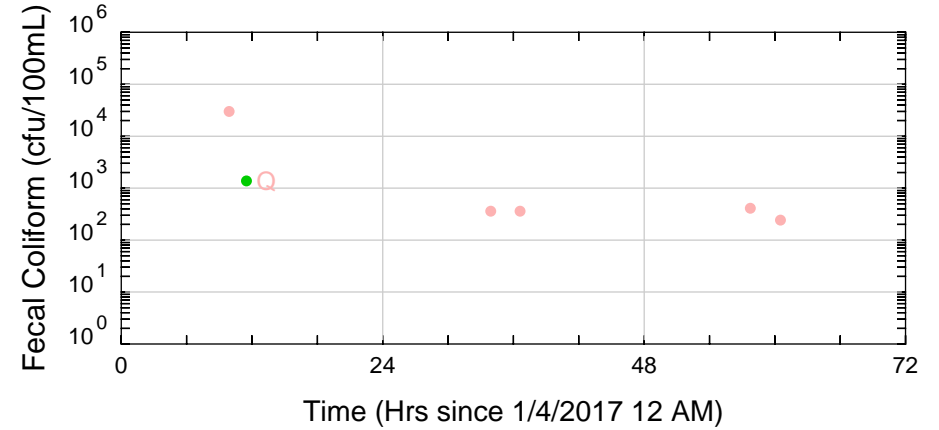
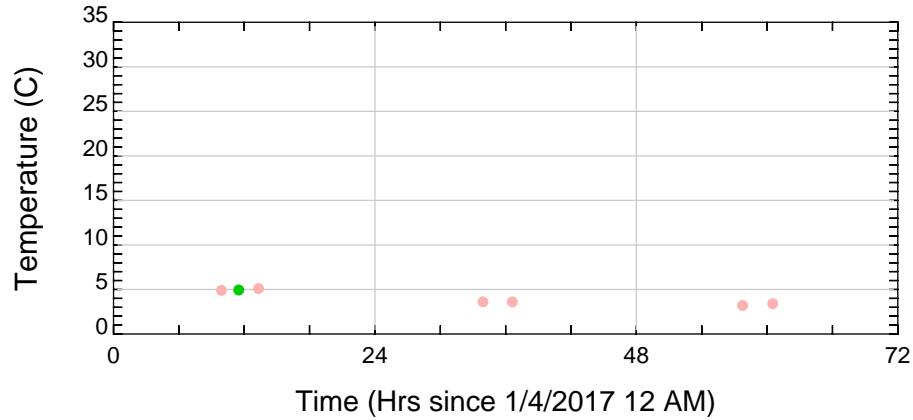
Passaic River & Tributaries, Passaic River, 3, (FW2)

● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG



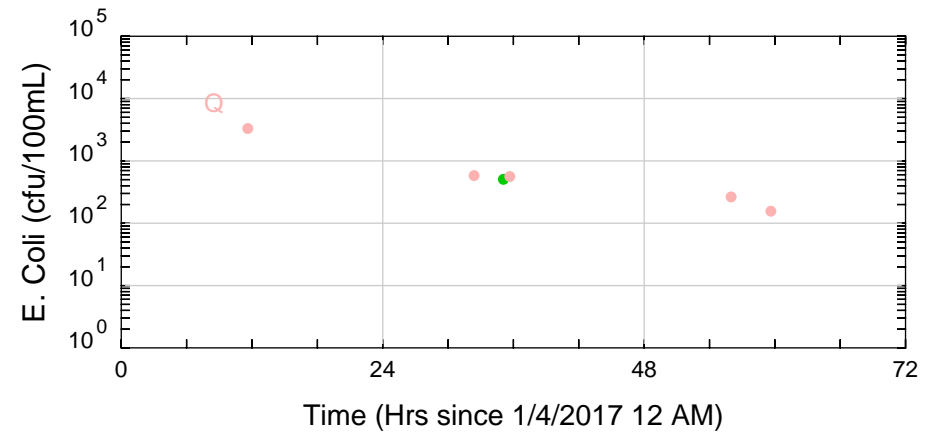
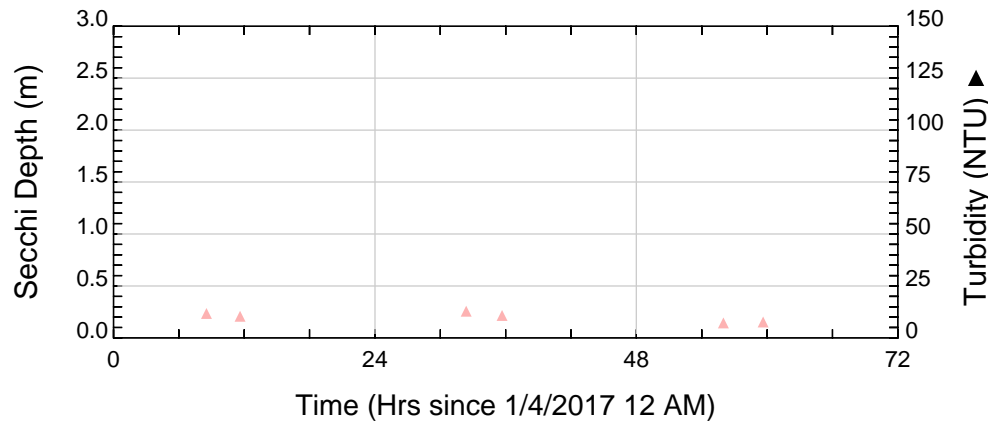
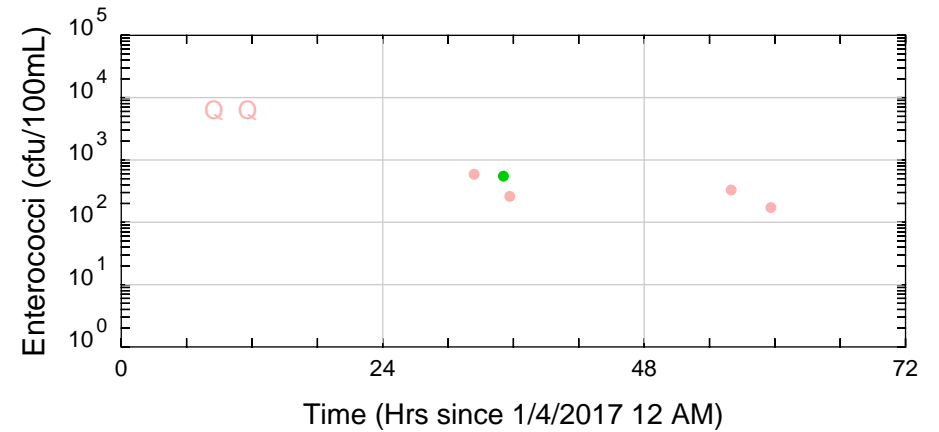
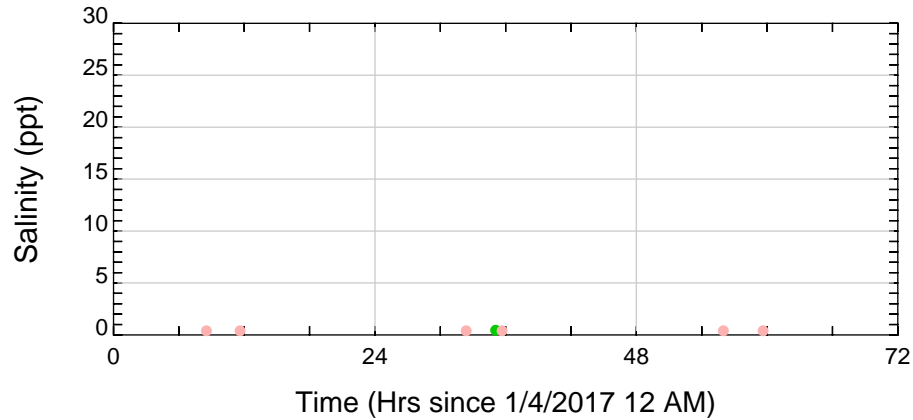
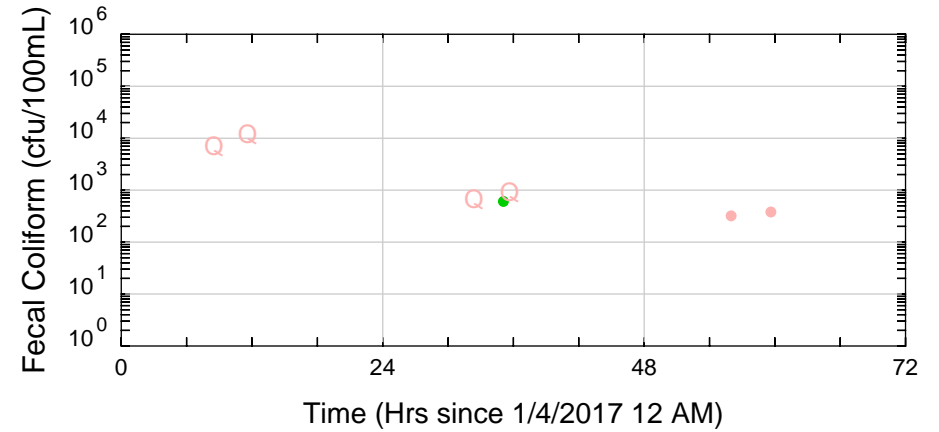
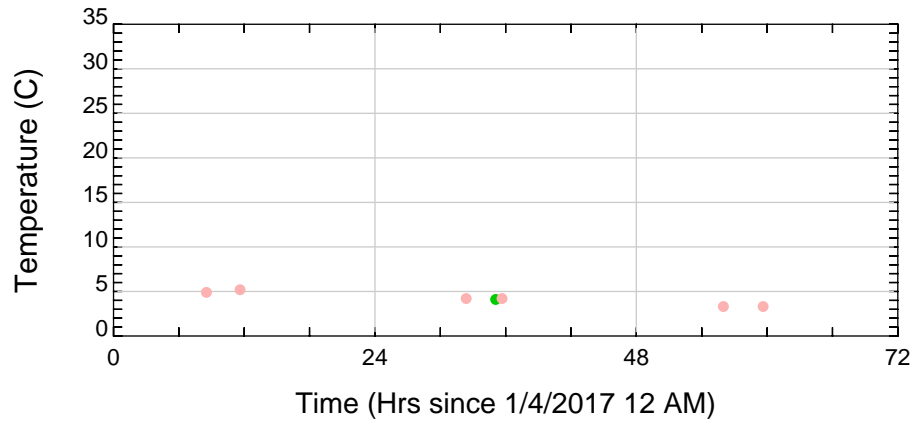
Passaic River & Tributaries, Passaic River, 4, (FW2)

● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG



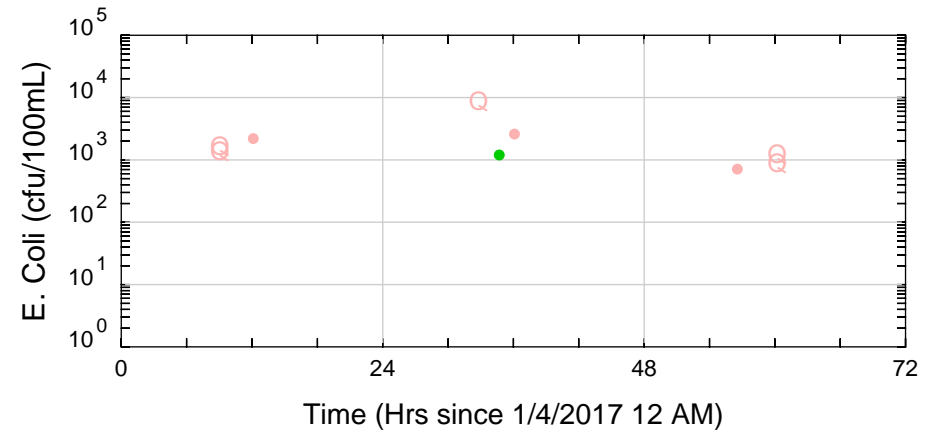
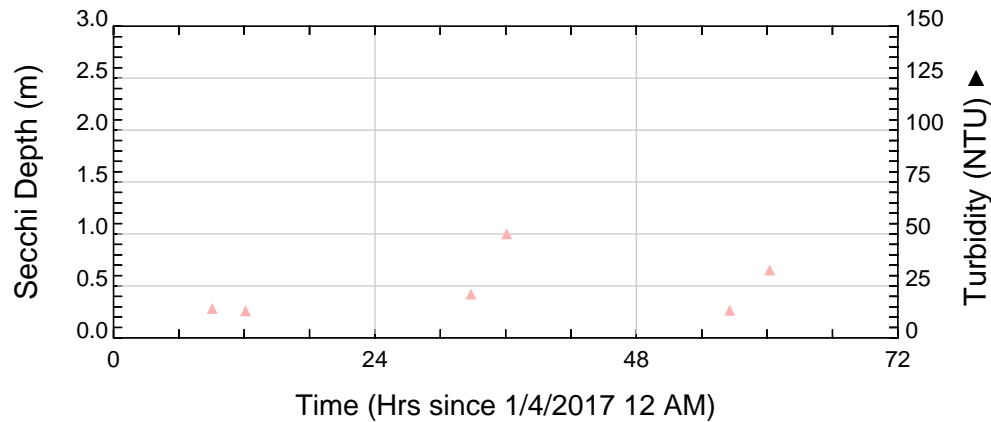
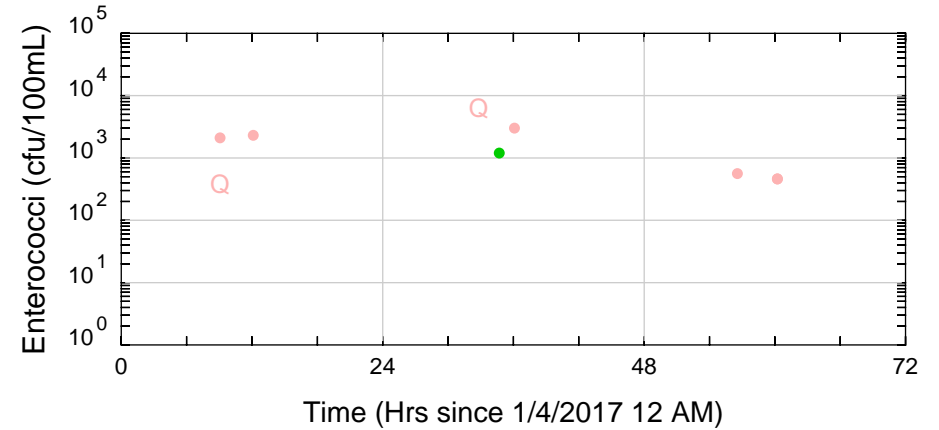
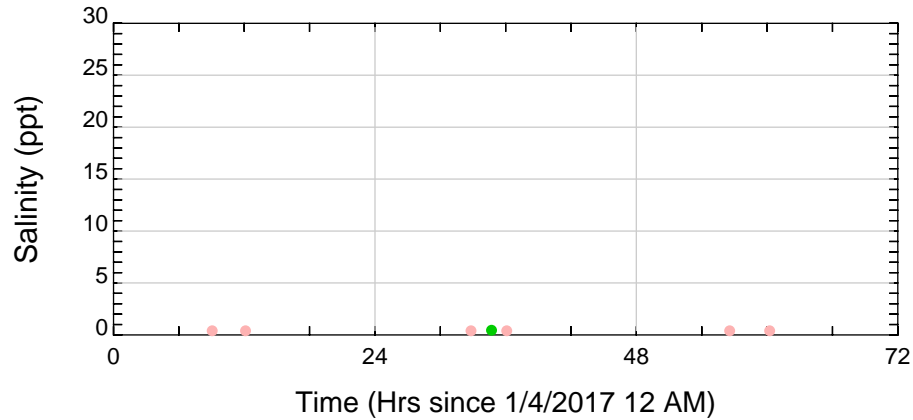
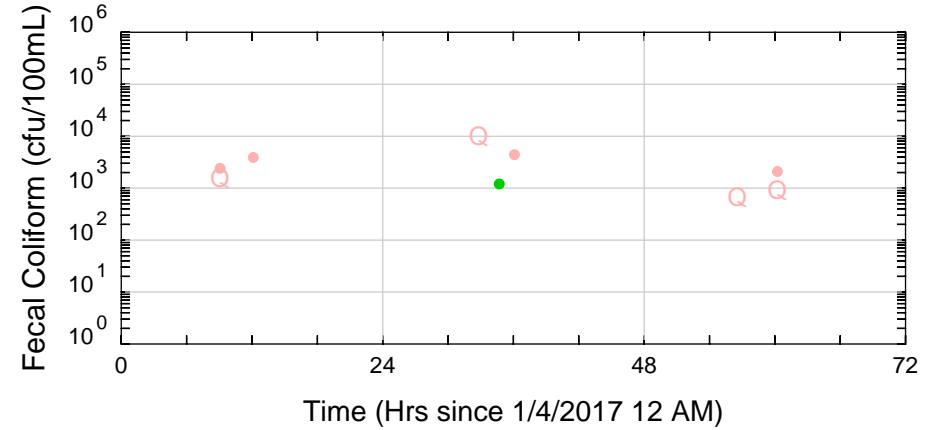
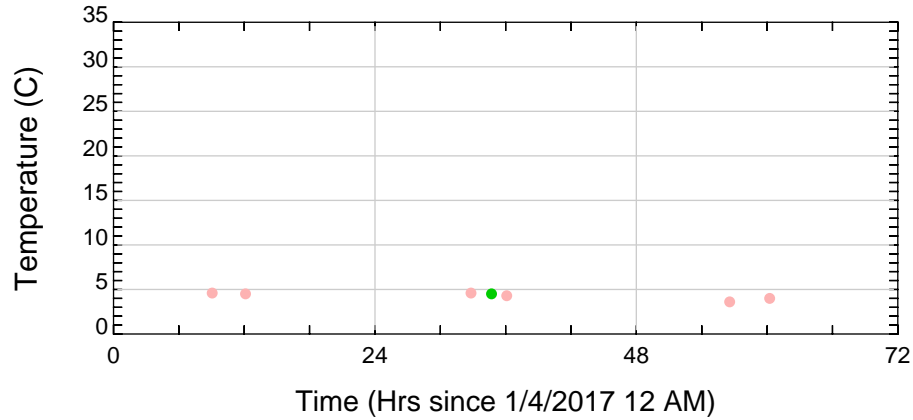
Passaic River & Tributaries, Passaic River, 7, (FW2/SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



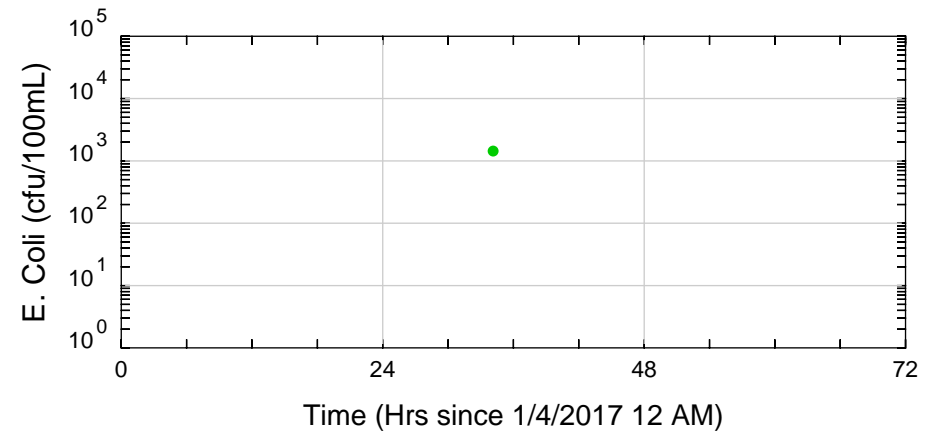
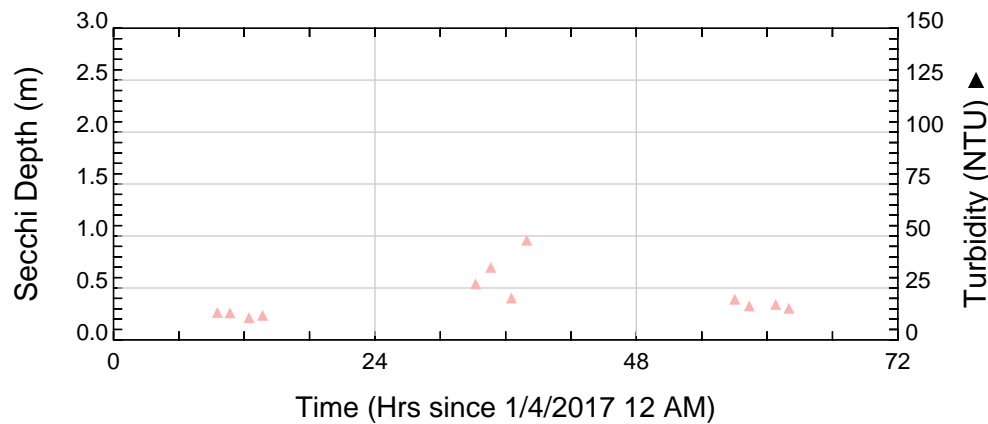
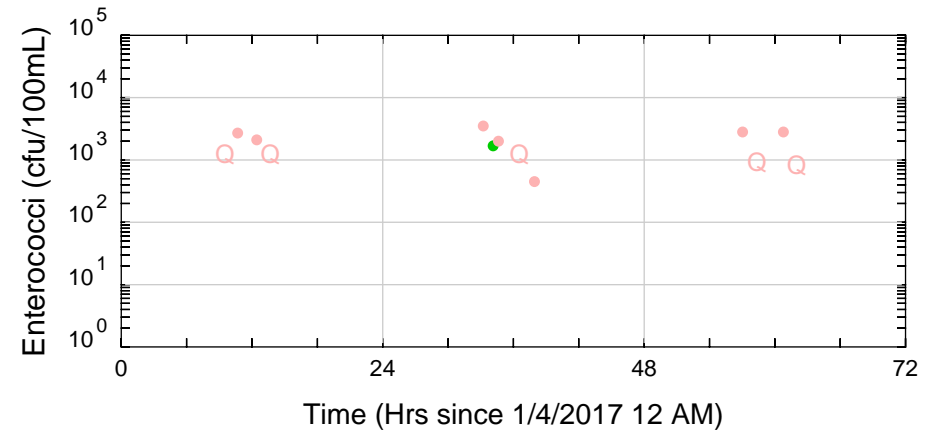
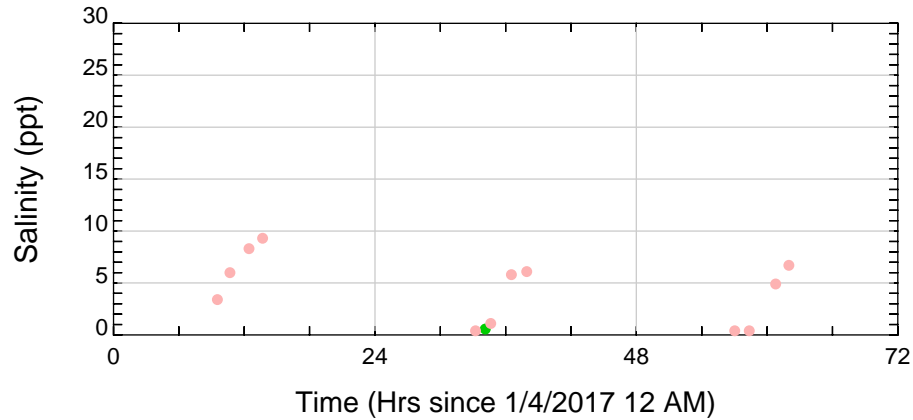
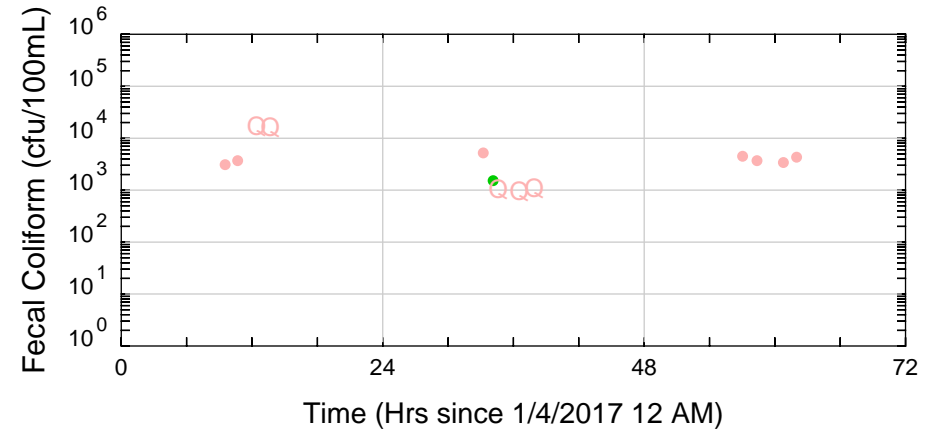
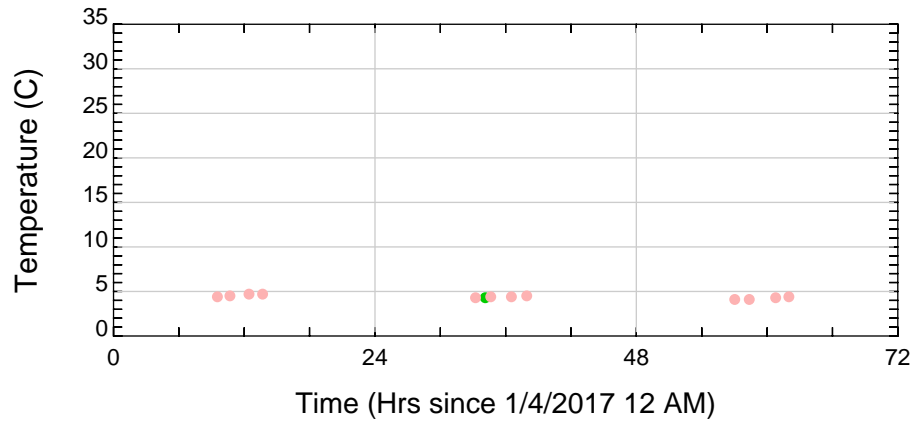
Passaic River & Tributaries, Passaic River, 8, (FW2/SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



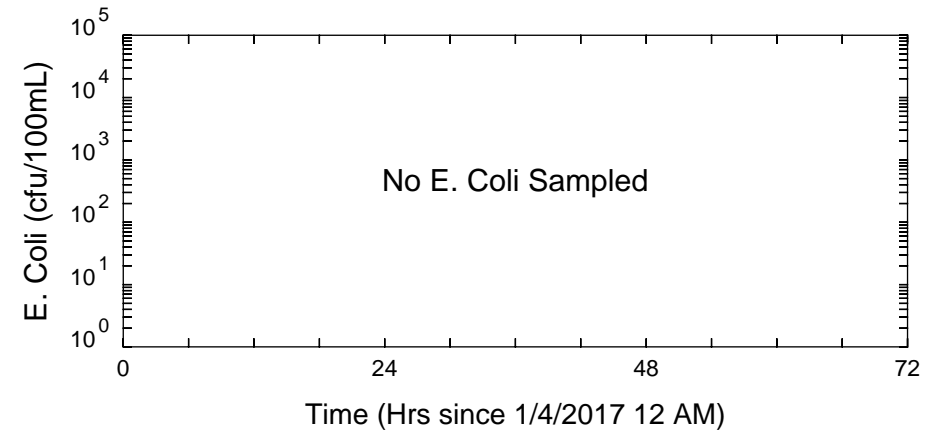
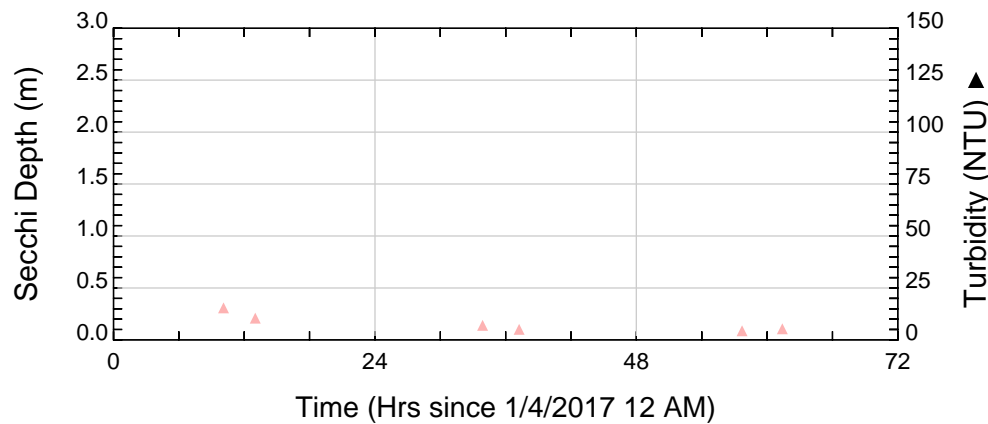
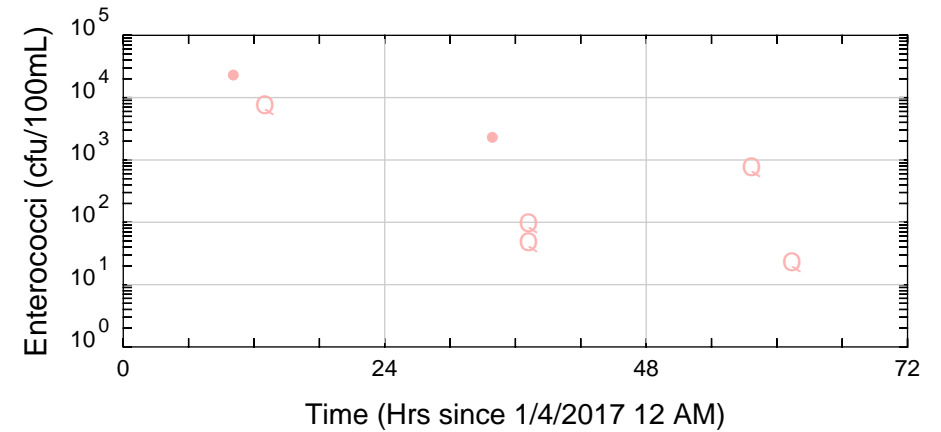
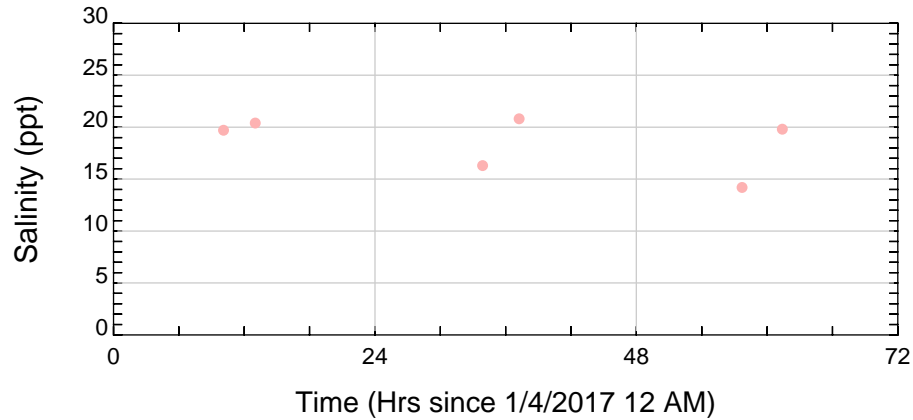
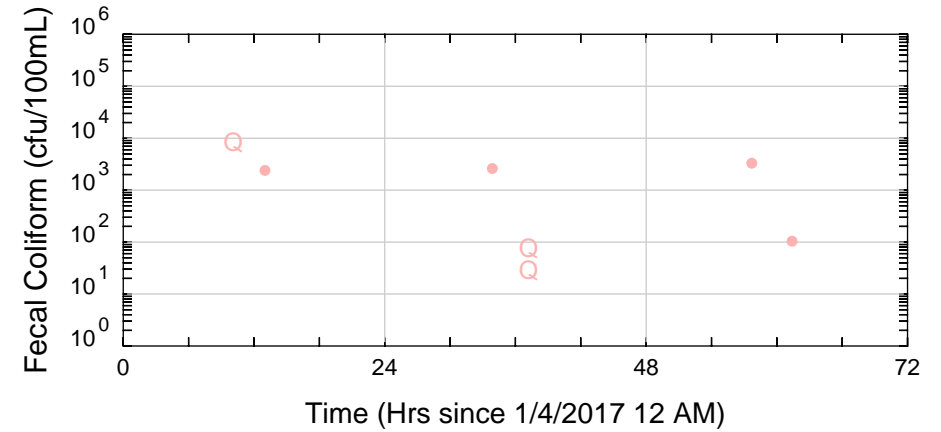
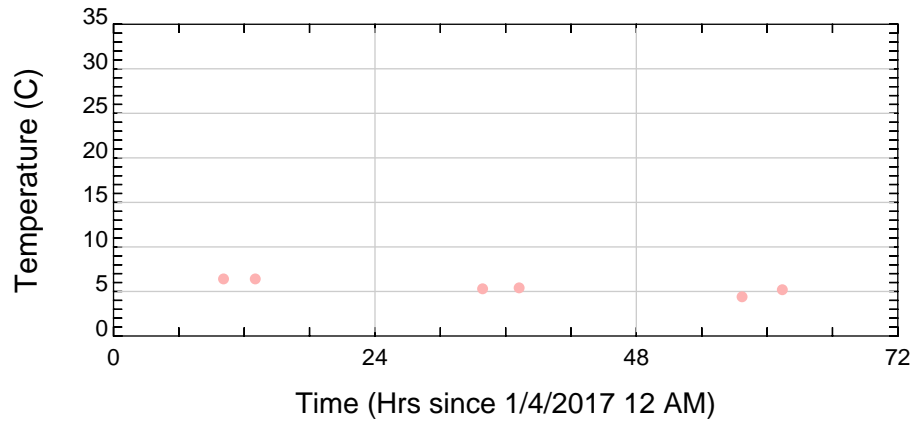
Passaic River & Tributaries, Passaic River, 10, (SE3)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



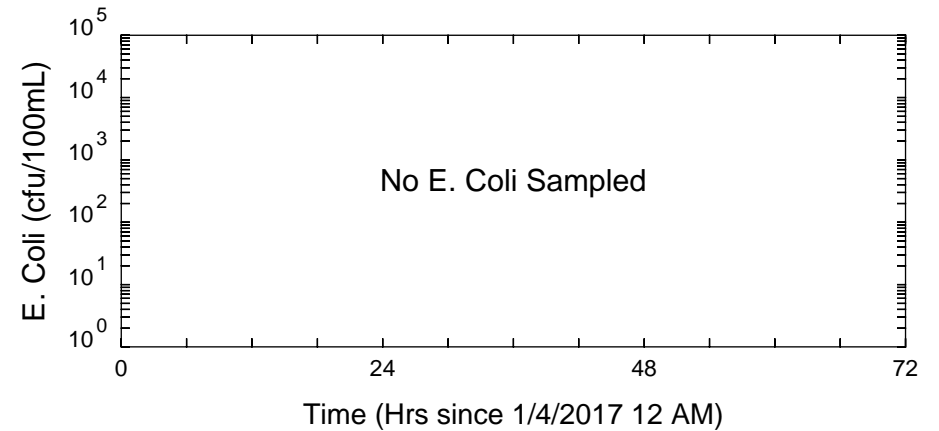
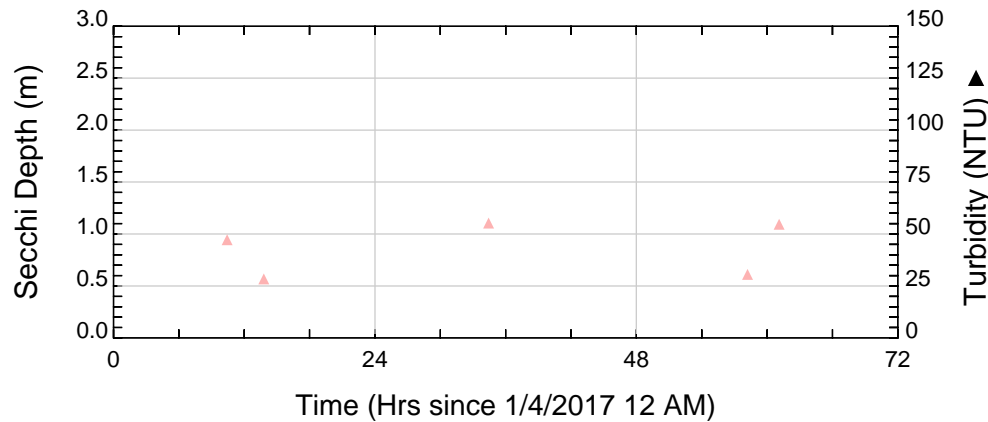
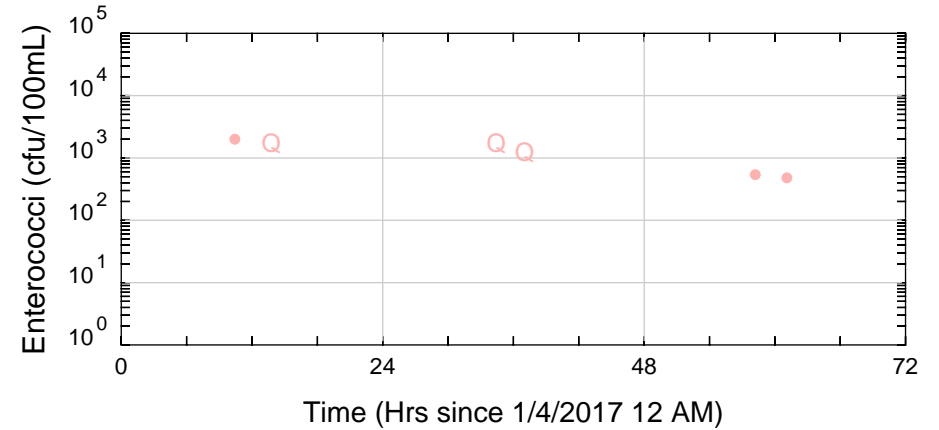
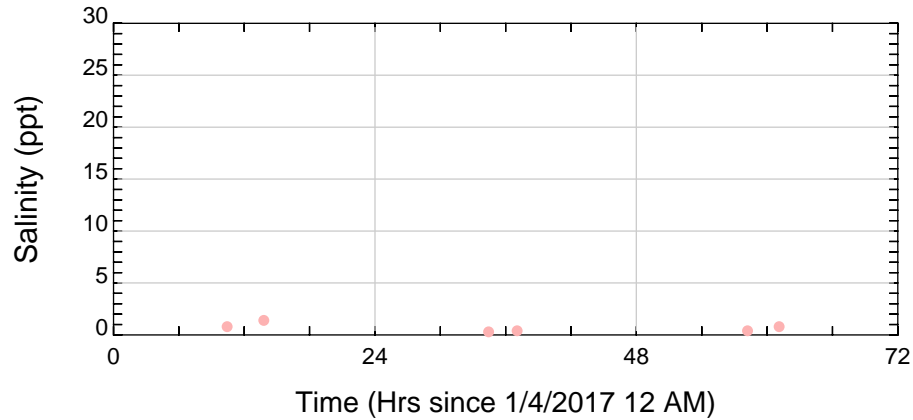
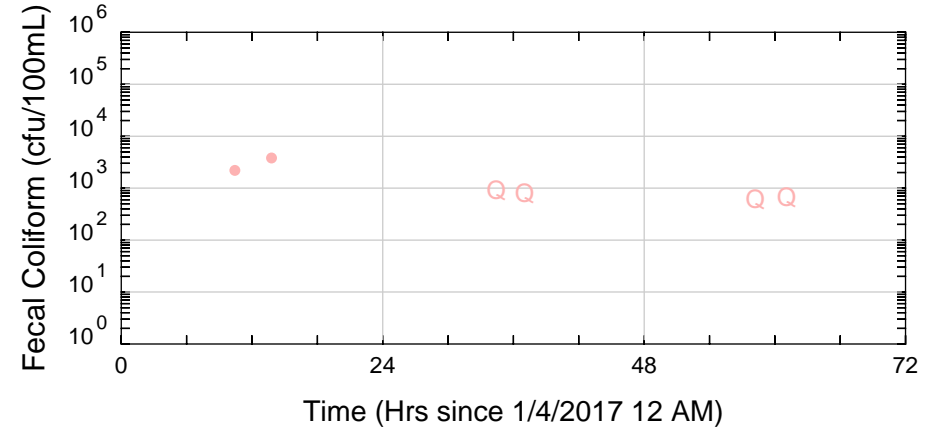
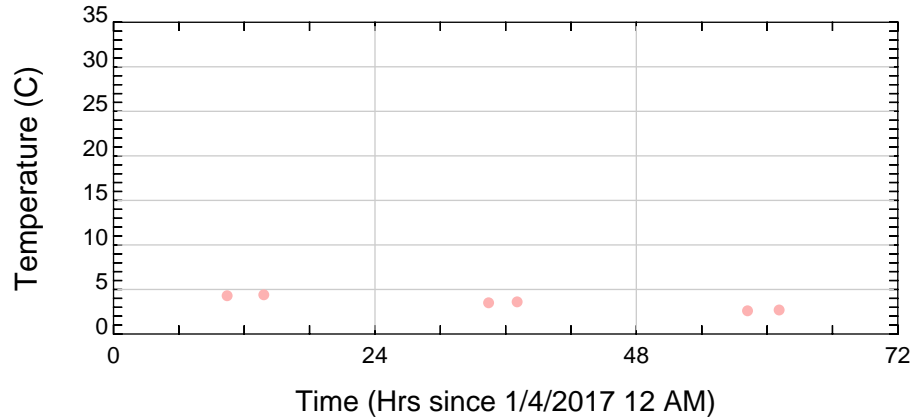
Newark Bay & Tributaries, Elizabeth River, 20, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



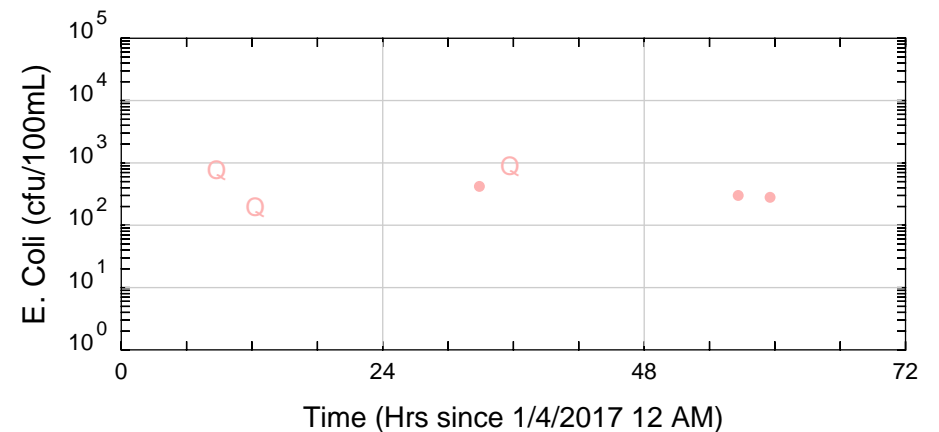
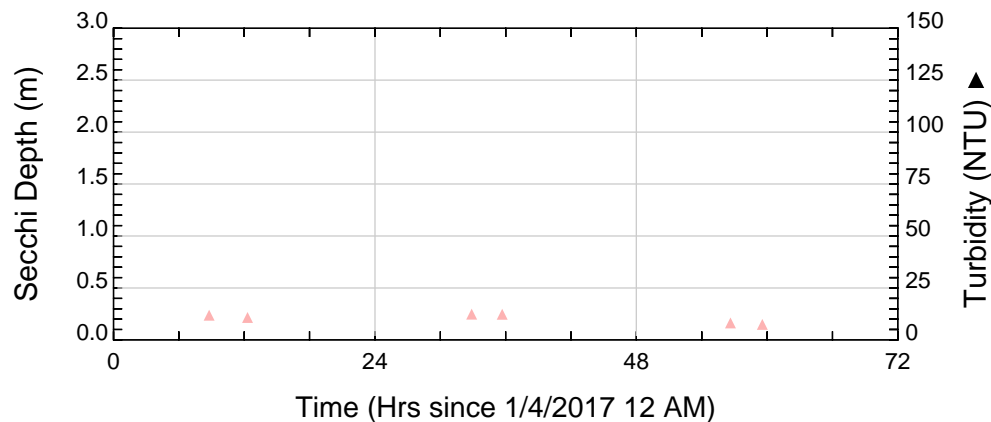
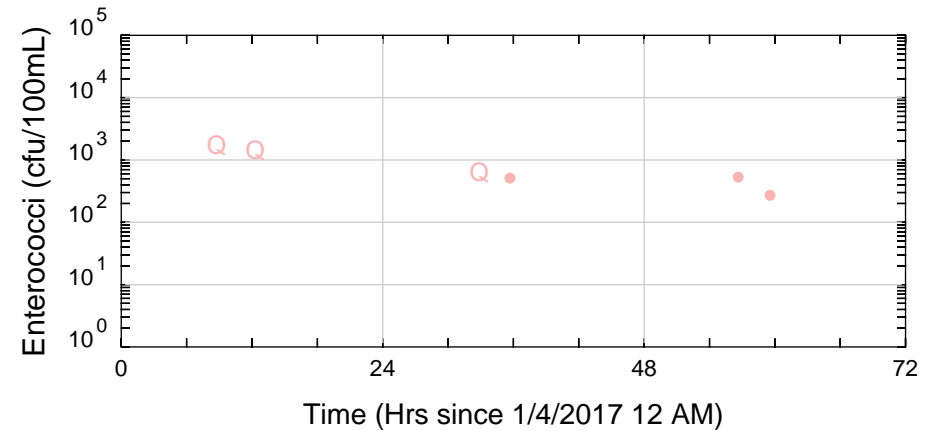
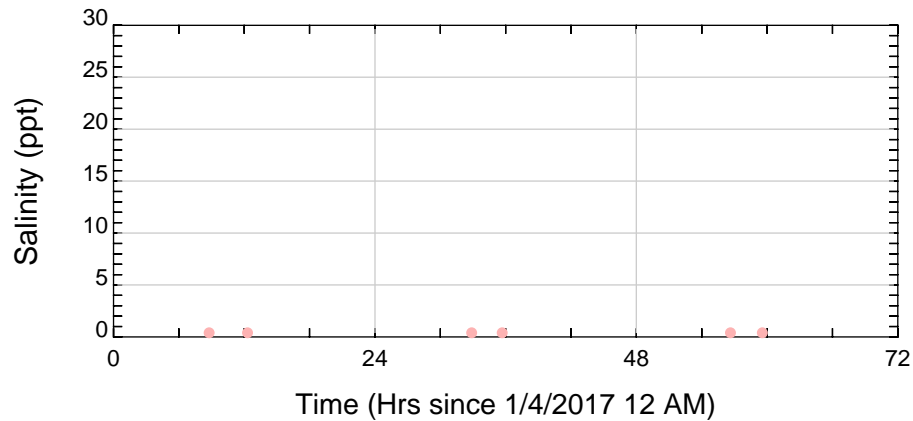
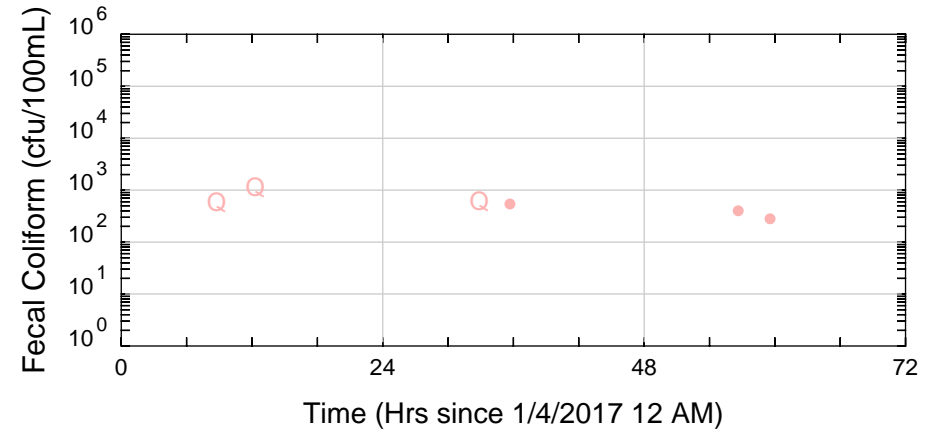
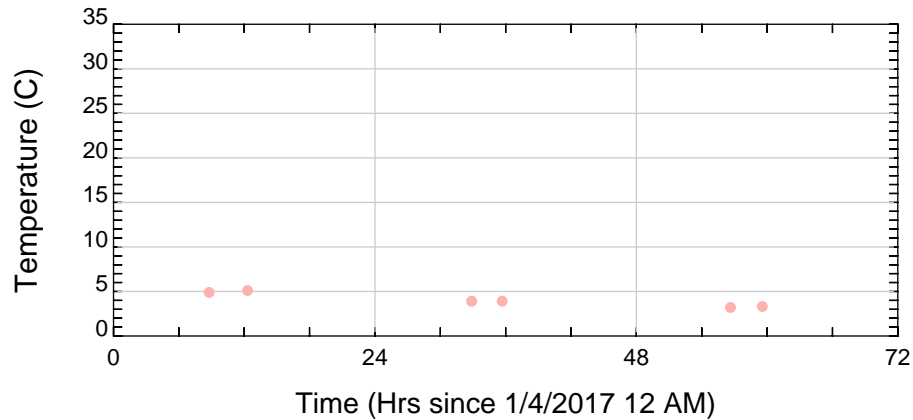
Hackensack River & Tributaries, Hackensack River, B1, (SE1)

● ● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG



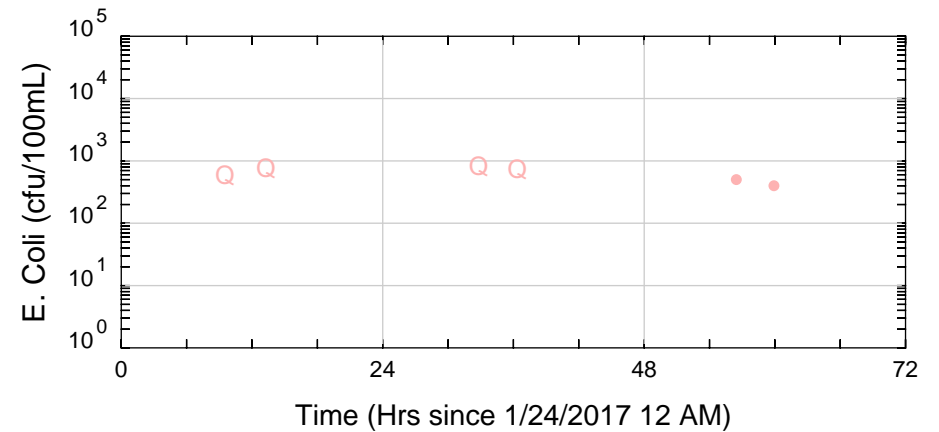
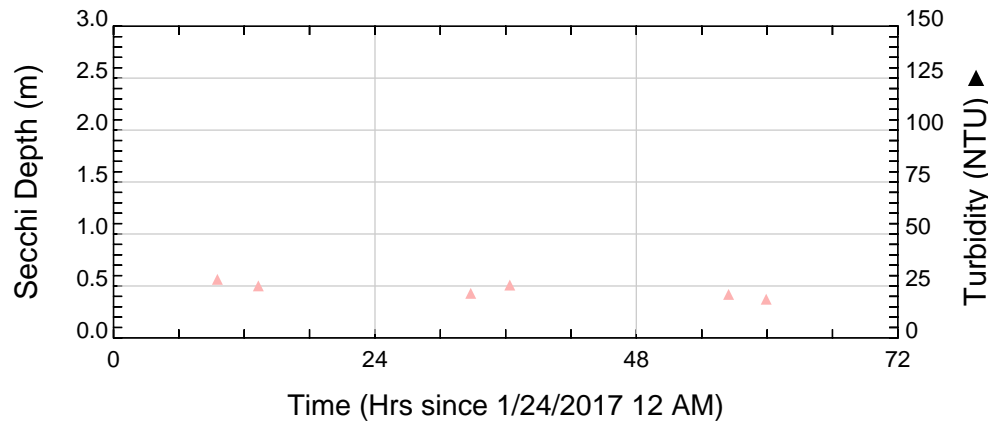
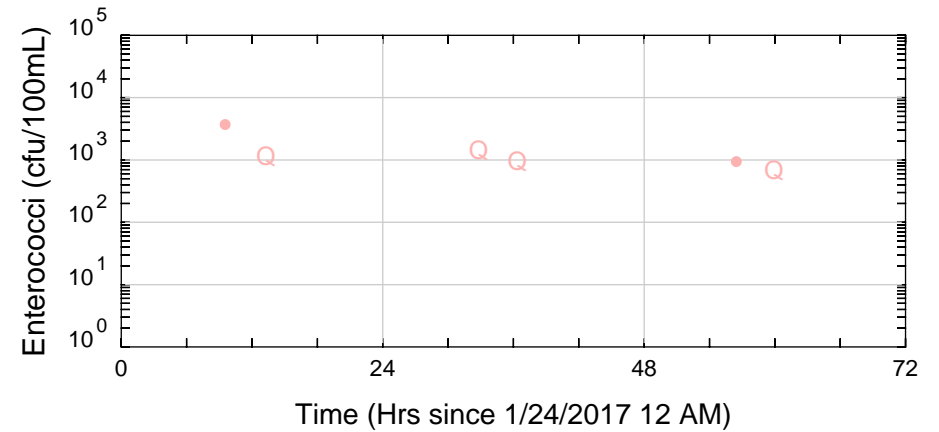
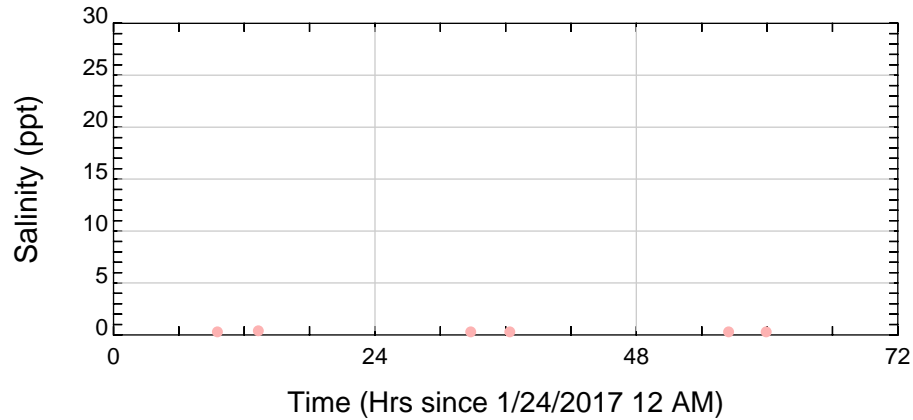
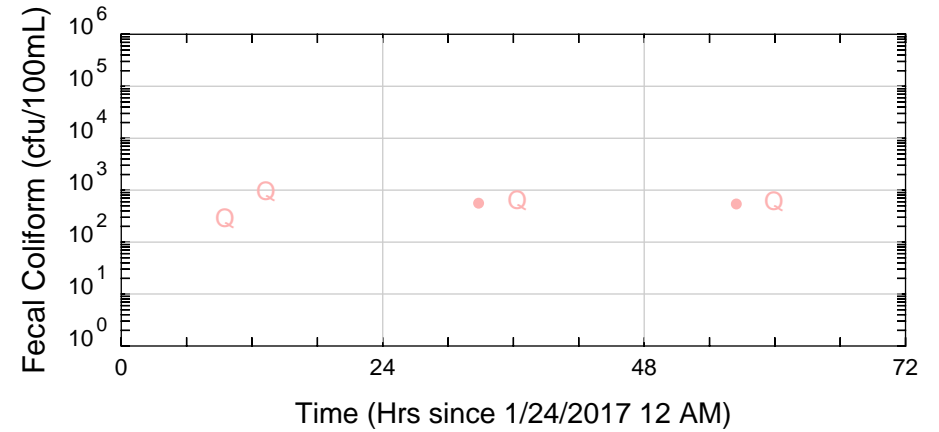
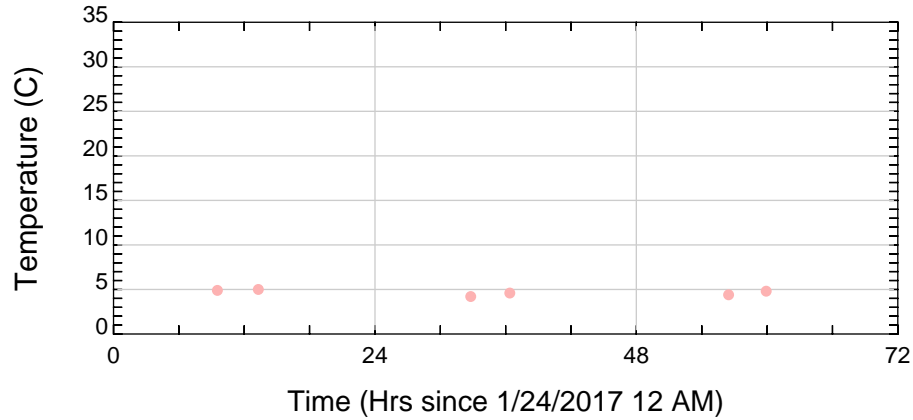
Passaic River & Tributaries, Passaic River, B24, (FW2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



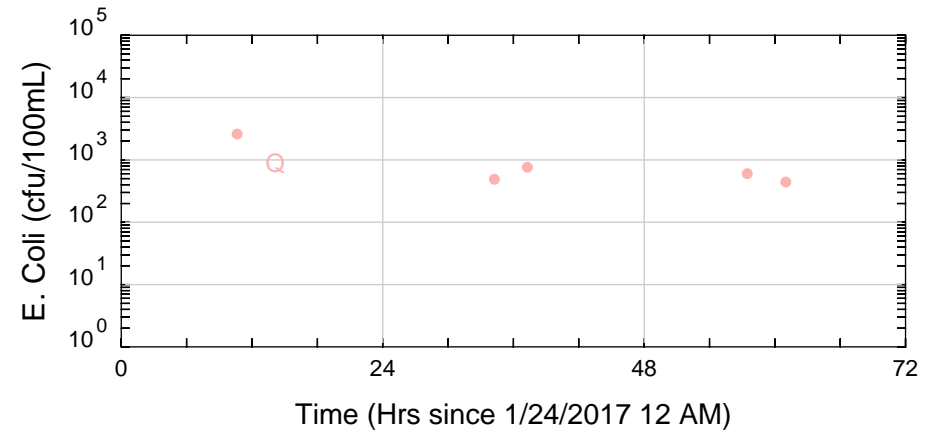
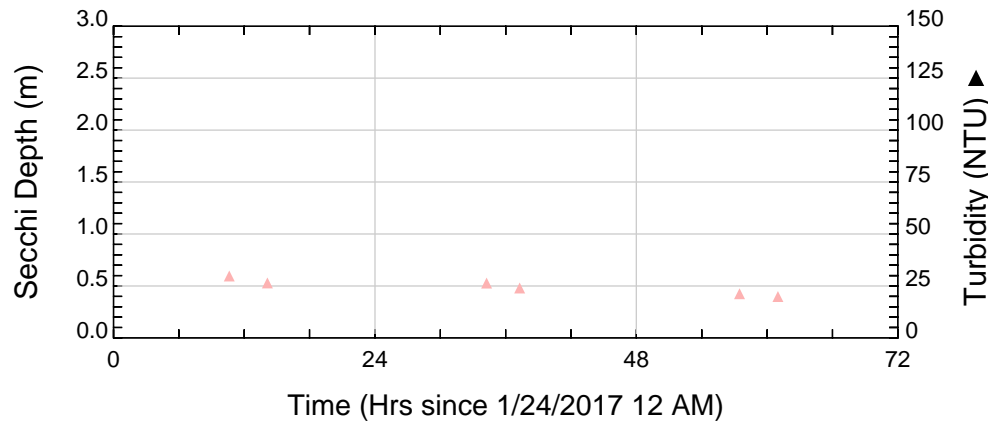
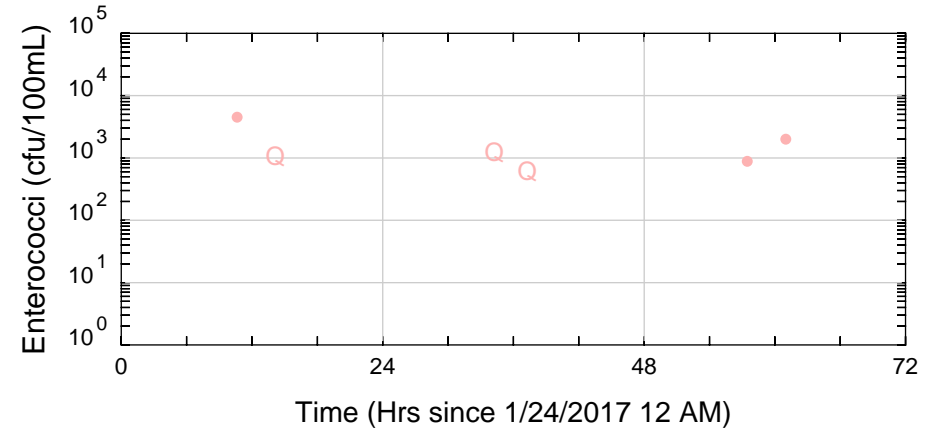
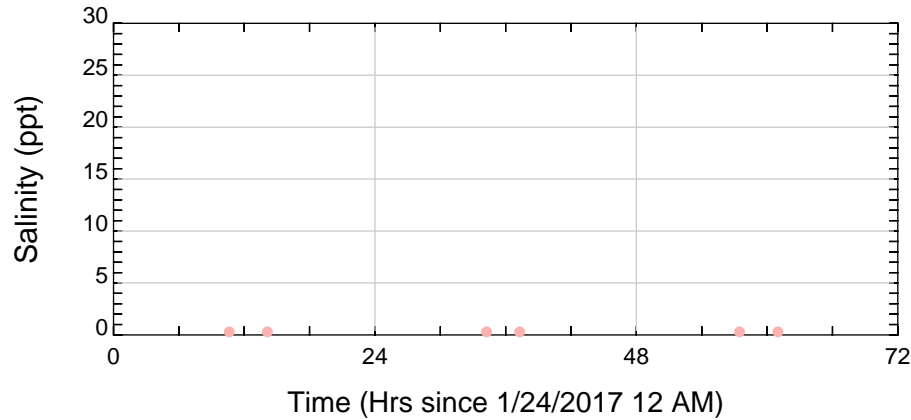
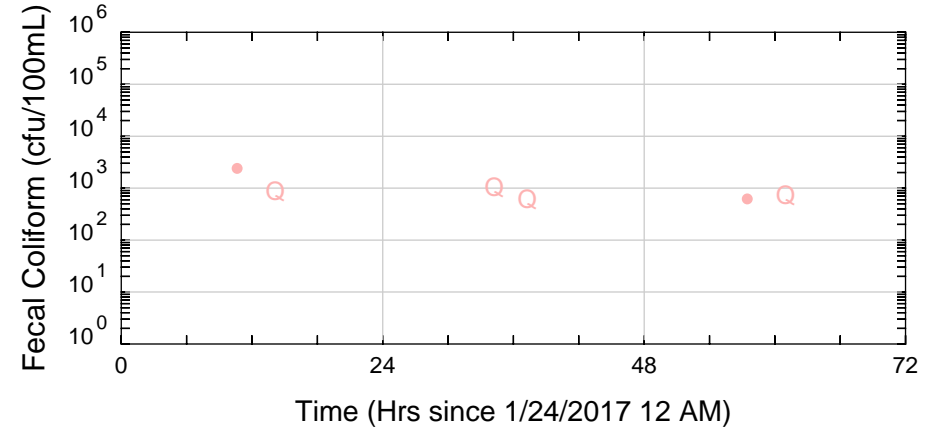
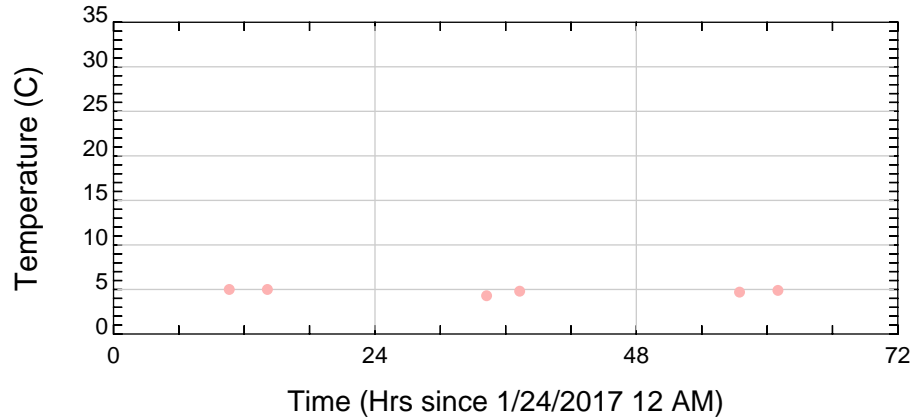
Passaic River & Tributaries, Passaic River, 1, (FW2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



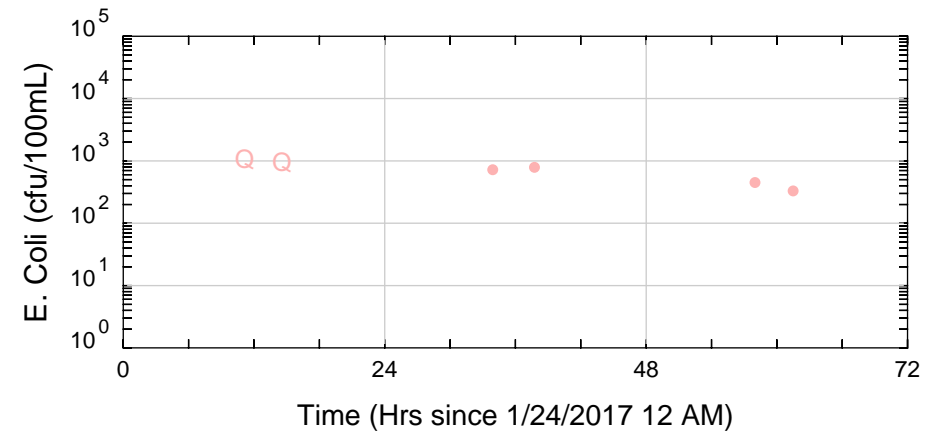
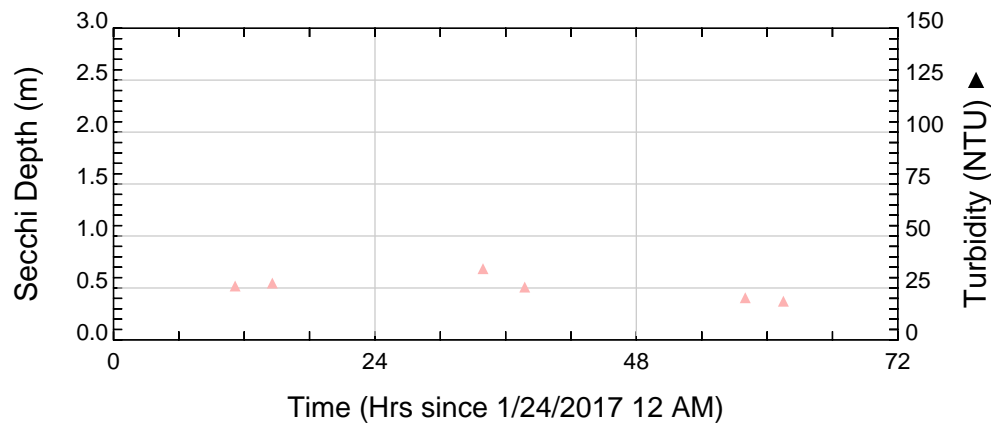
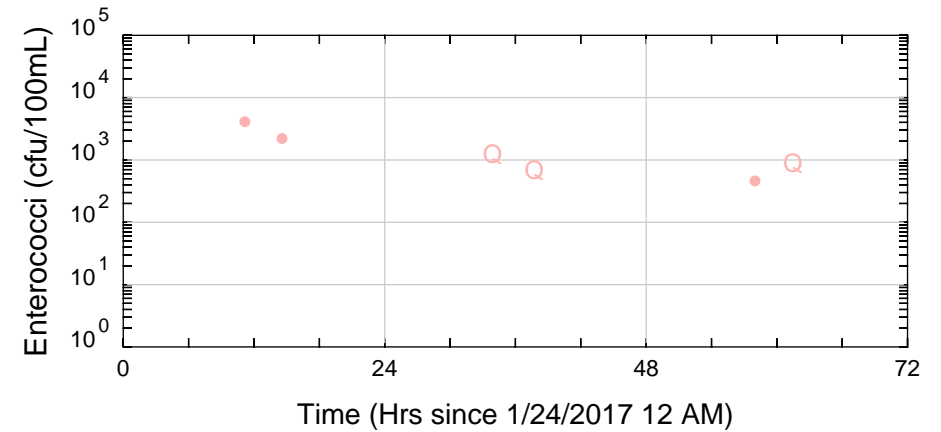
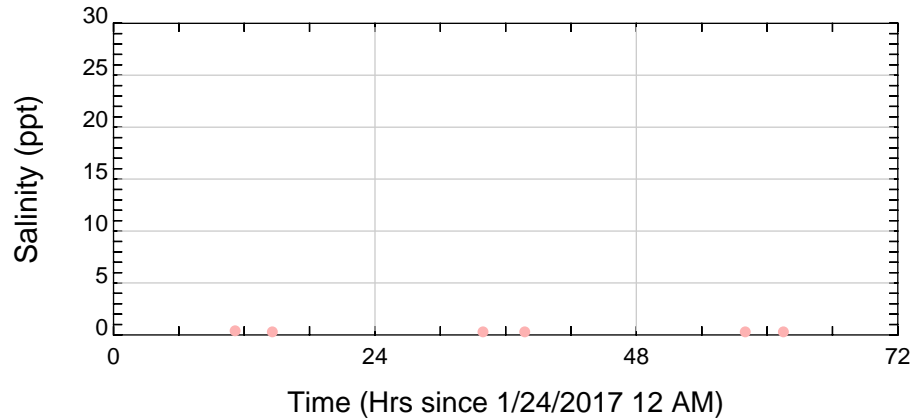
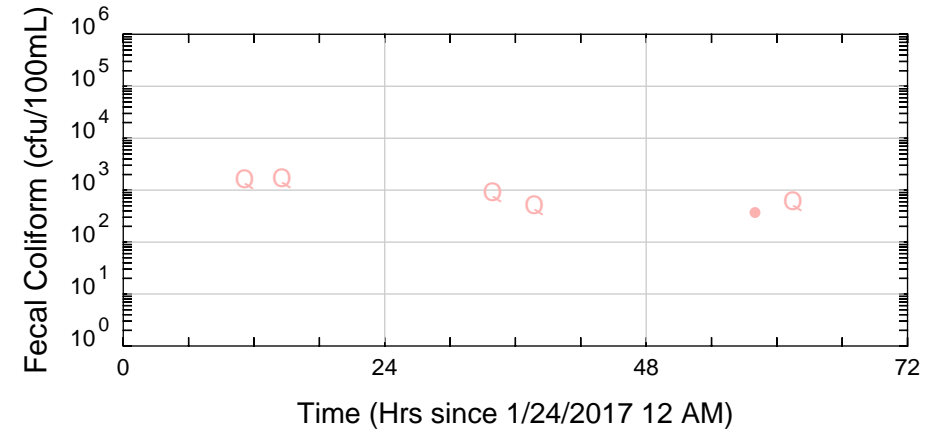
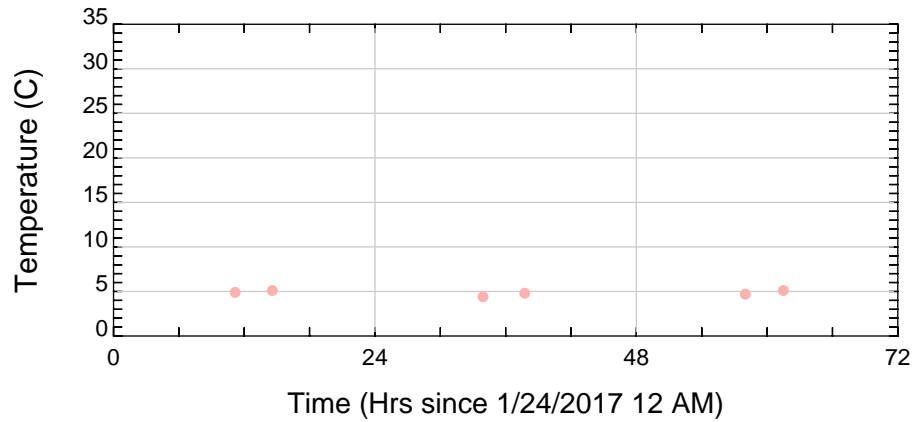
Passaic River & Tributaries, Passaic River, 3, (FW2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



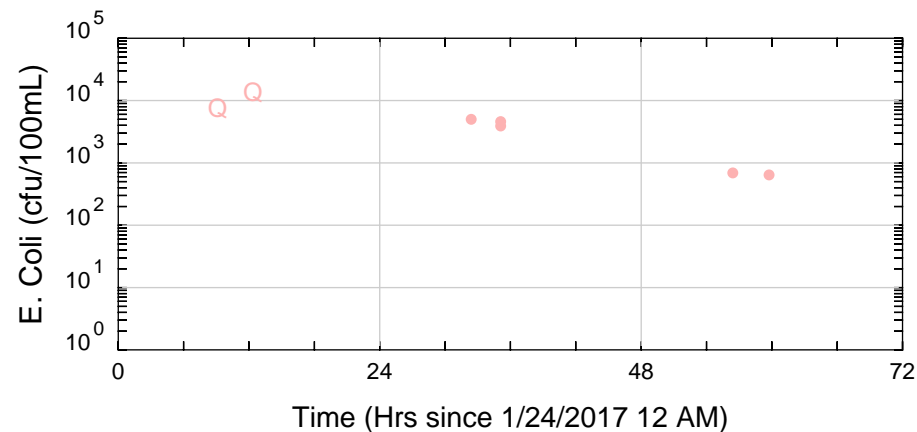
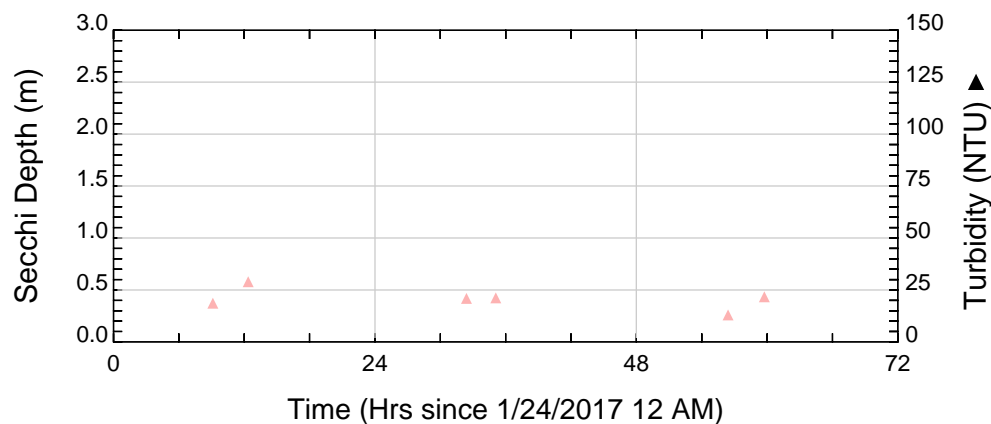
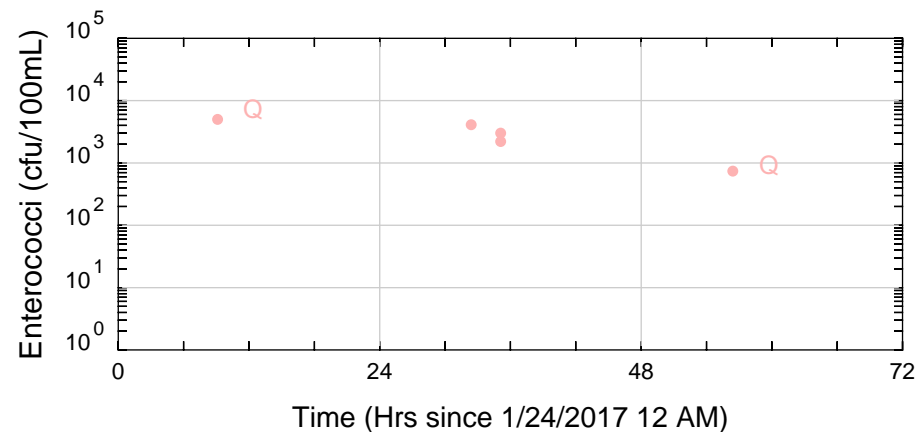
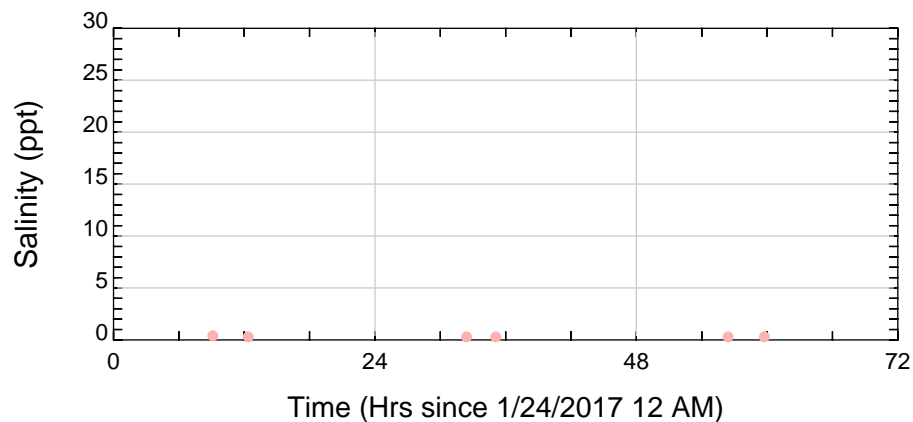
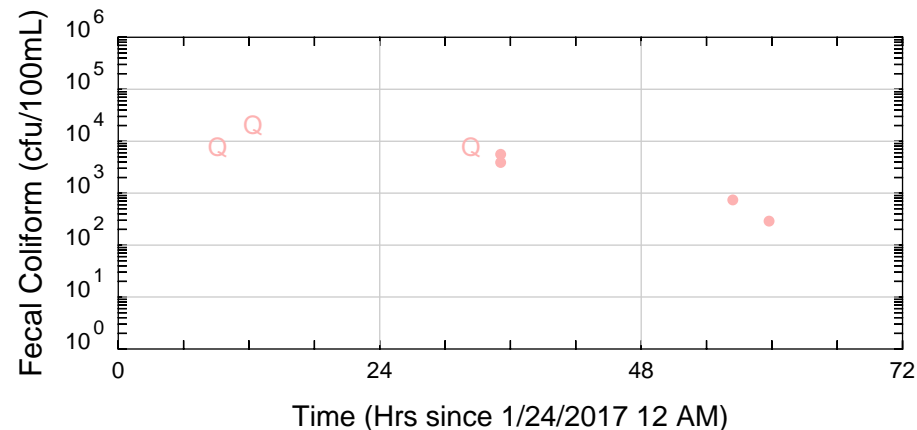
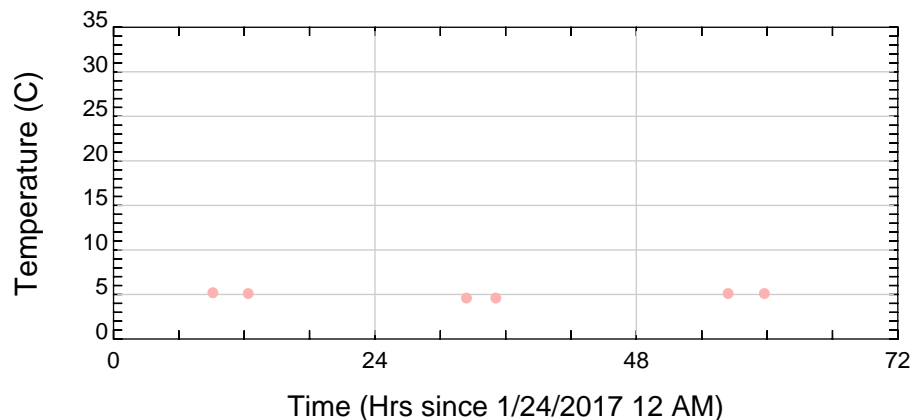
Passaic River & Tributaries, Passaic River, 4, (FW2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



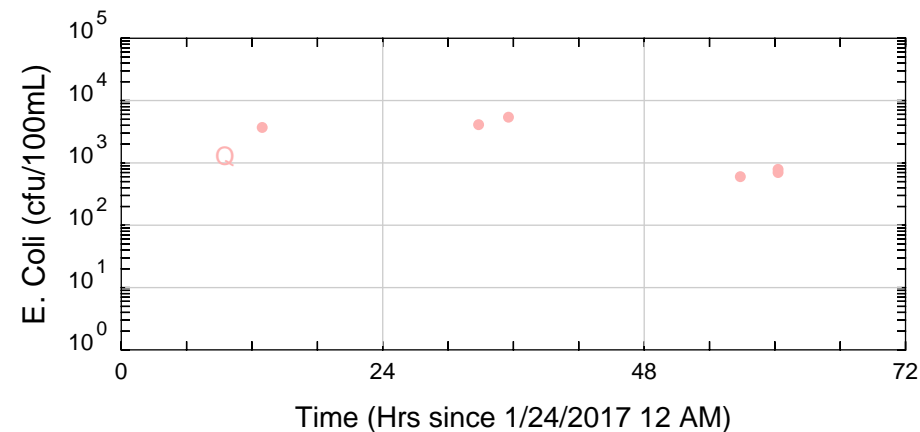
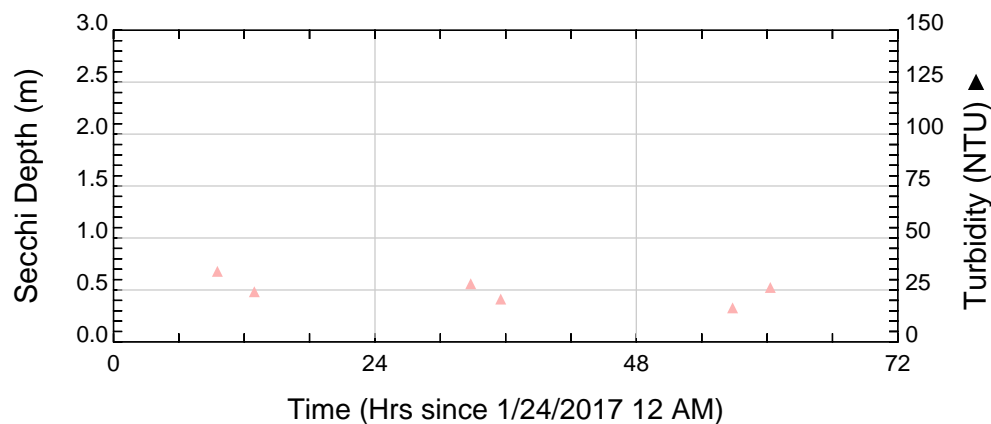
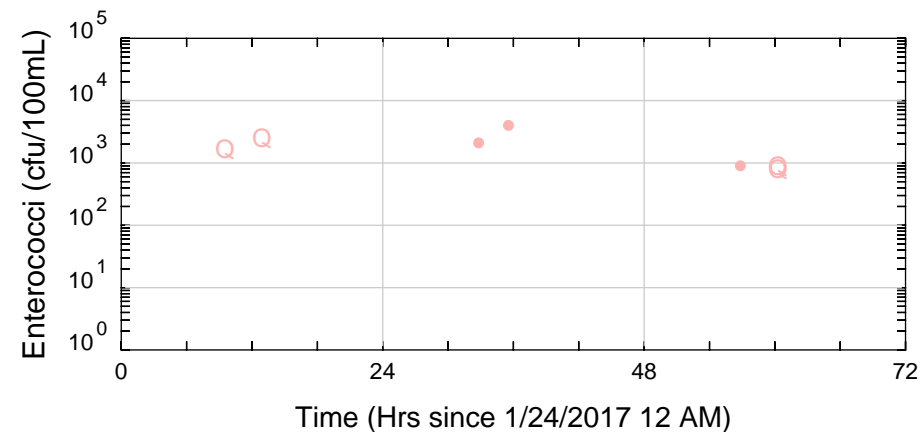
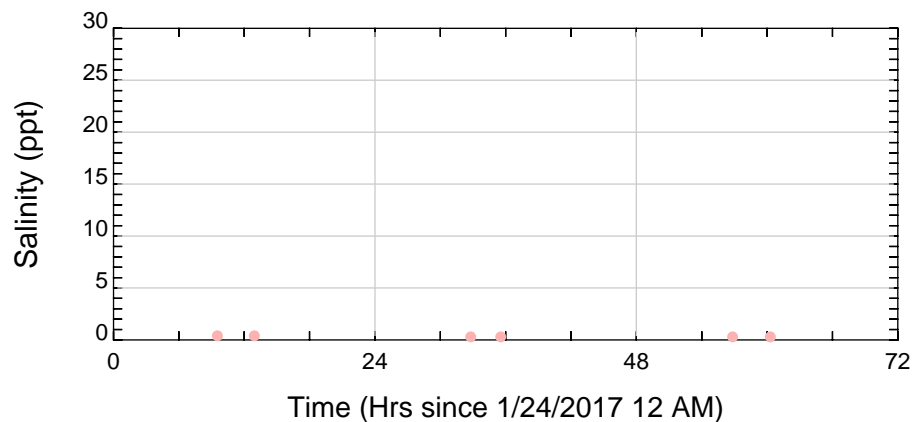
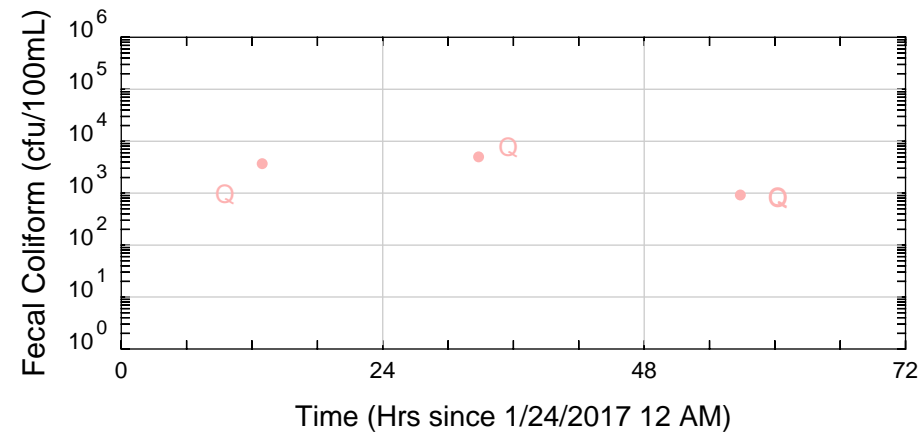
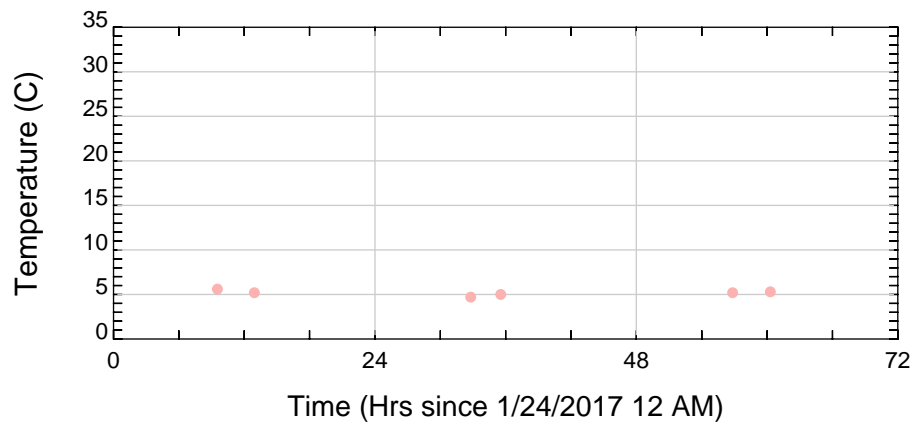
Passaic River & Tributaries, Passaic River, 7, (FW2/SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



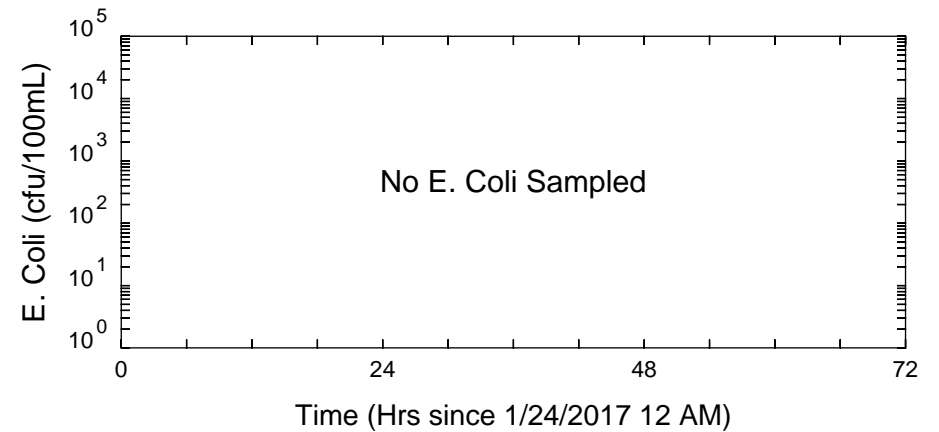
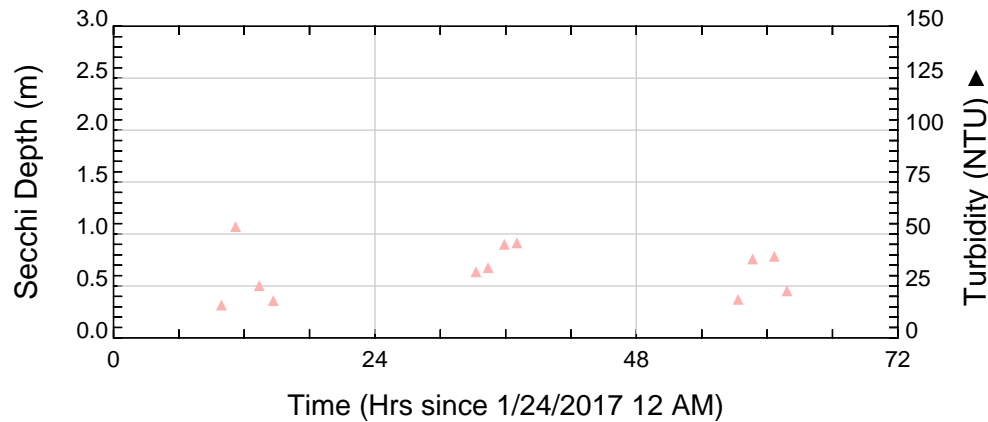
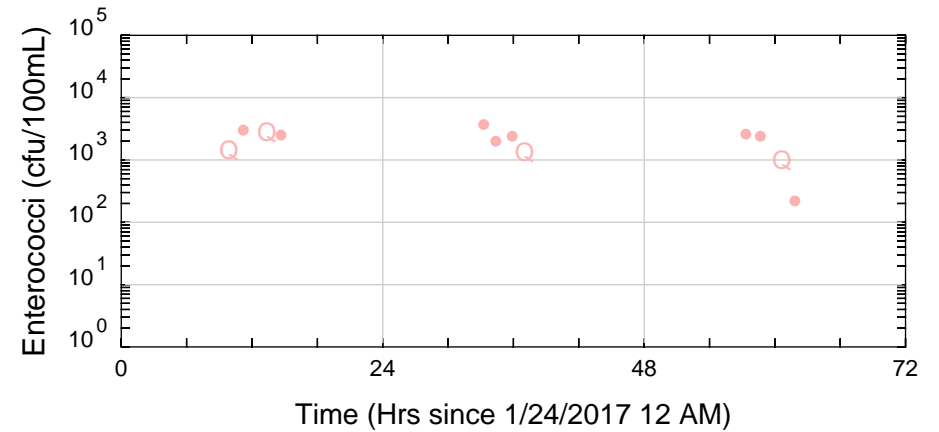
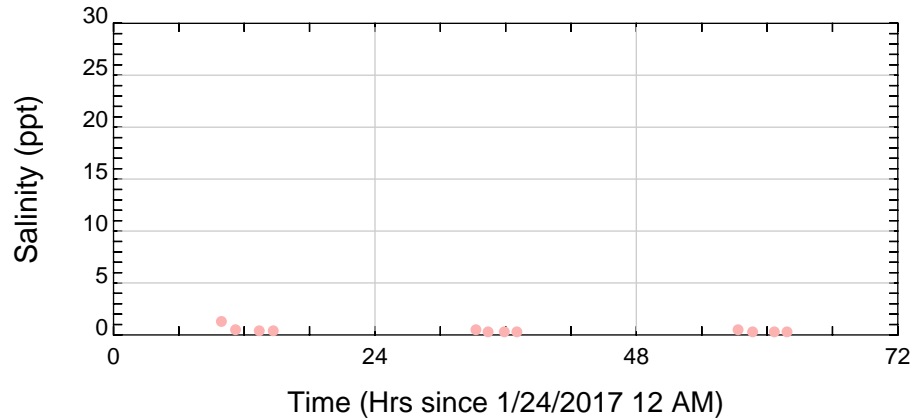
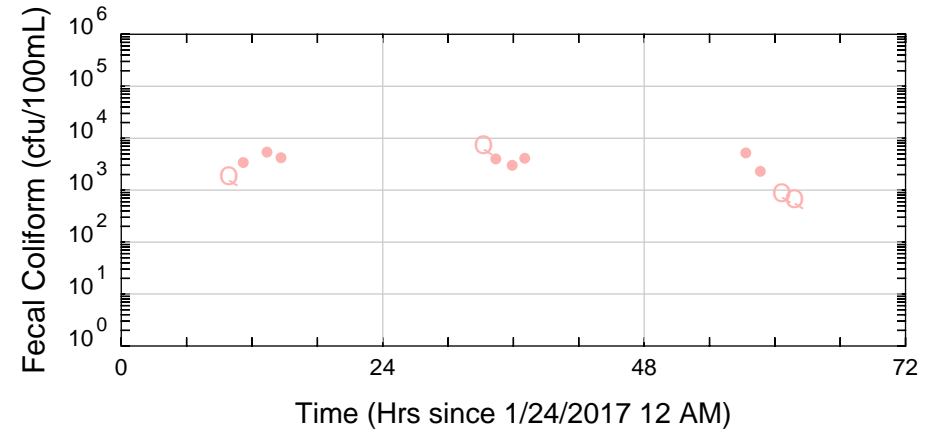
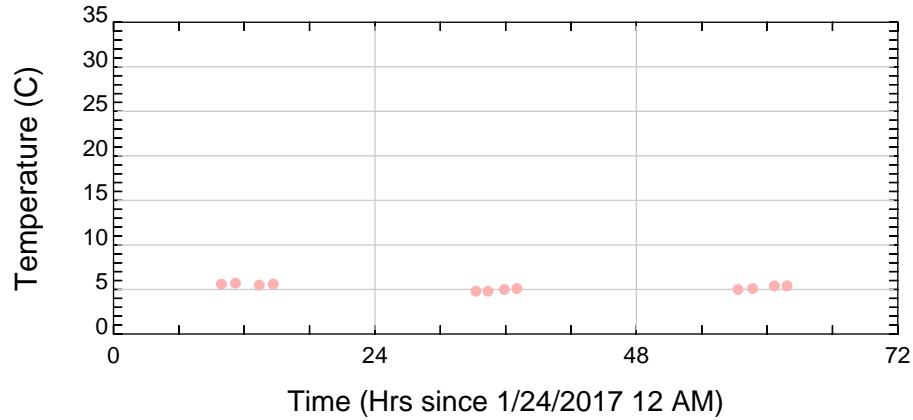
Passaic River & Tributaries, Passaic River, 8, (FW2/SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



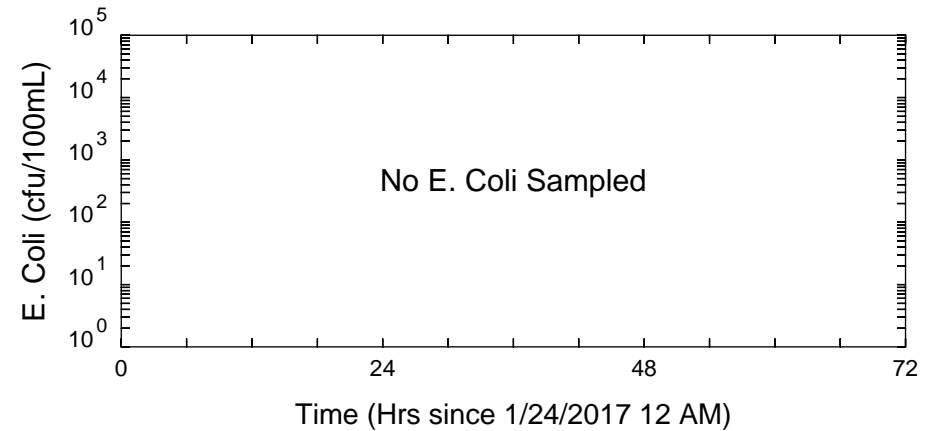
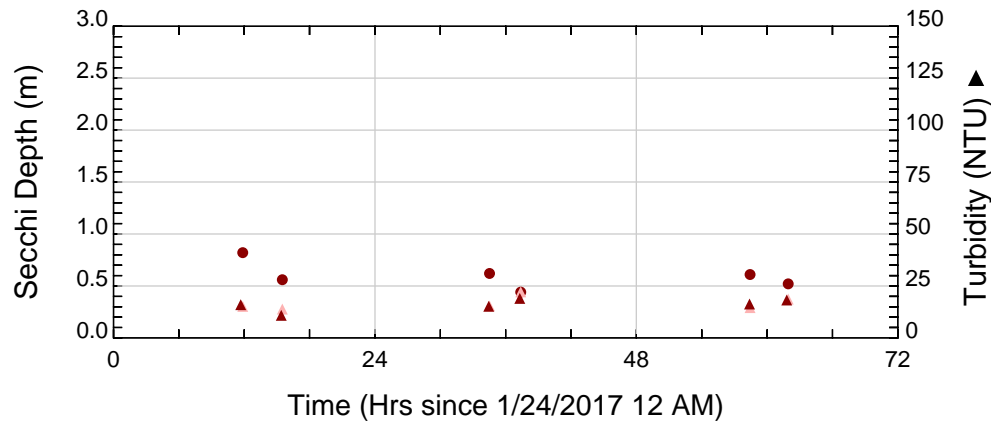
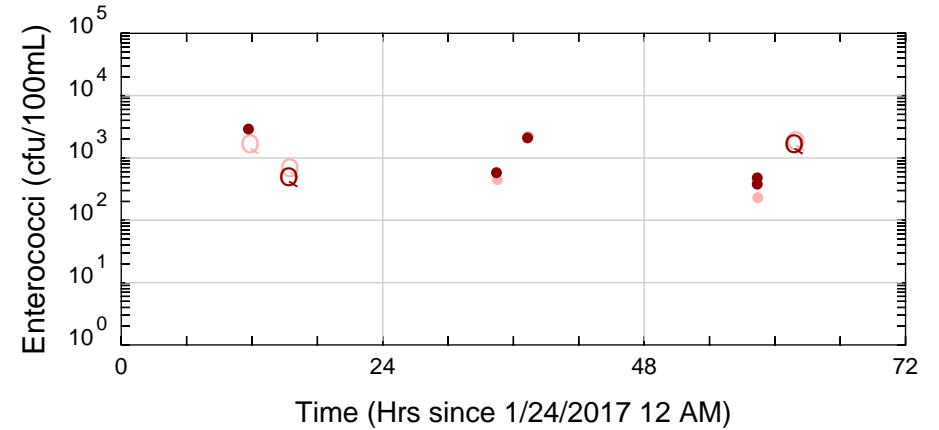
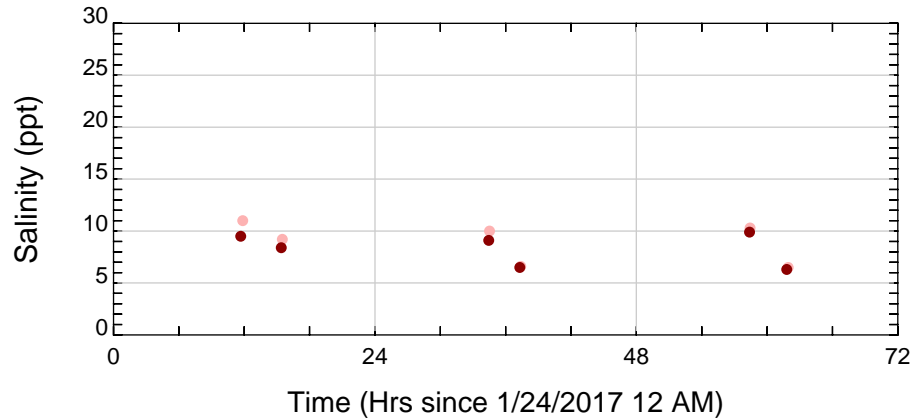
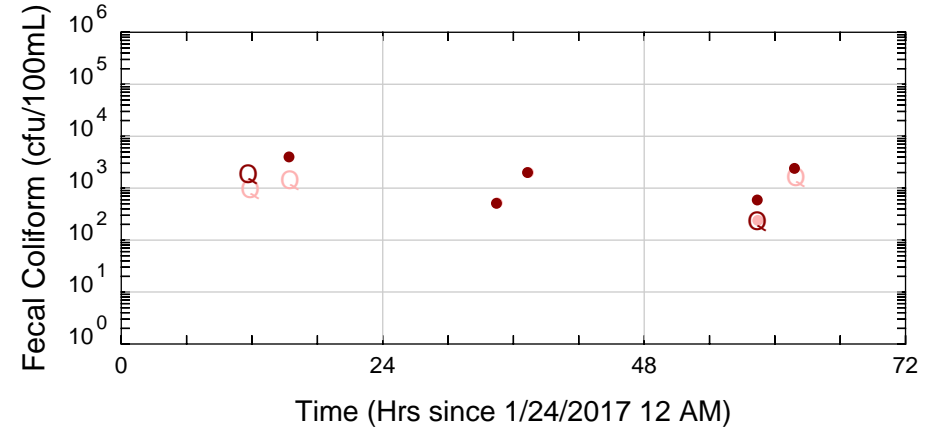
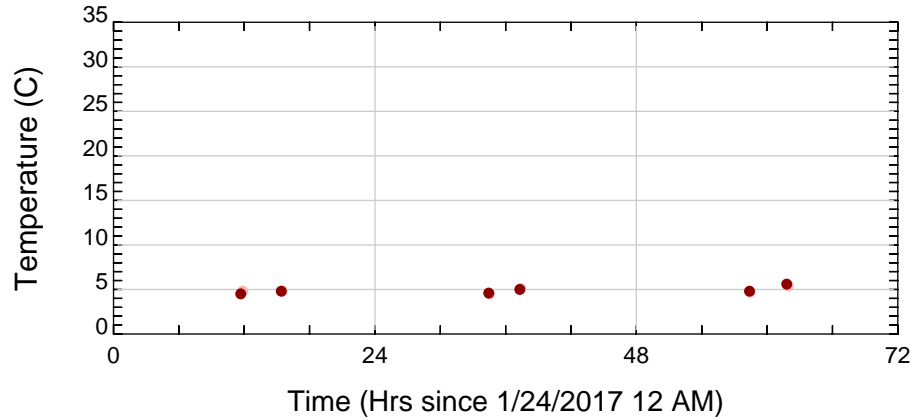
Passaic River & Tributaries, Passaic River, 10, (SE3)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



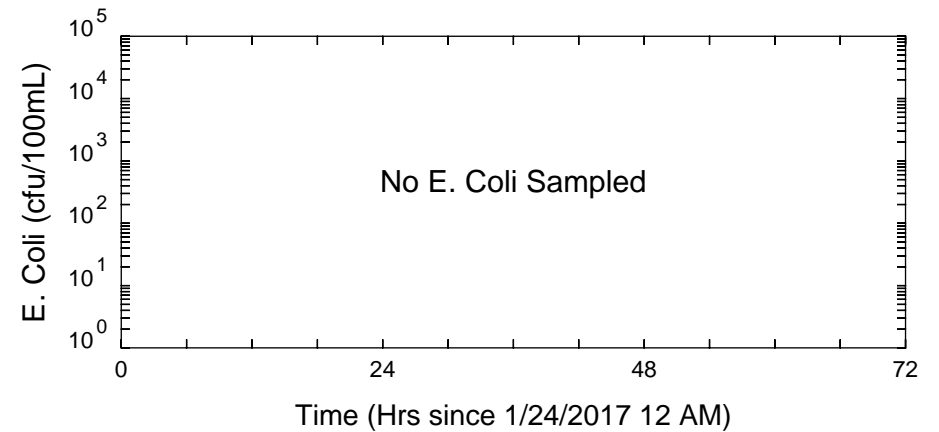
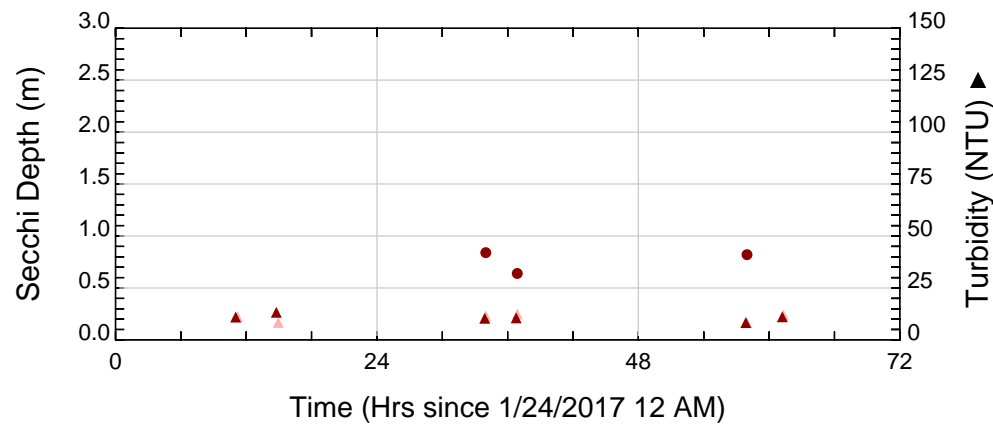
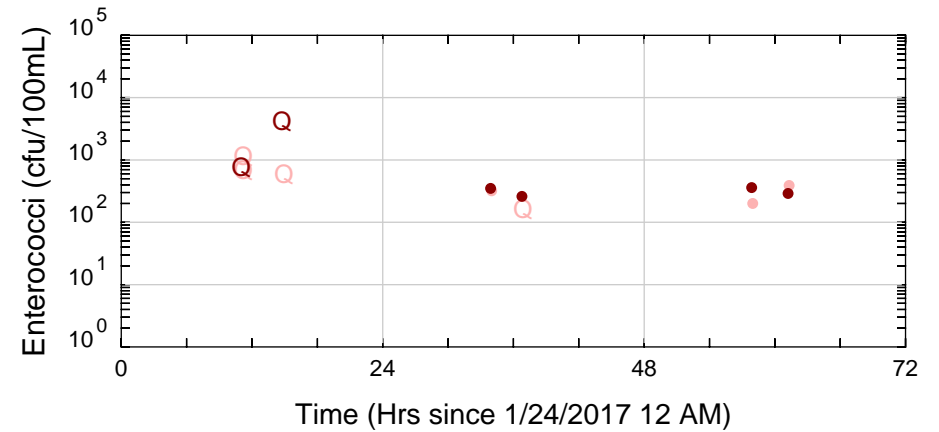
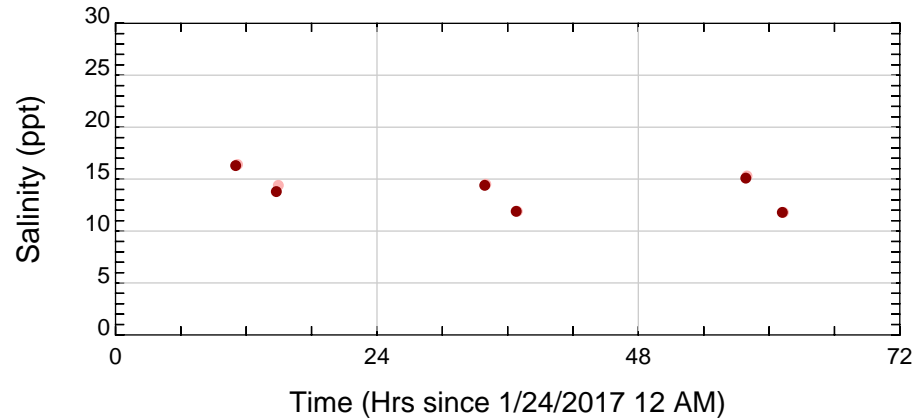
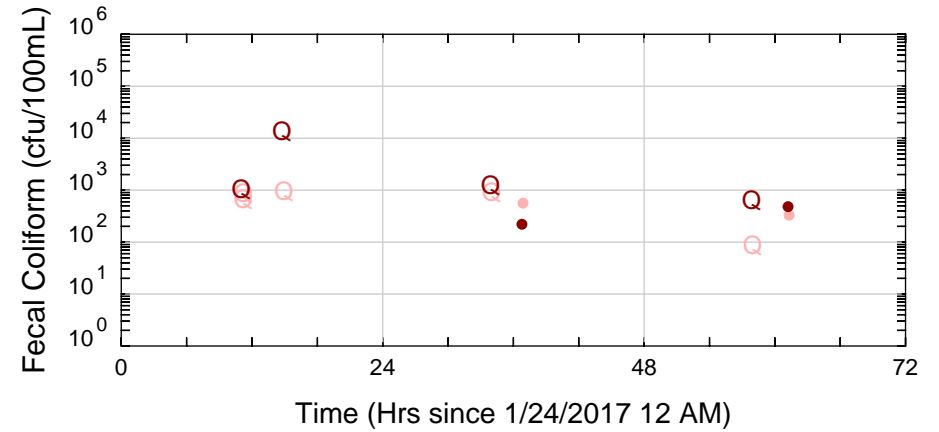
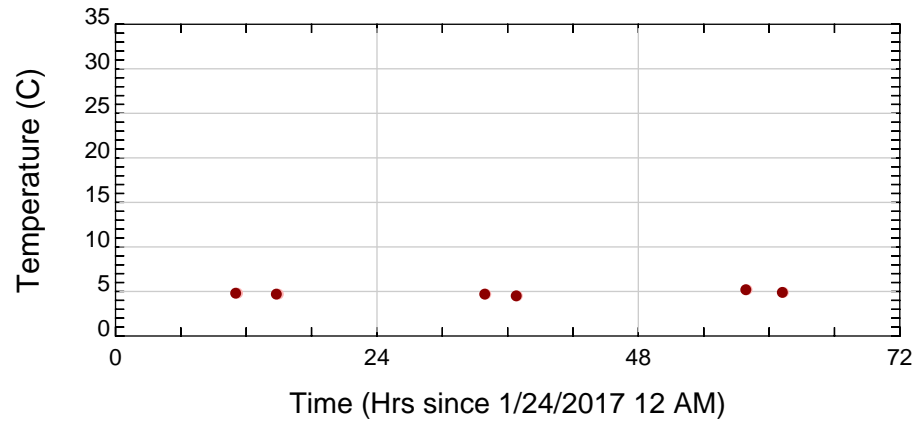
Hackensack River & Tributaries, Hackensack River, 14, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



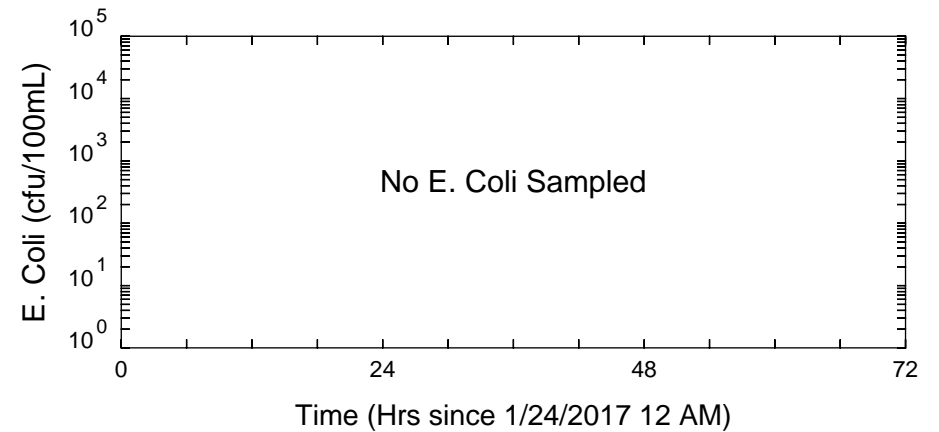
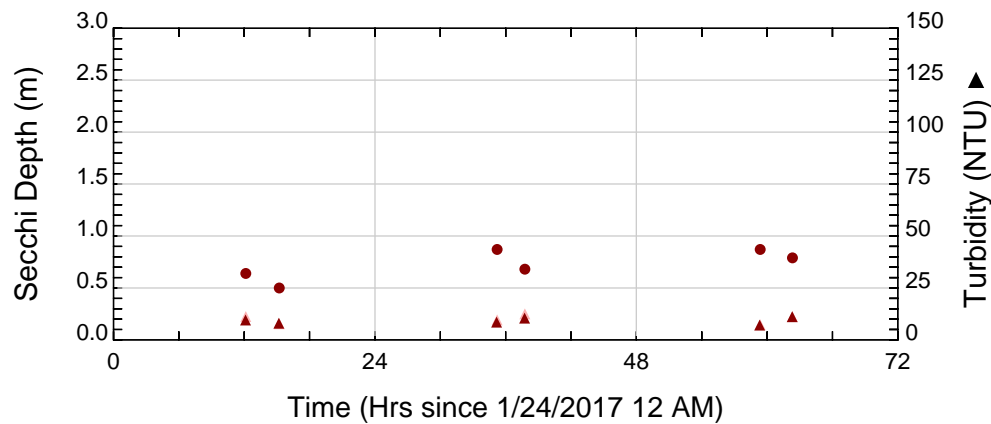
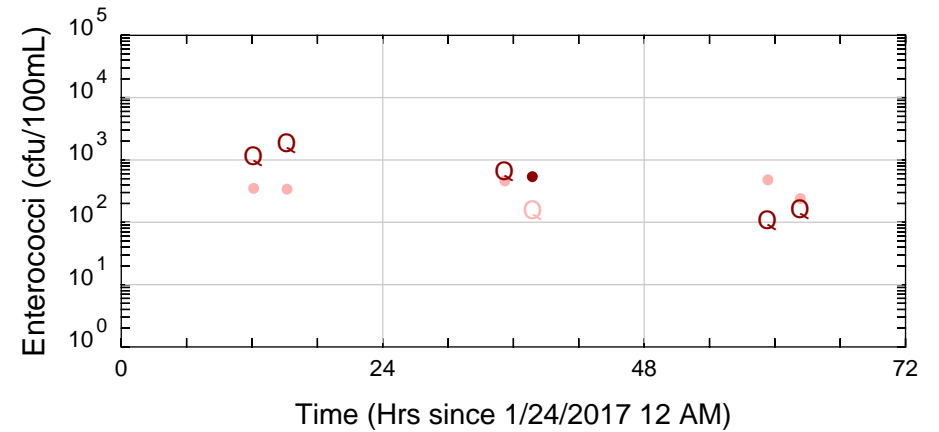
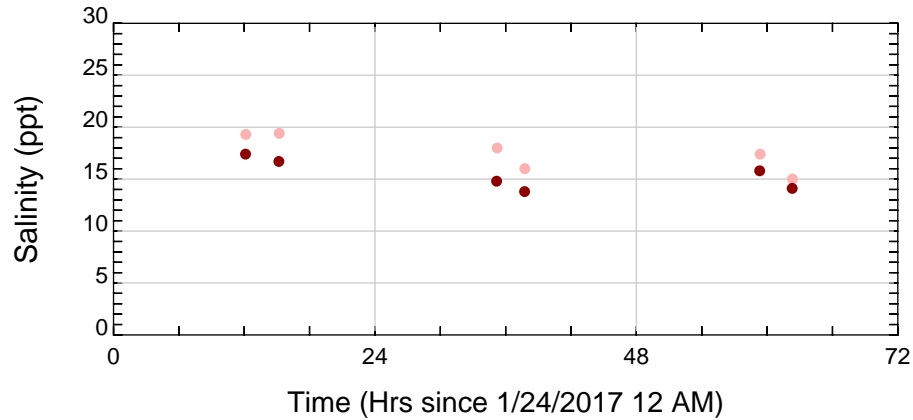
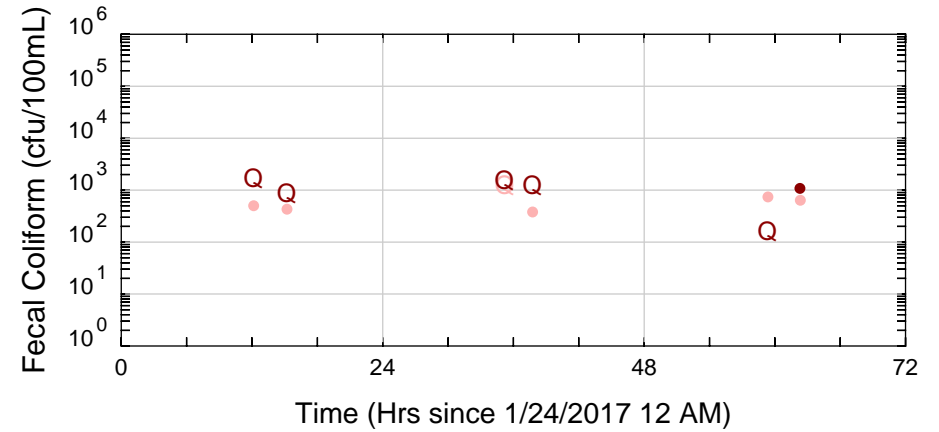
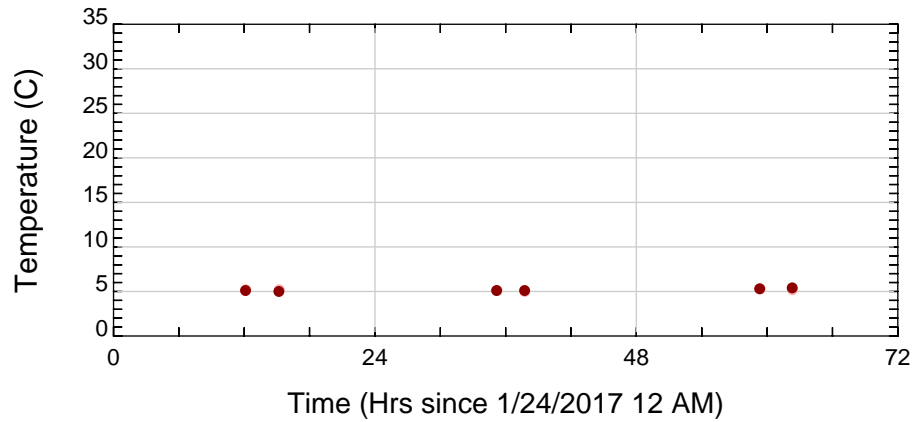
Hackensack River & Tributaries, Hackensack River, 15, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



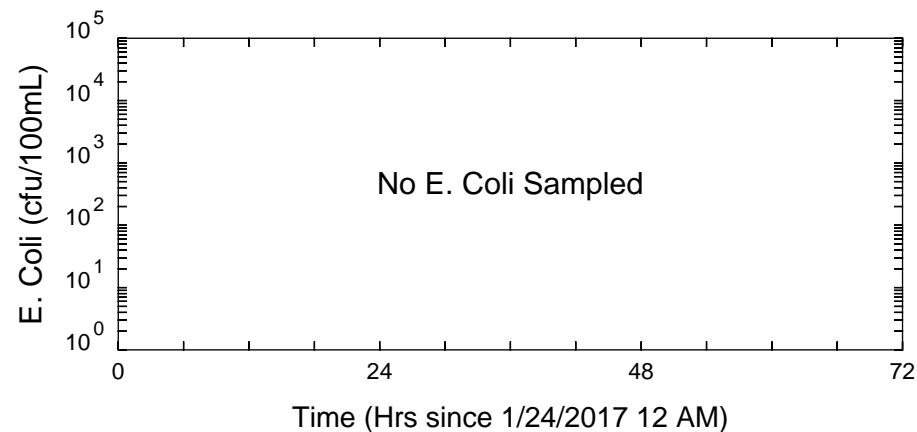
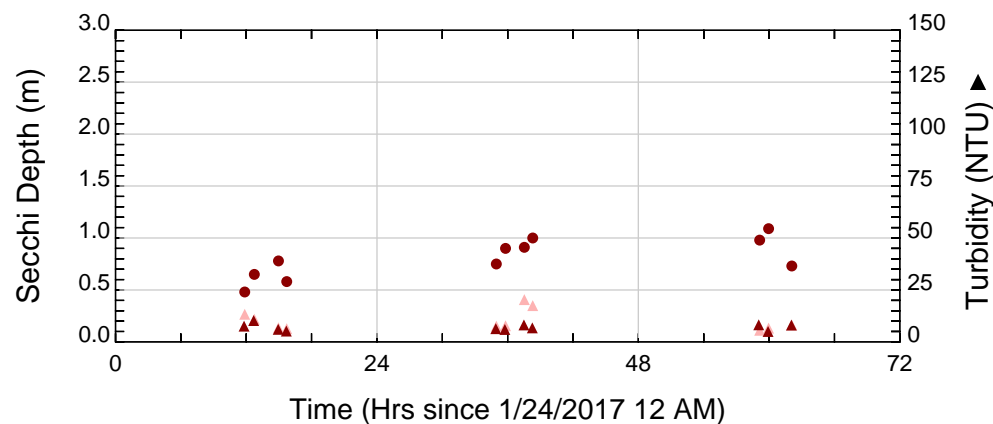
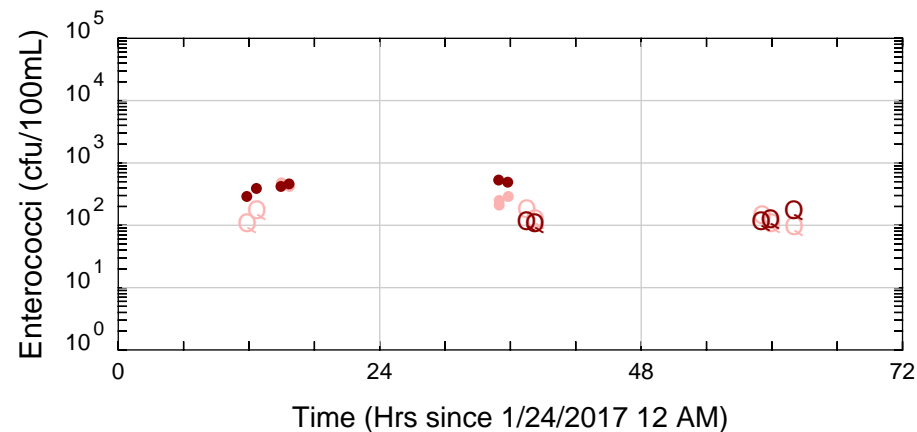
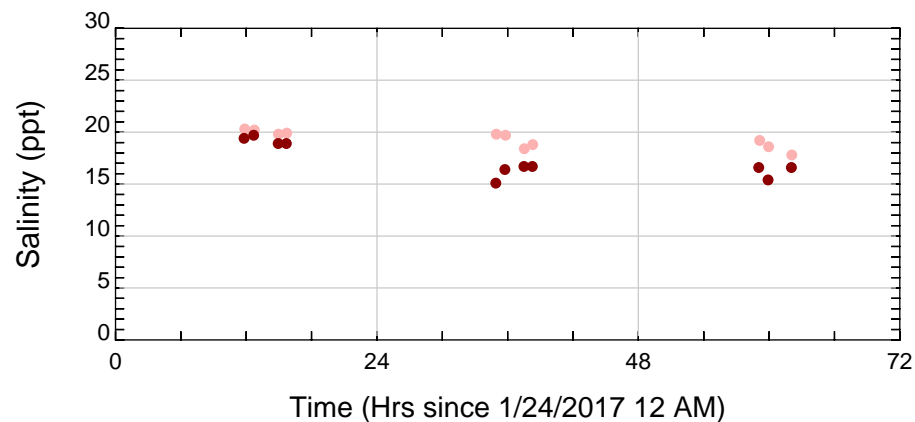
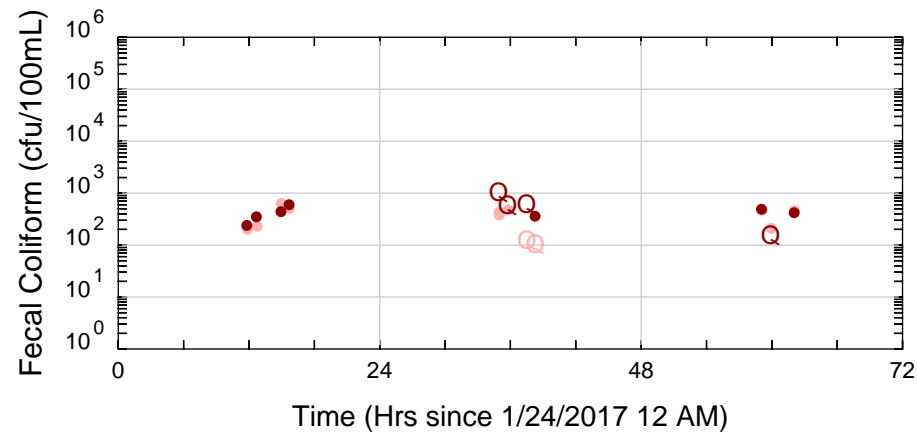
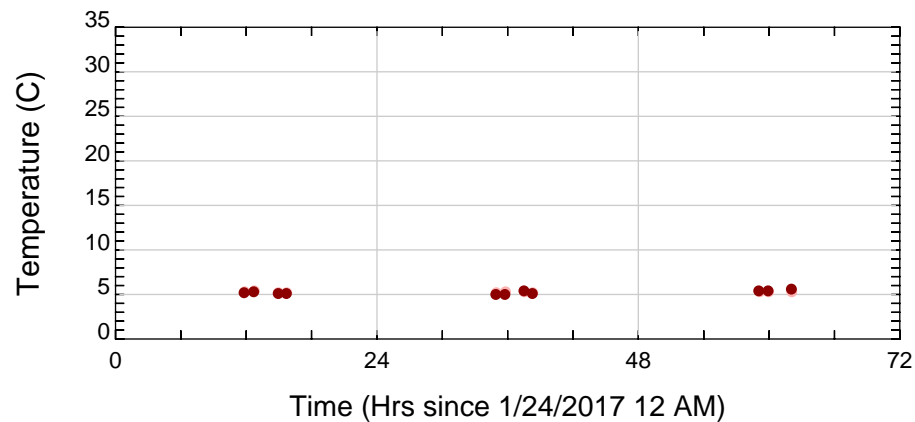
Newark Bay & Tributaries, Newark Bay, 17, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



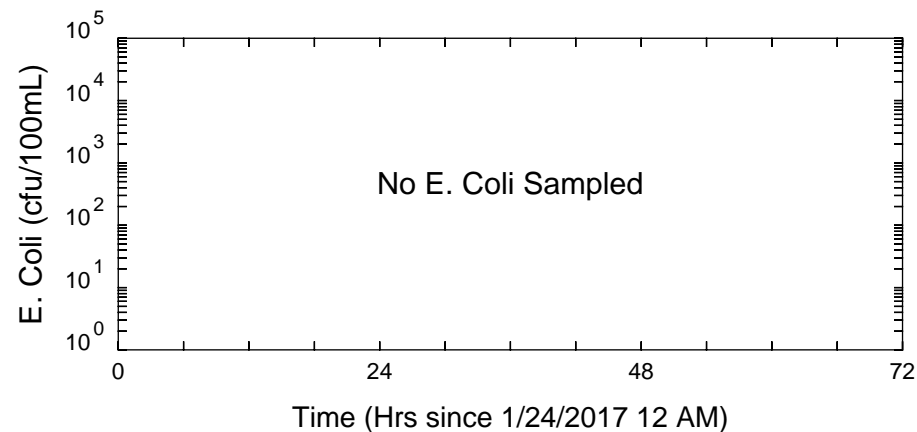
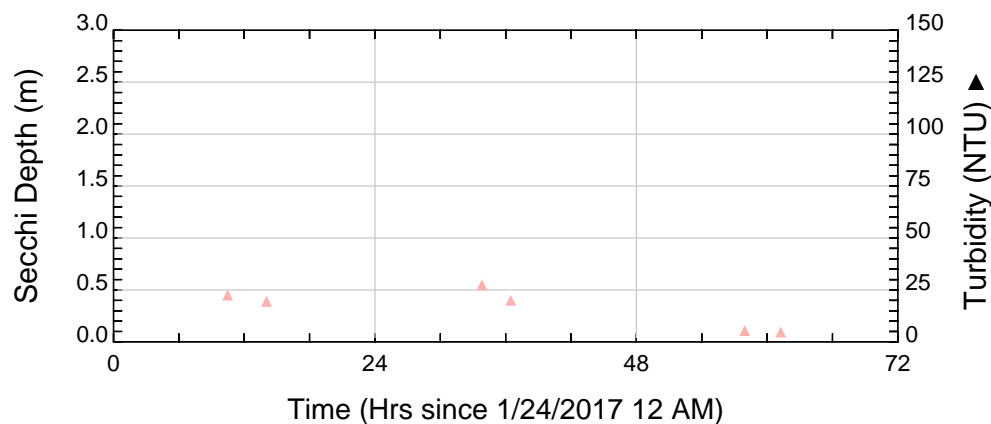
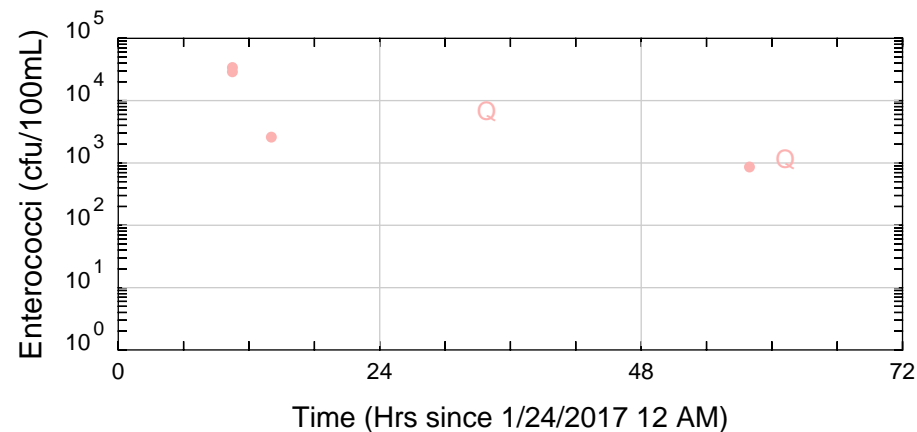
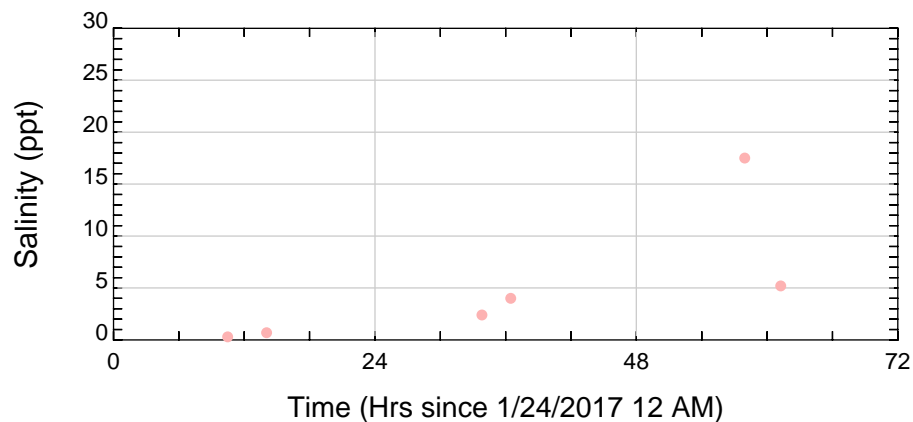
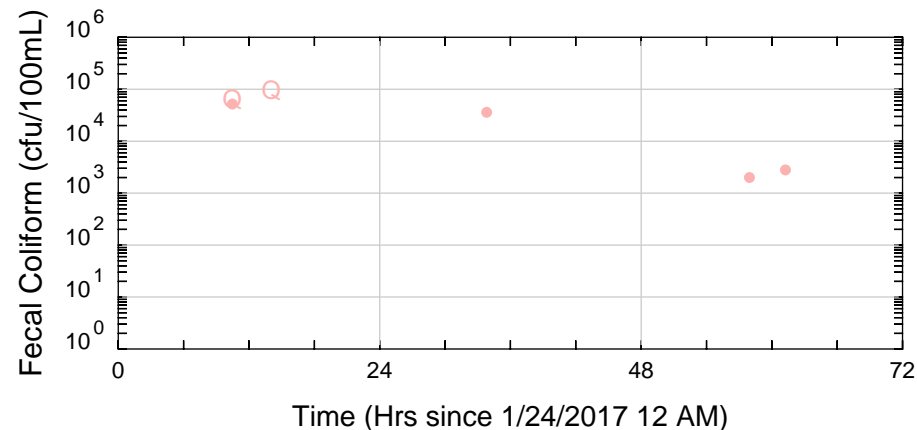
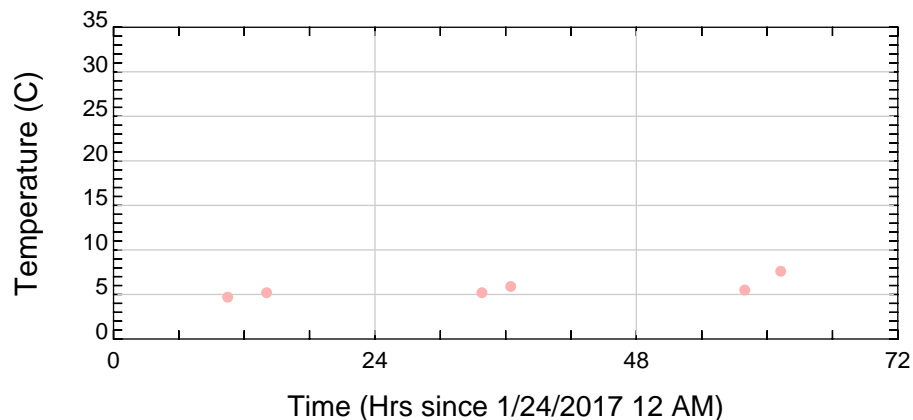
Newark Bay & Tributaries, Newark Bay, 18, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



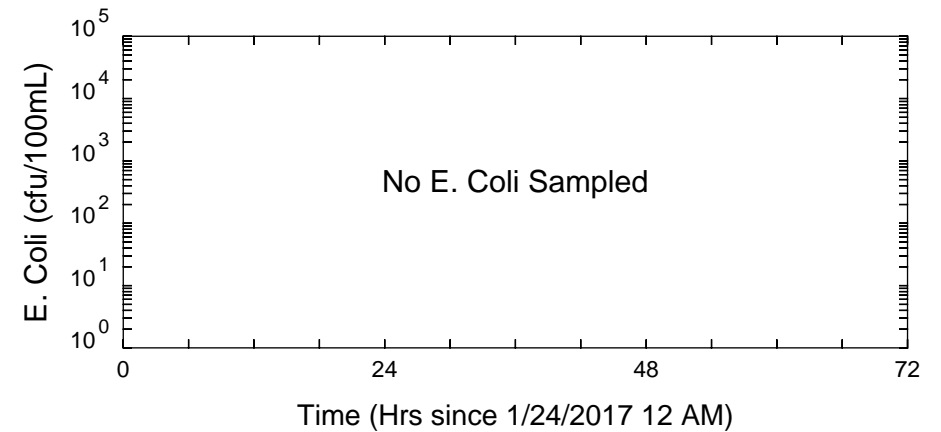
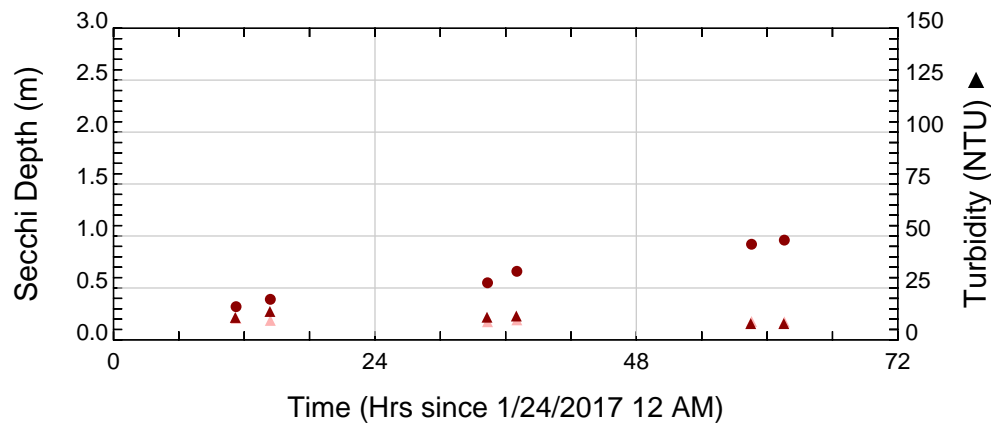
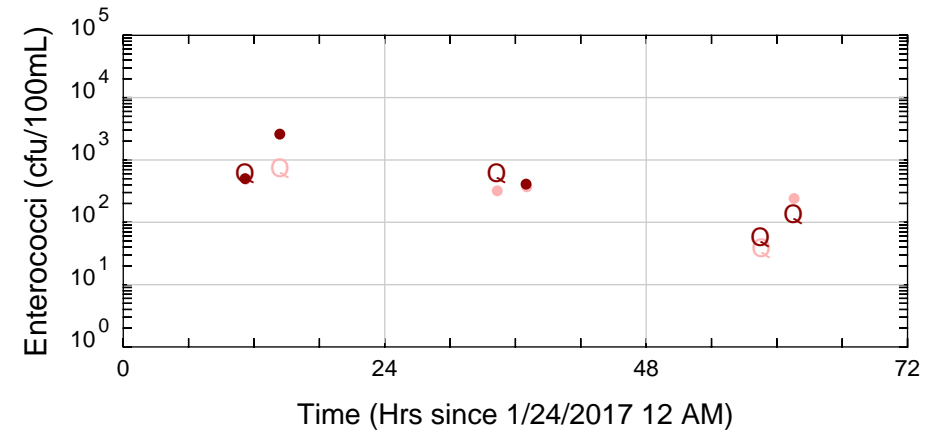
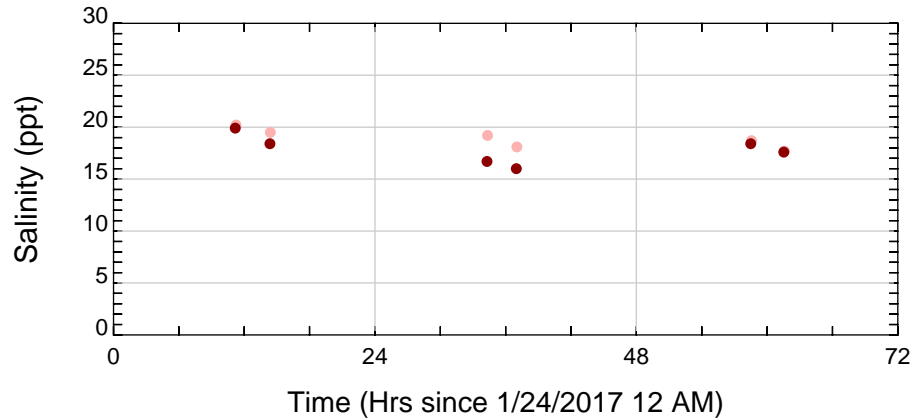
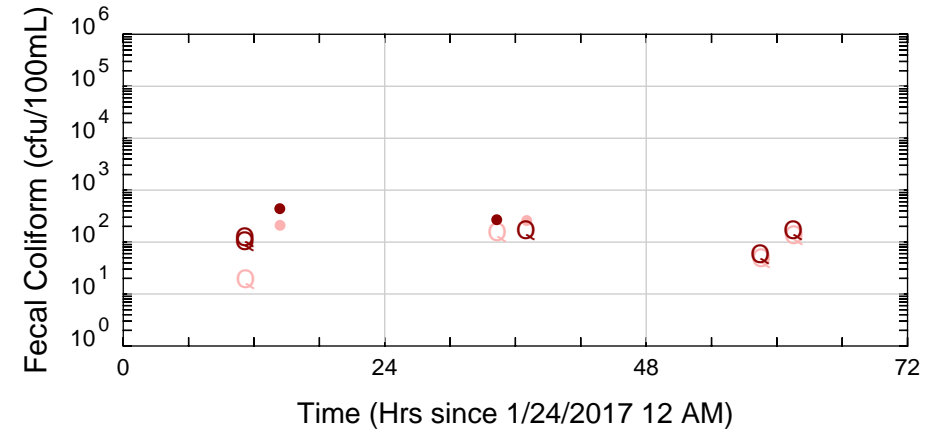
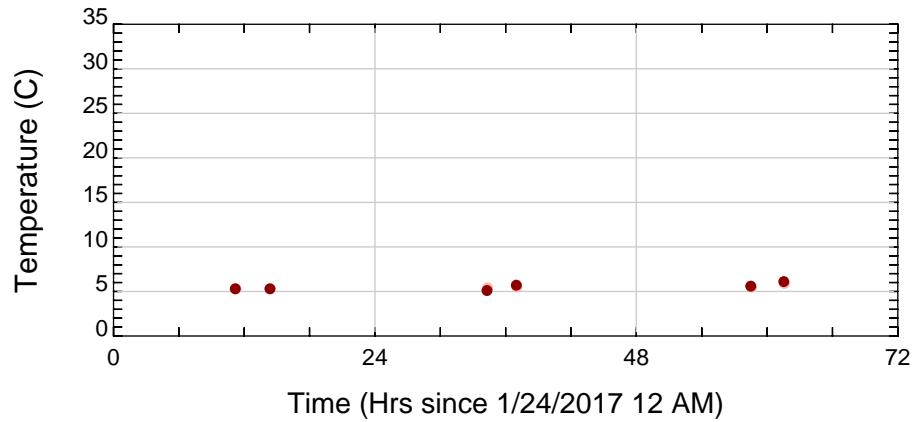
Newark Bay & Tributaries, Elizabeth River, 20, (SE3)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



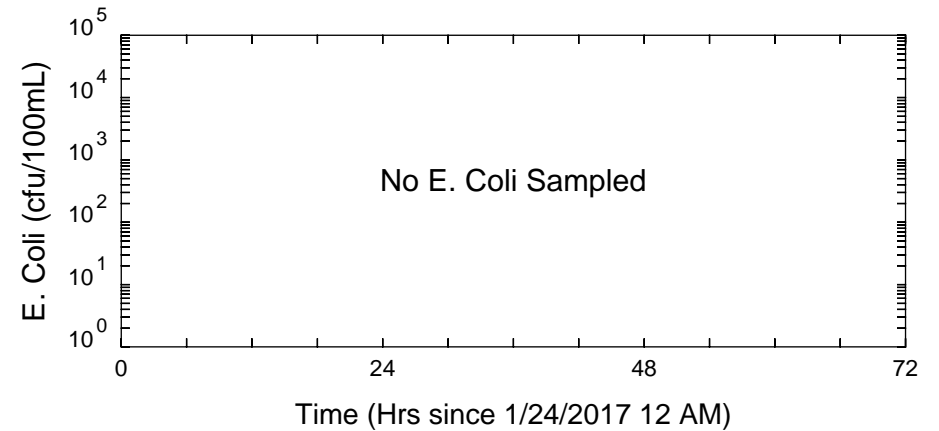
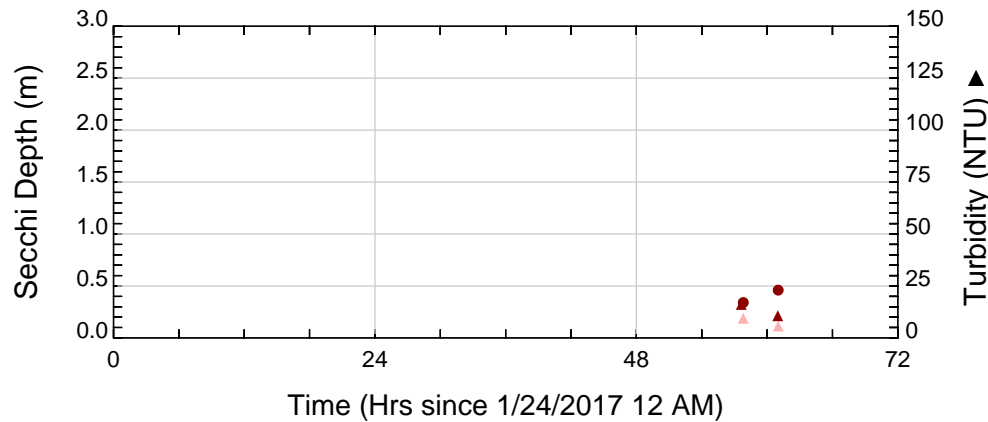
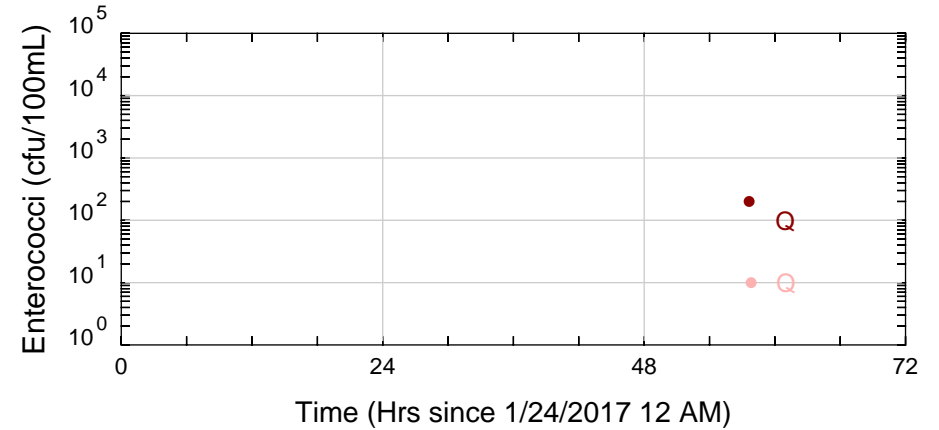
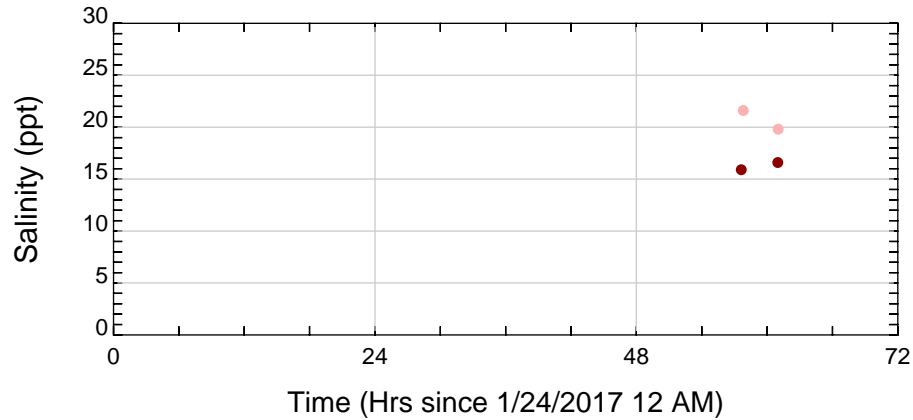
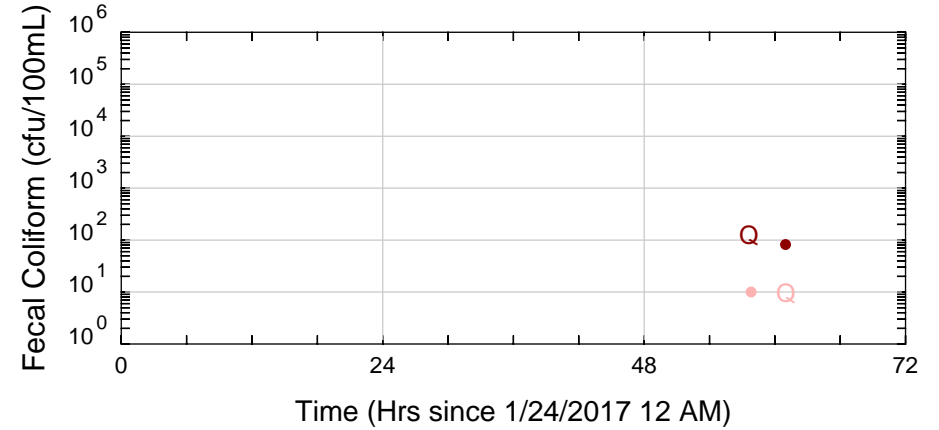
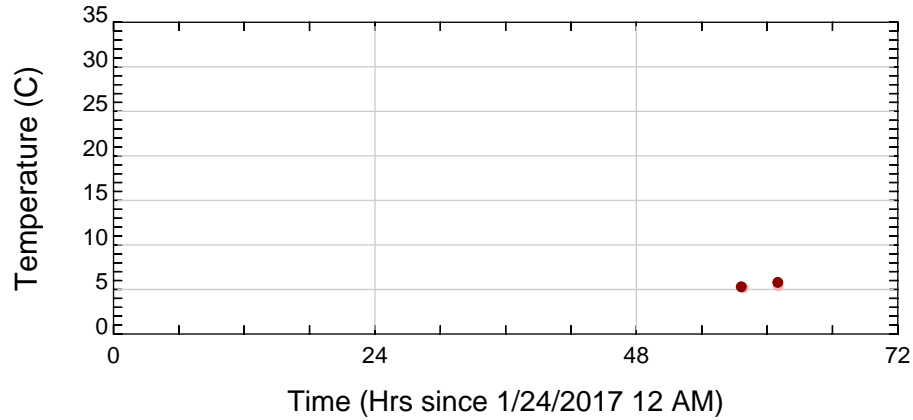
Arthur Kill, Raritan River/Bay & Tributaries, Arthur Kill, 24, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



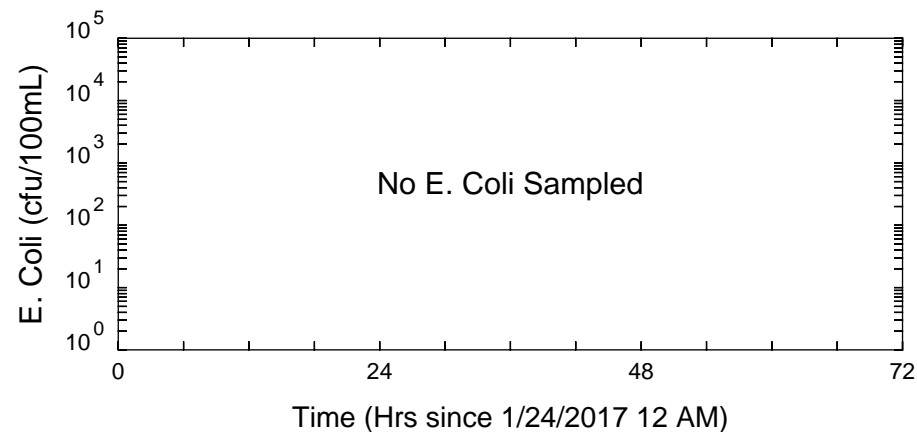
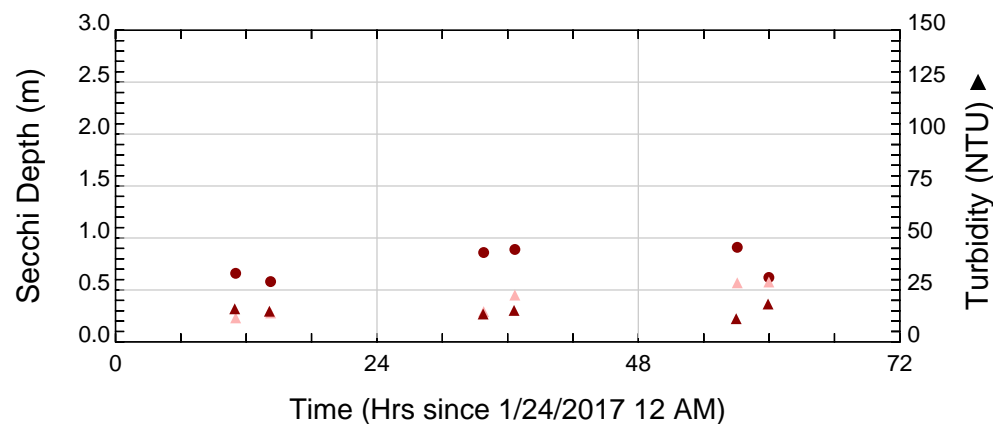
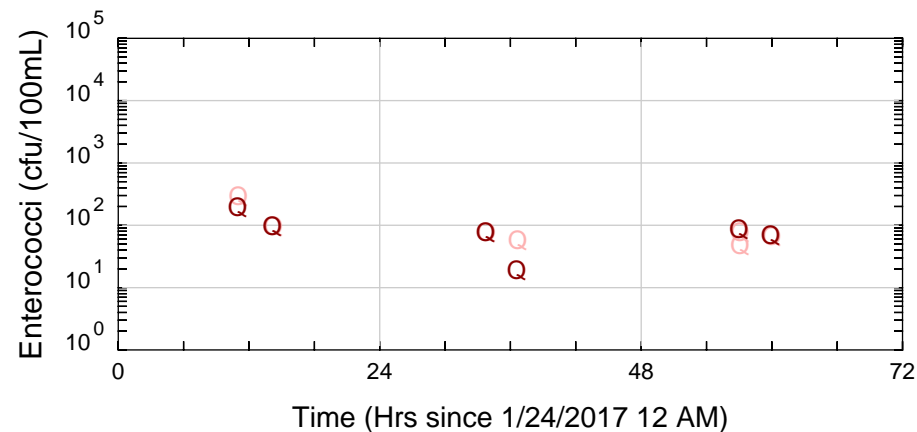
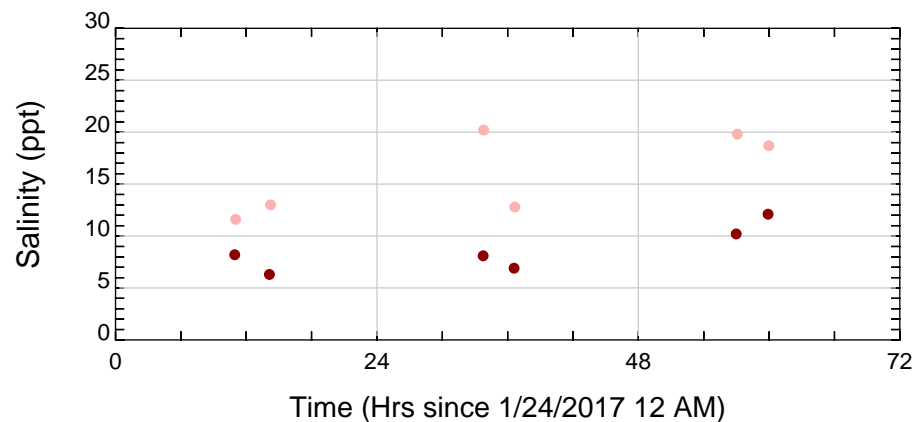
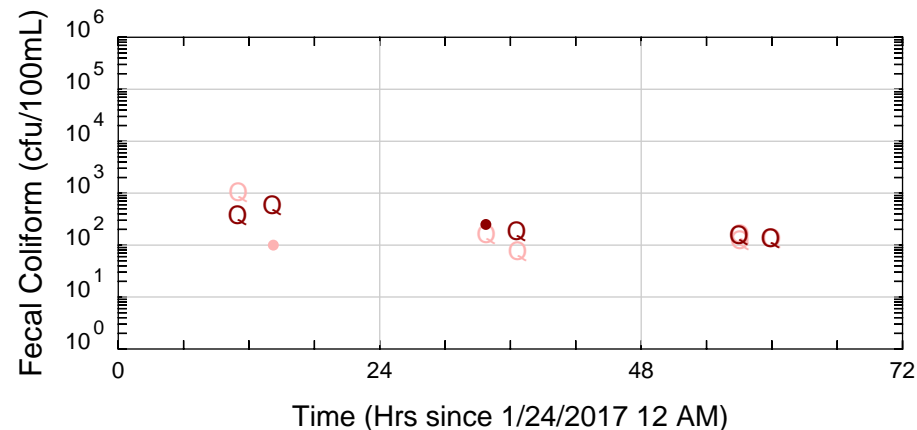
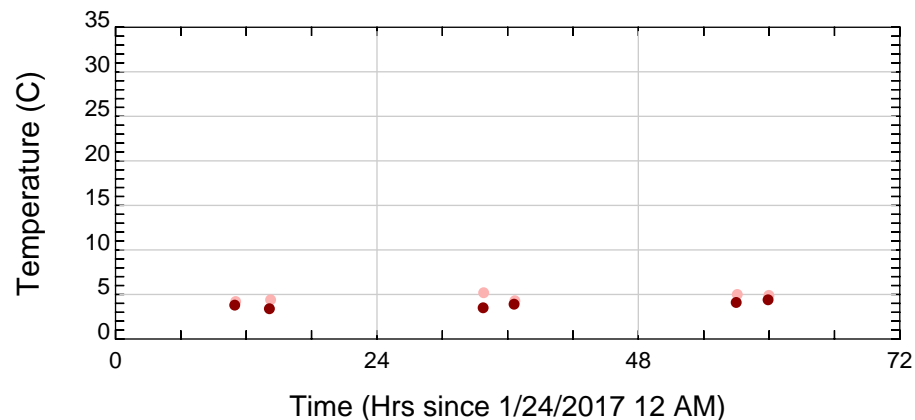
Arthur Kill, Raritan River/Bay & Tributaries, Raritan Bay, 29, (Shellfish)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



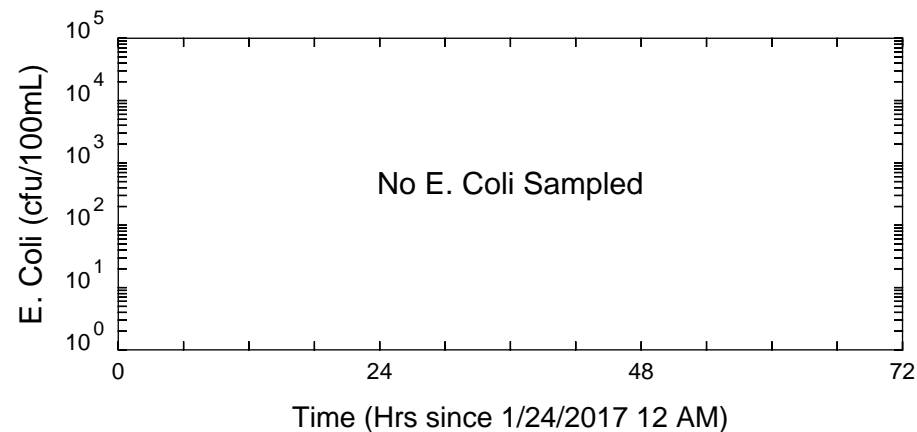
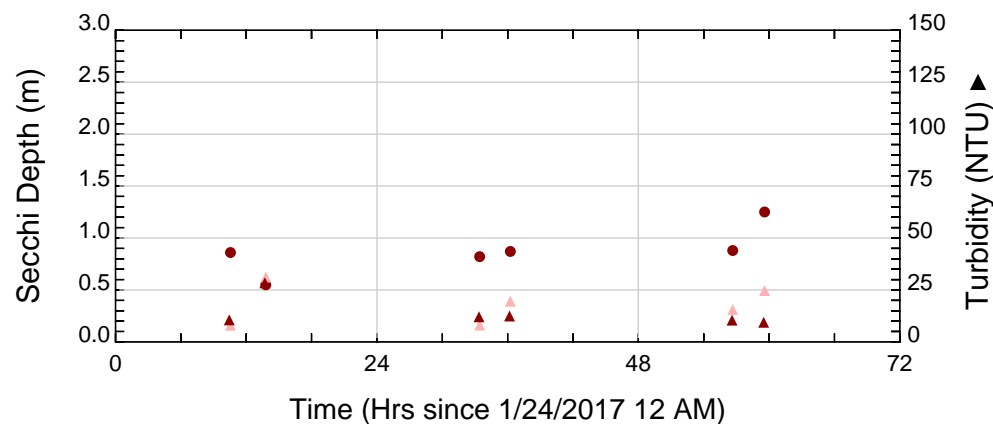
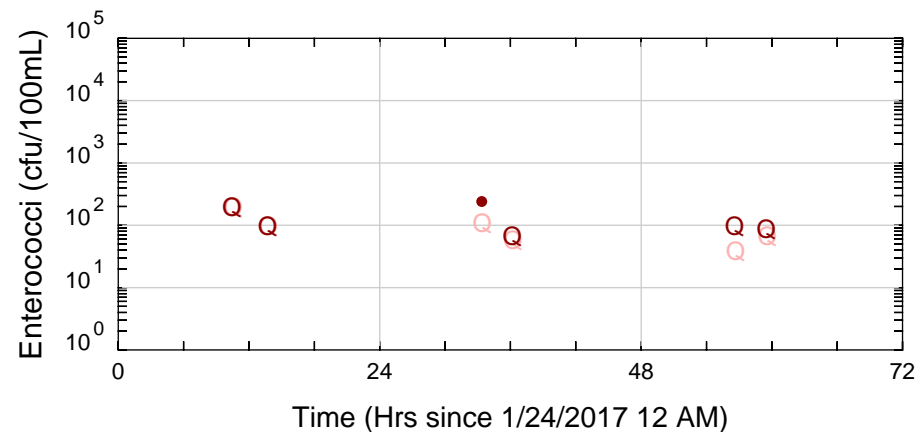
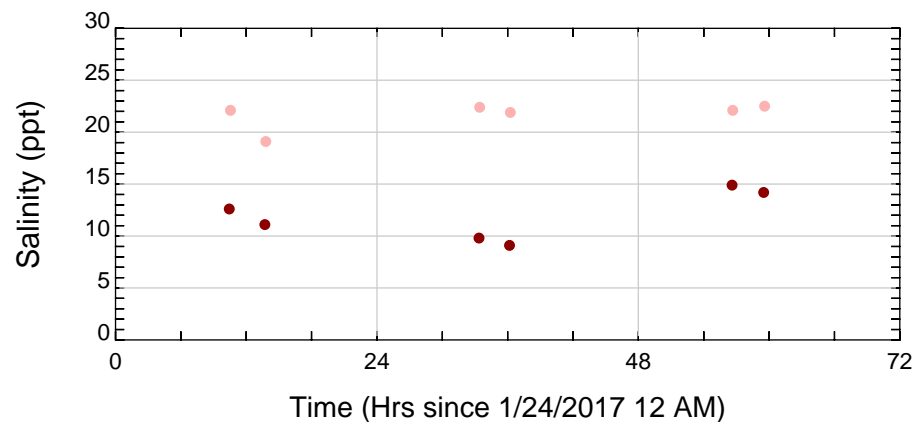
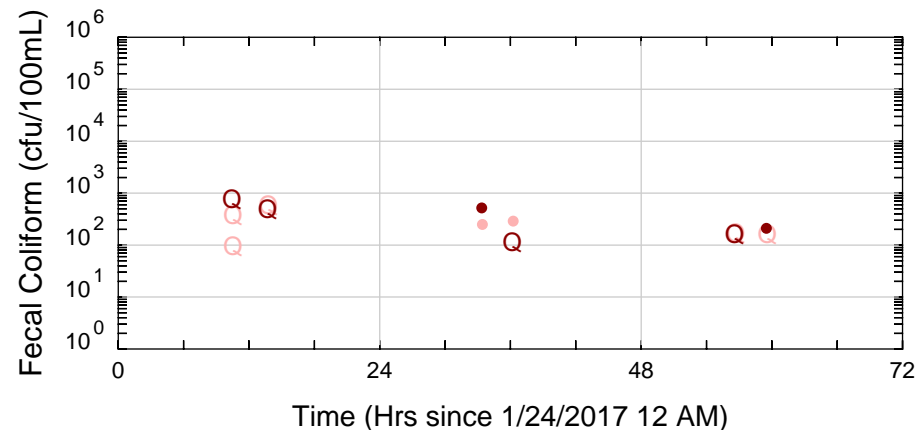
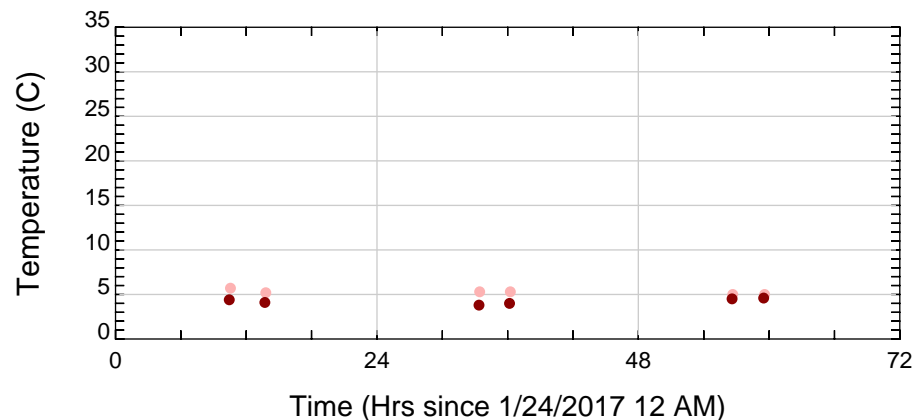
Hudson River, Upper Bay, Hudson River, 31, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



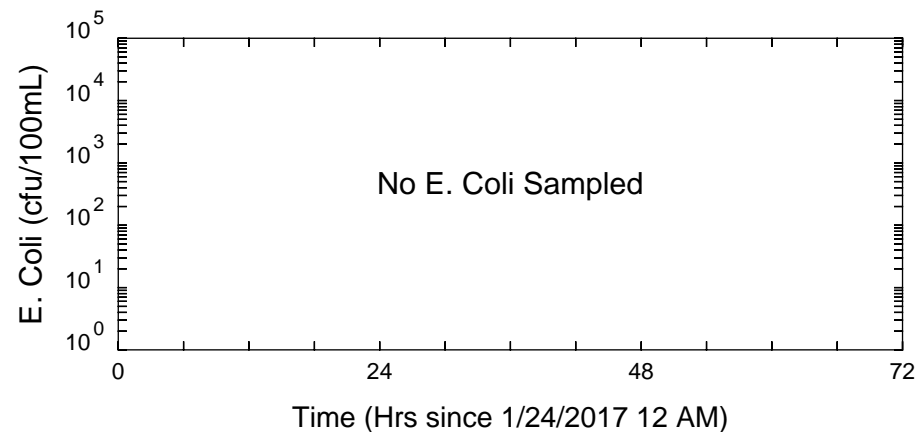
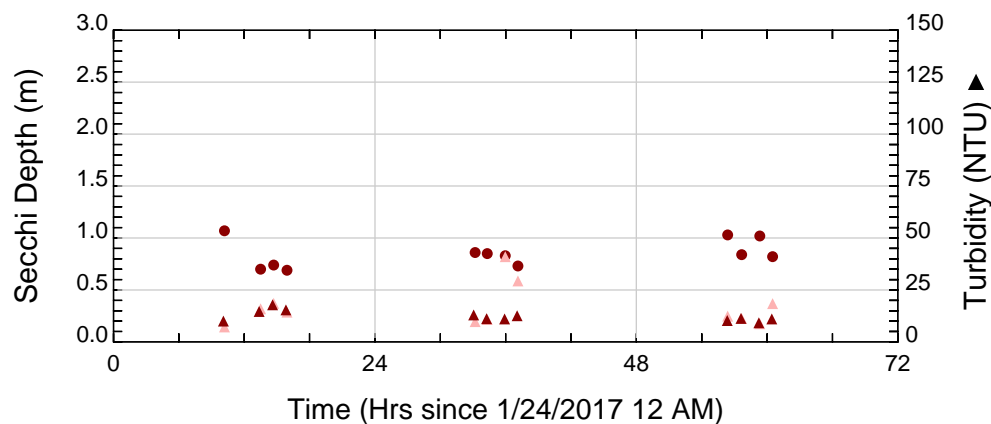
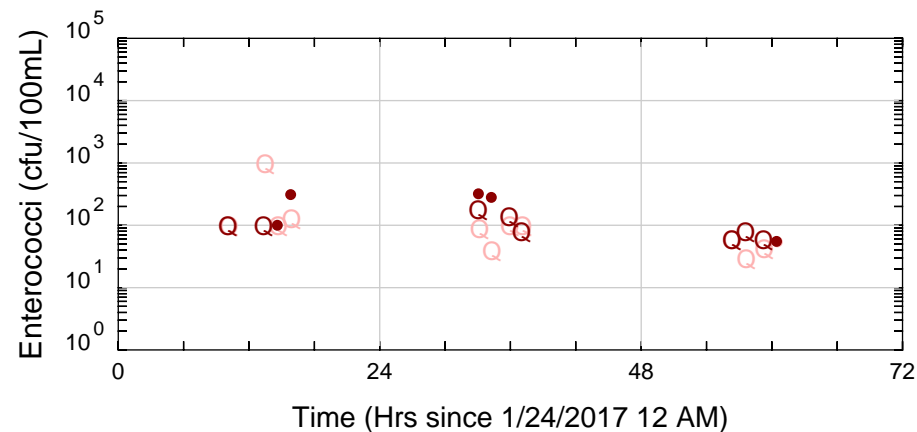
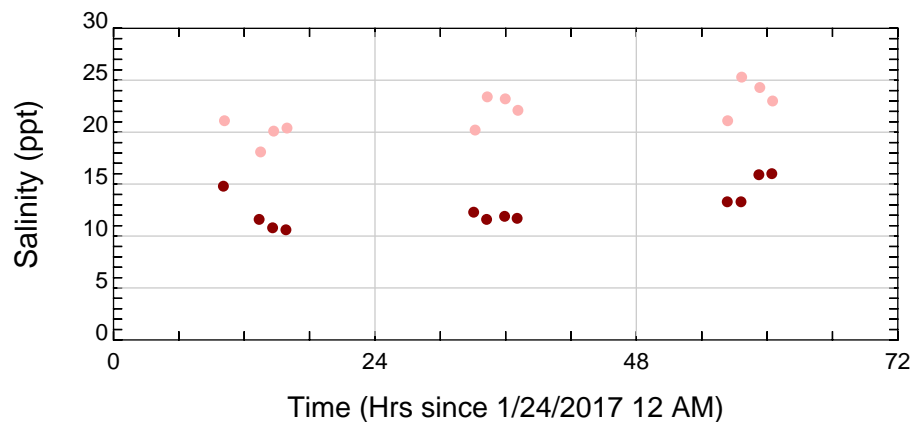
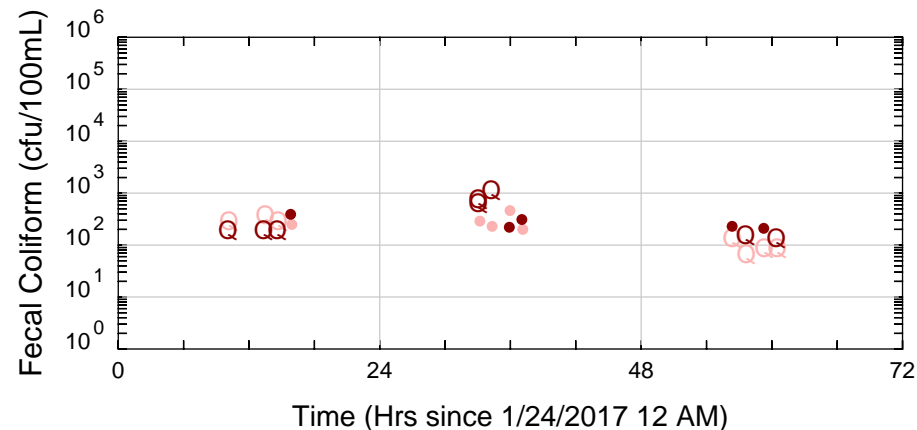
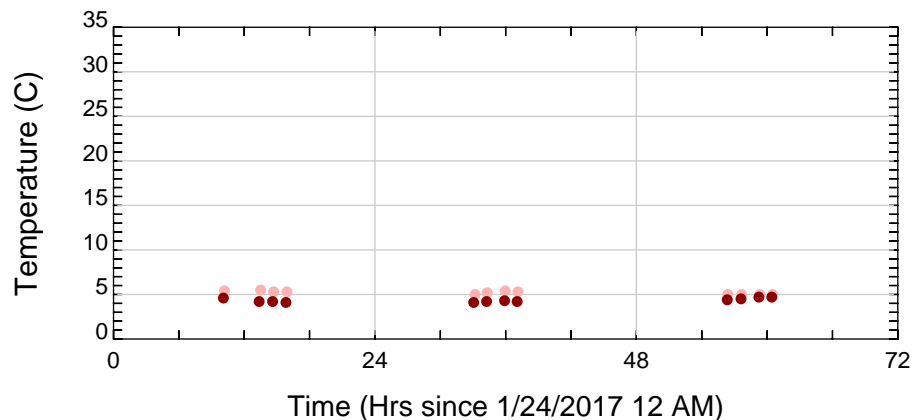
Hudson River, Upper Bay, Hudson River, 32, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



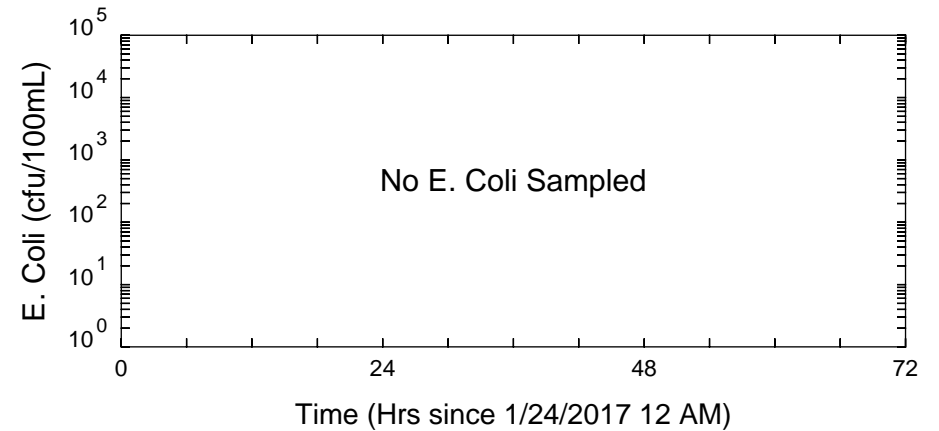
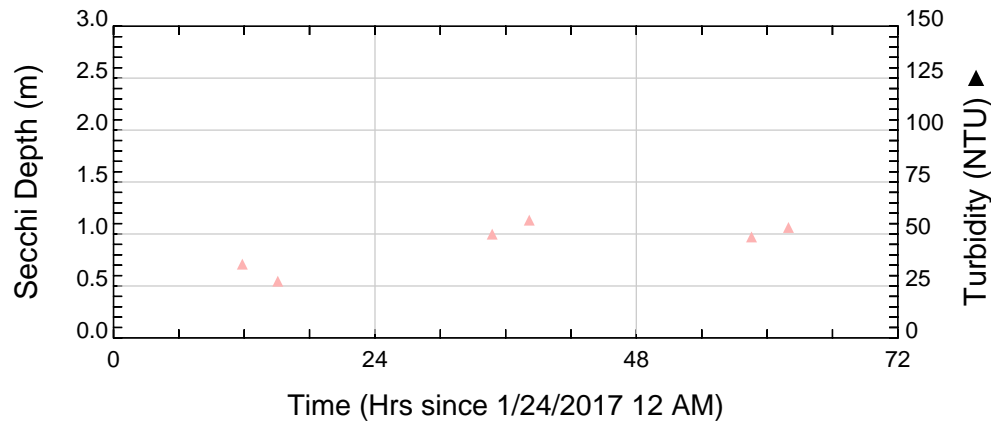
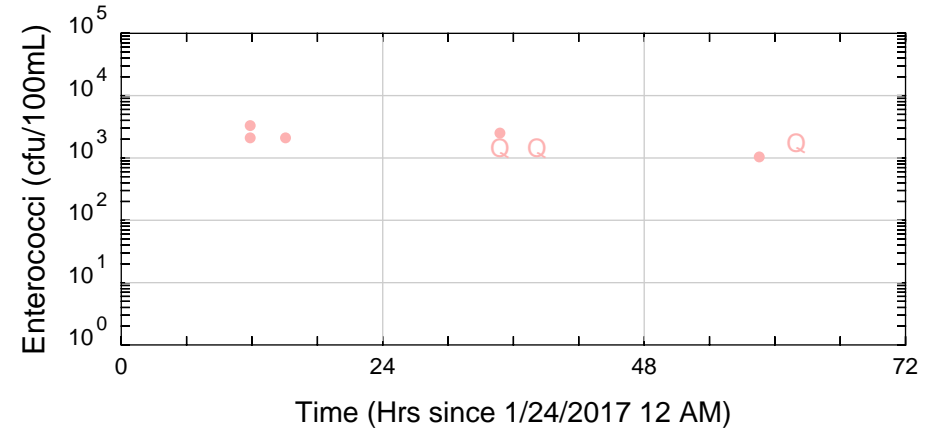
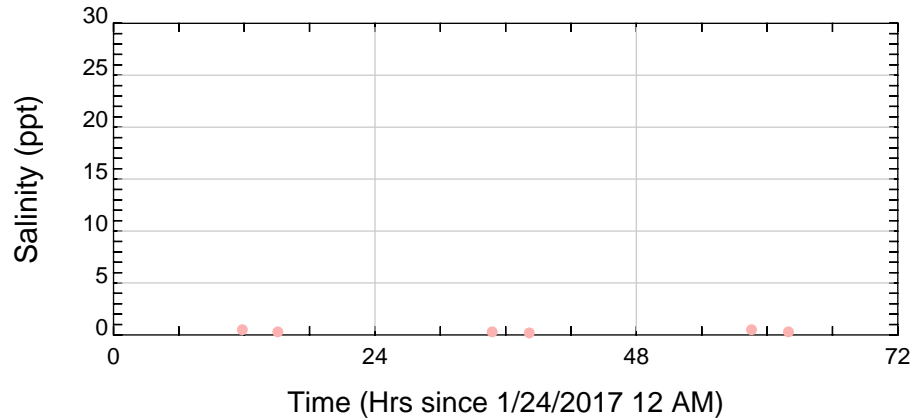
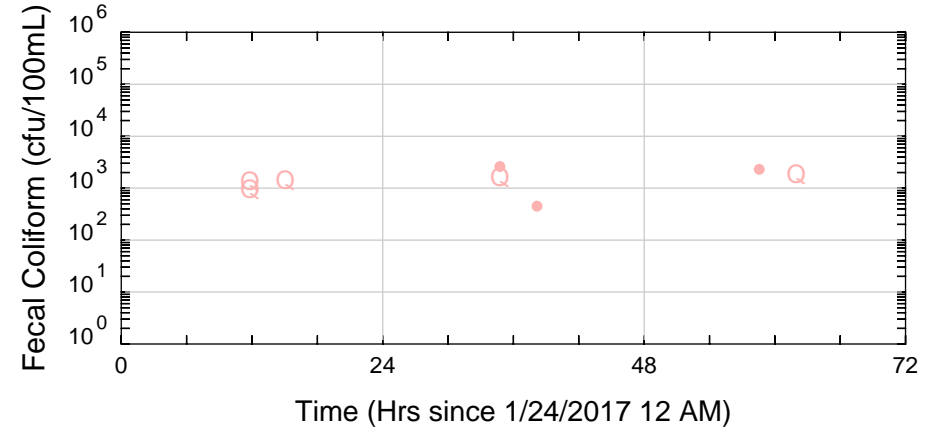
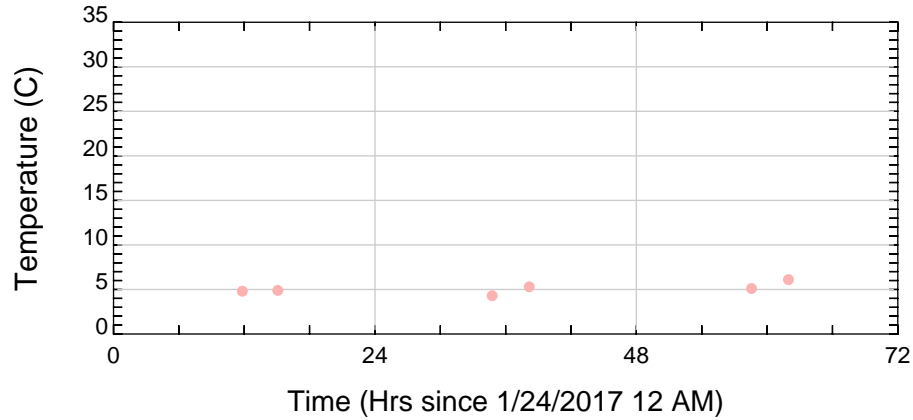
Hudson River, Upper Bay, Hudson River, 33, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



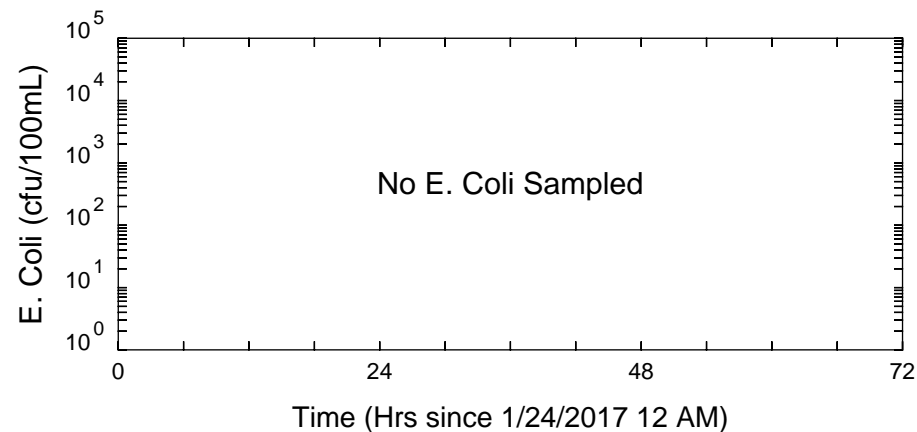
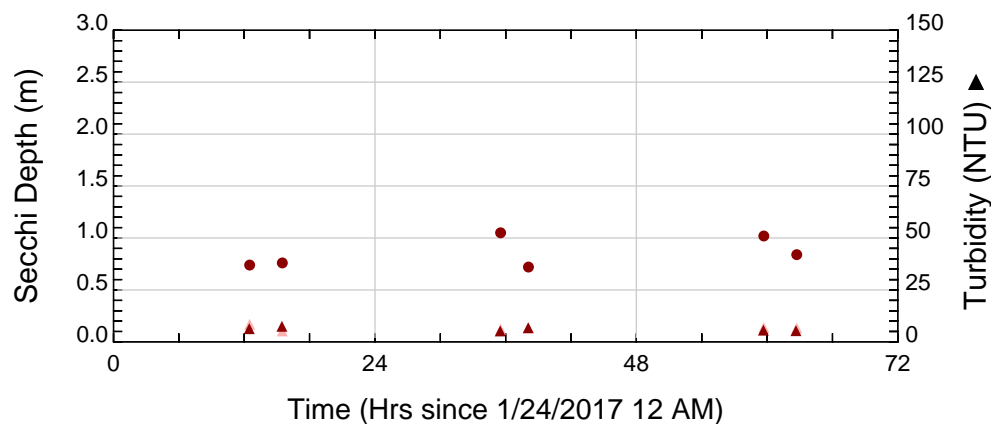
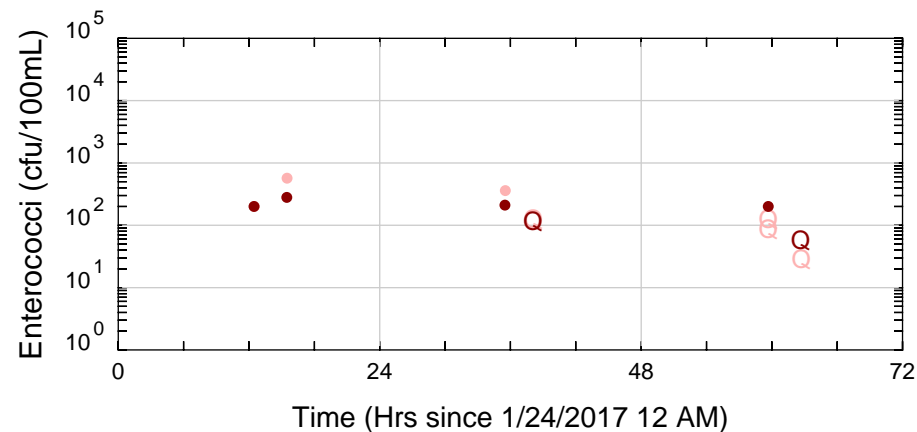
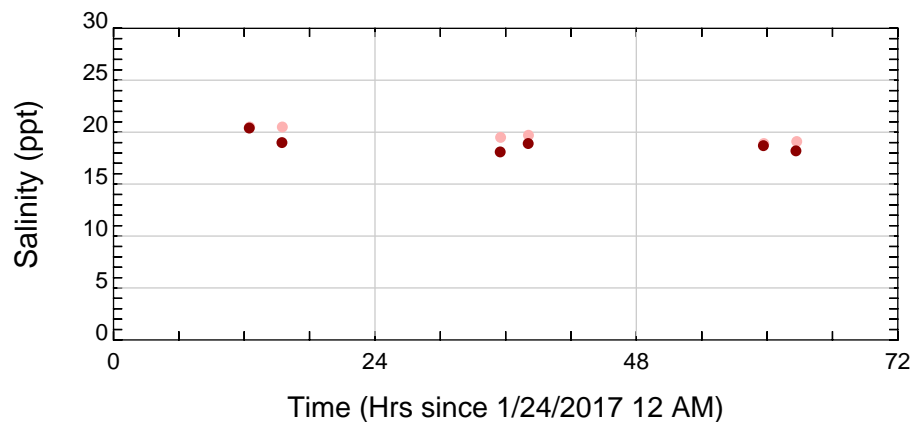
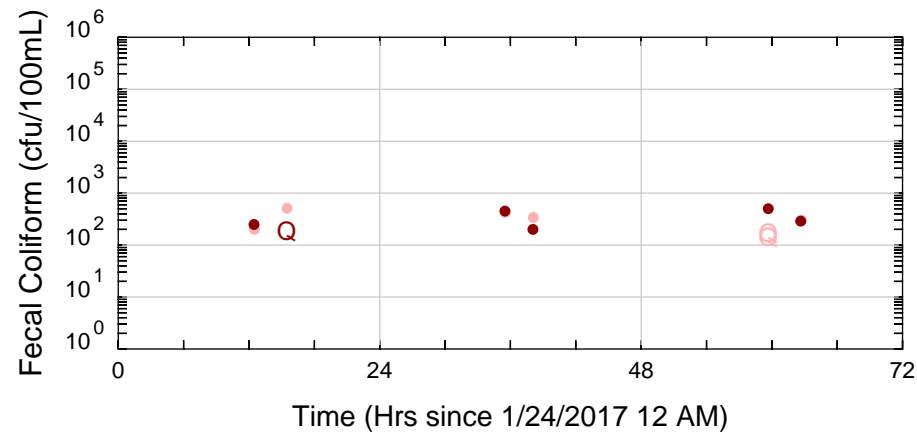
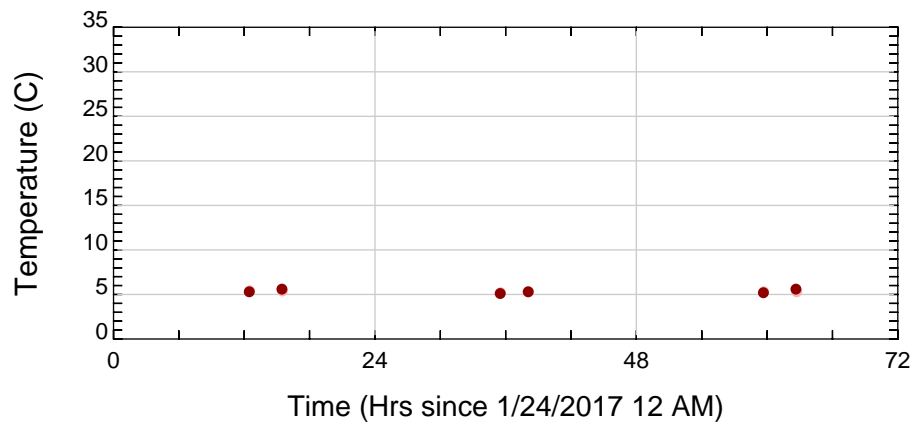
Hackensack River & Tributaries, Hackensack River, B1, (SE1)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



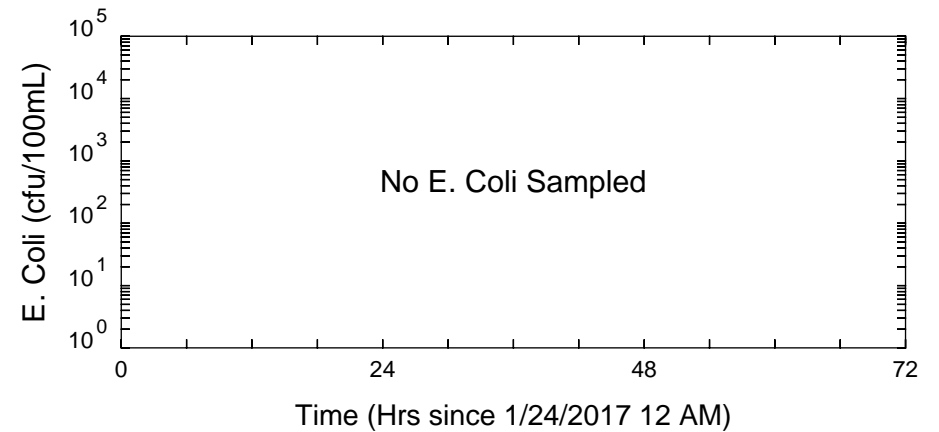
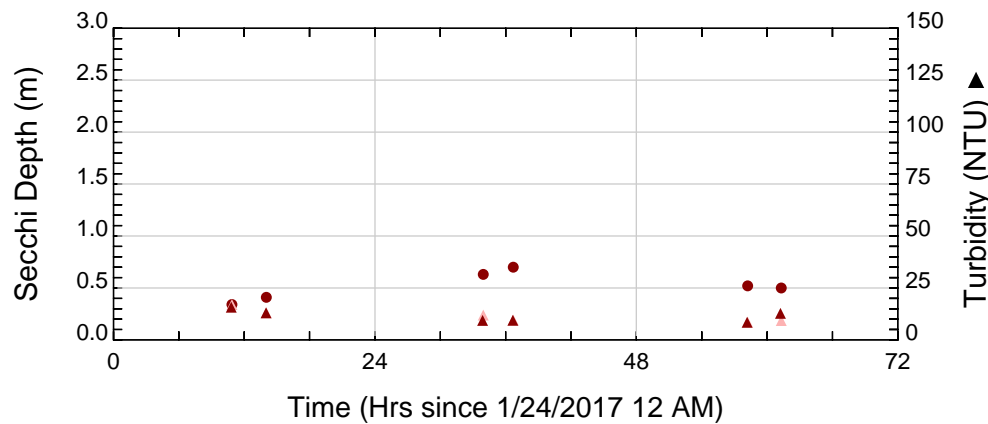
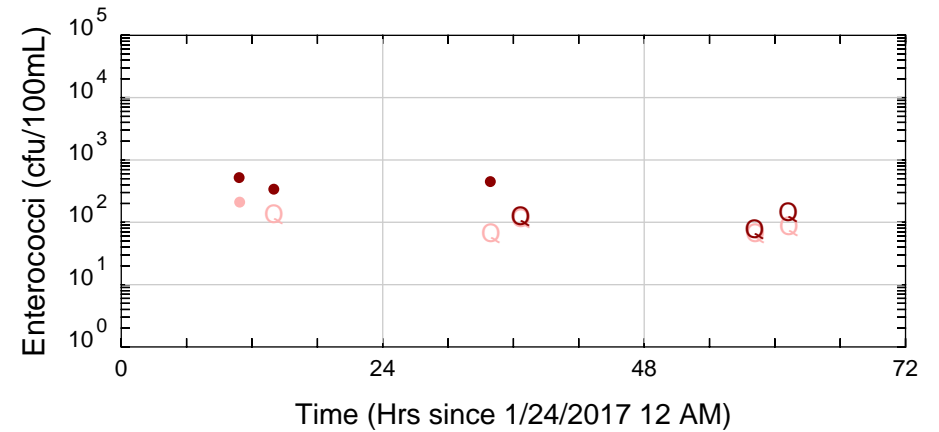
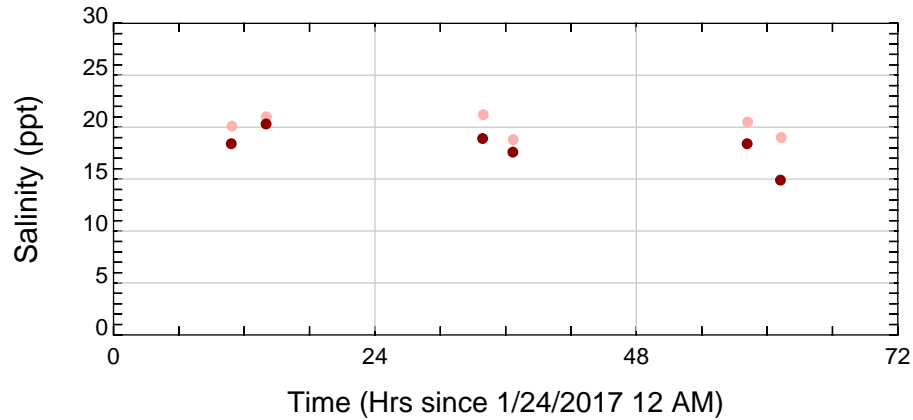
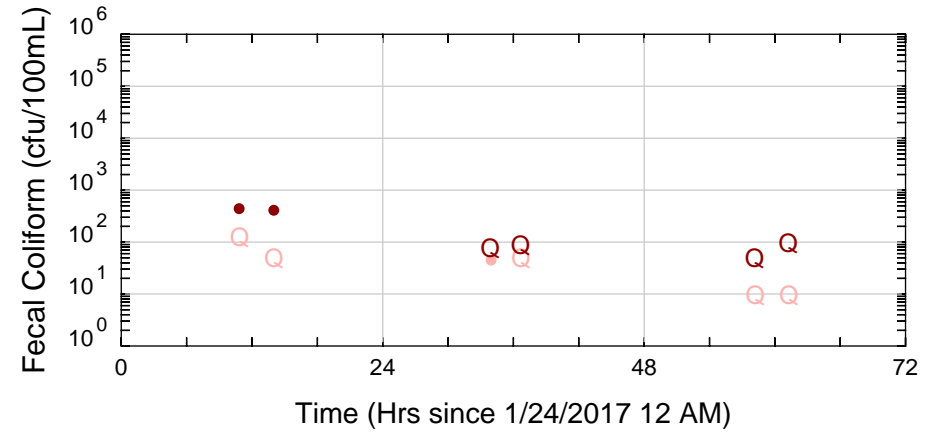
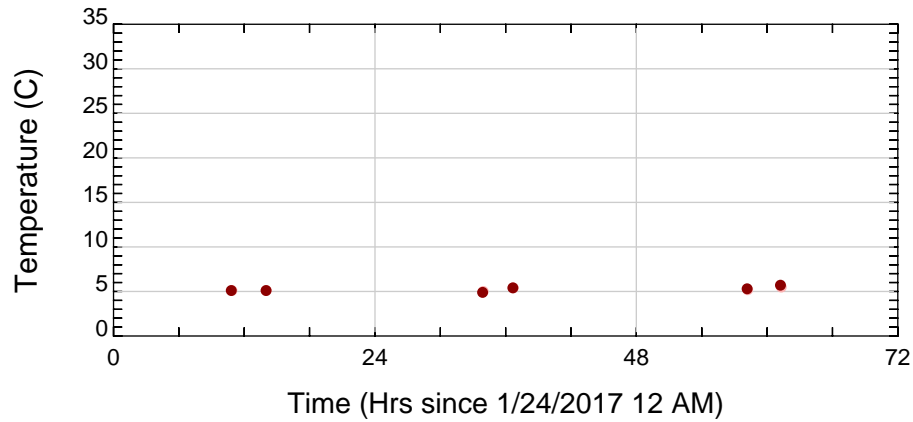
Hudson River, Upper Bay, Kill Van Kull, B12, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



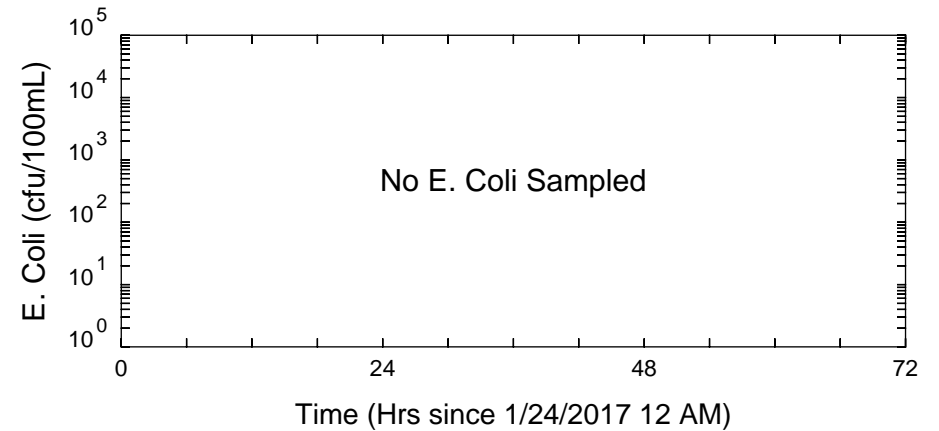
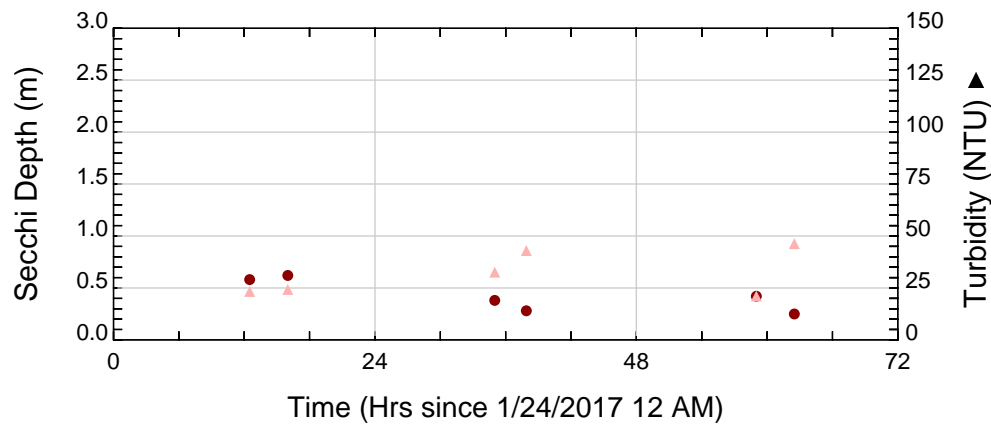
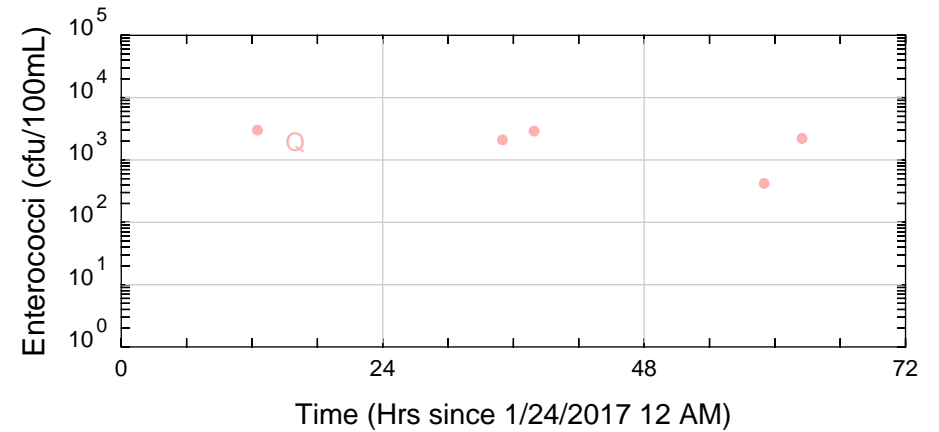
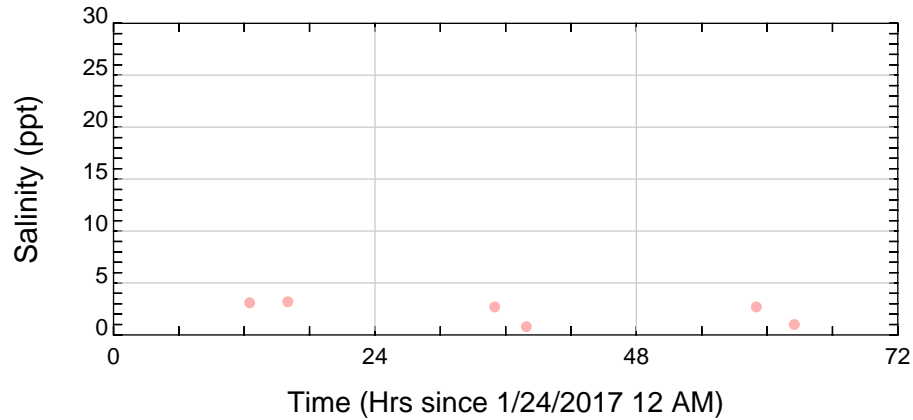
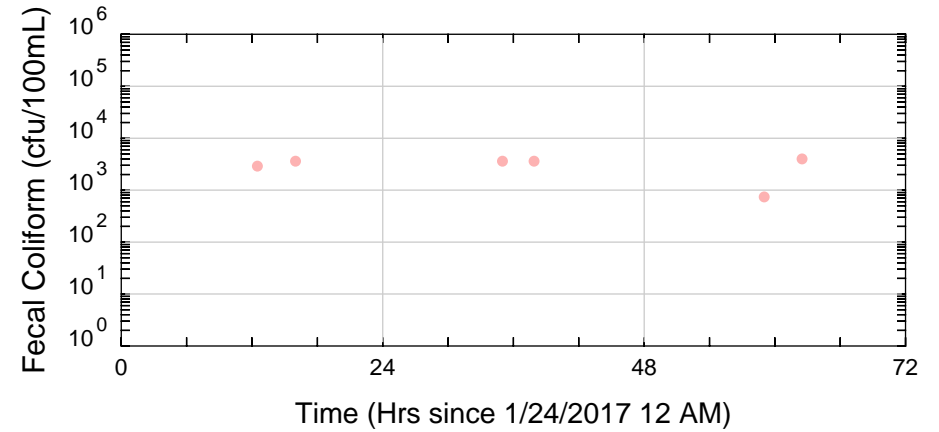
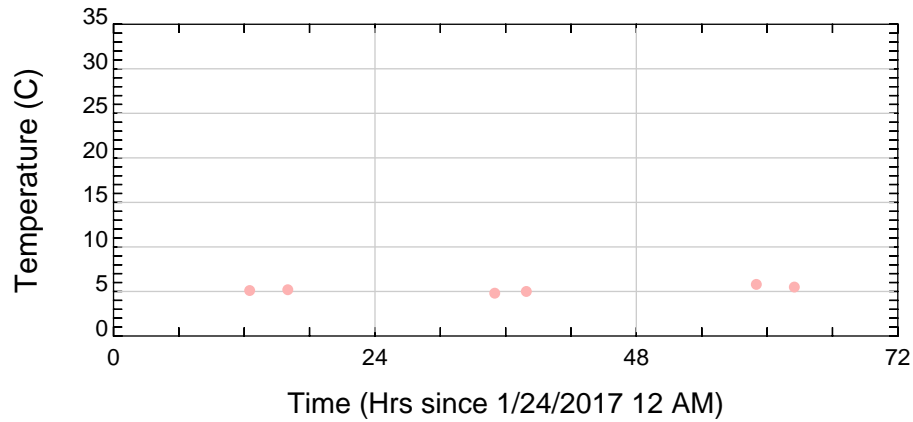
Arthur Kill, Raritan River/Bay & Tributaries, Arthur Kill, B15, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



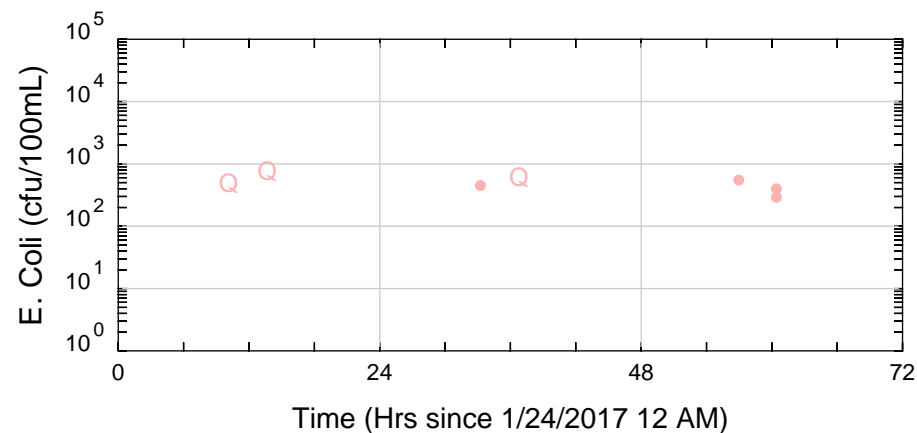
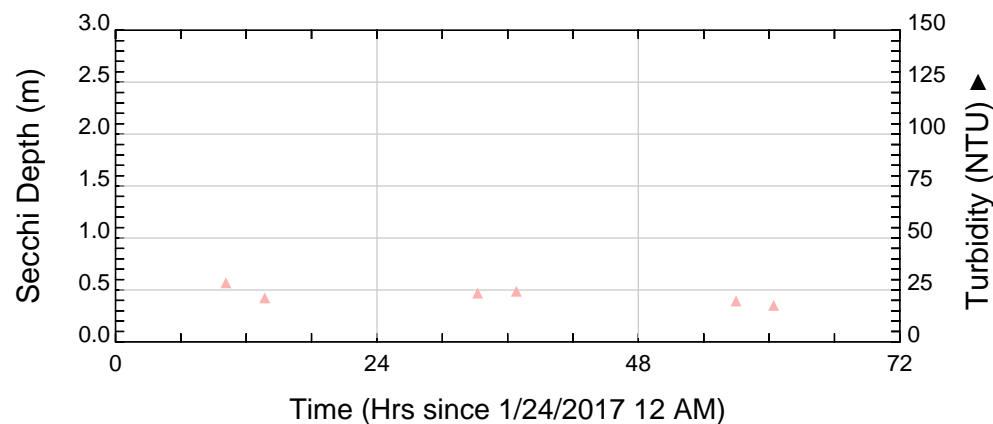
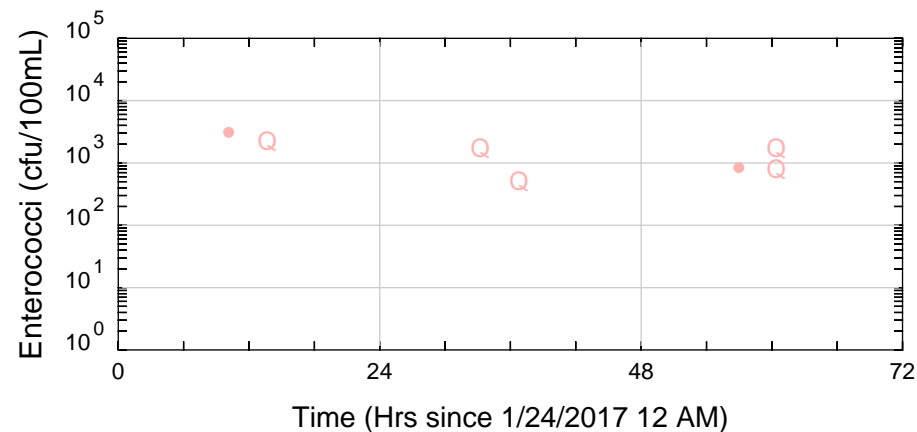
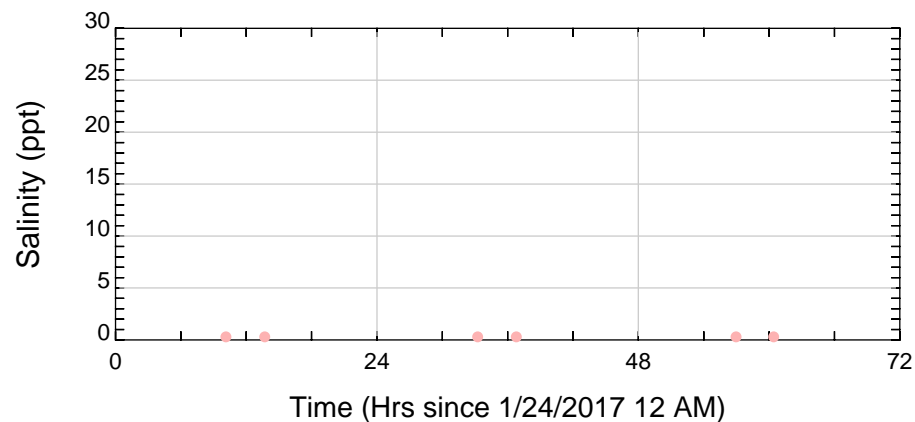
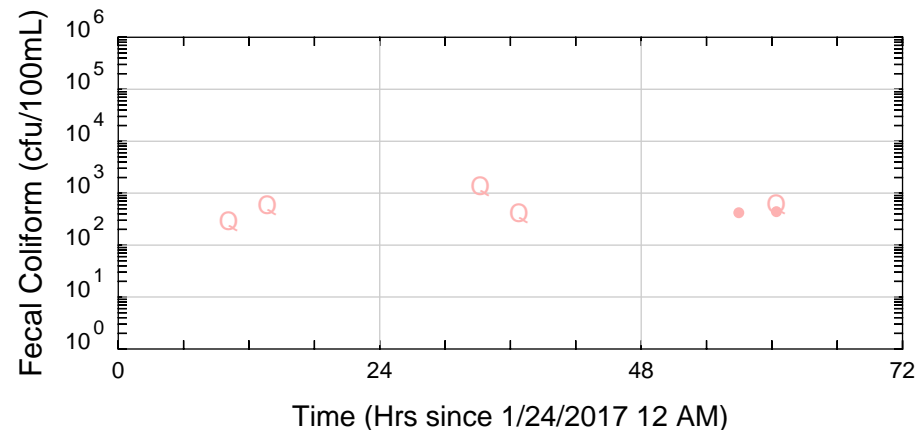
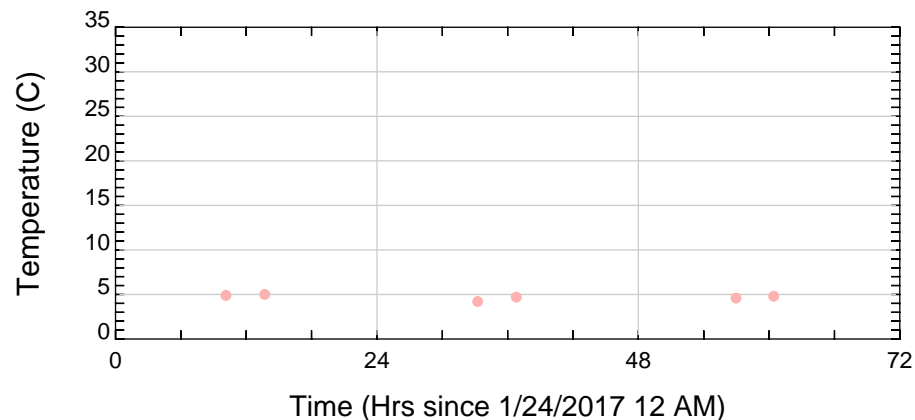
Hackensack River & Tributaries, Hackensack River, B2, (SE1)

● ● Surface/Mid-depth HDR
● ● ● Surface/Mid/Bottom NJHDG



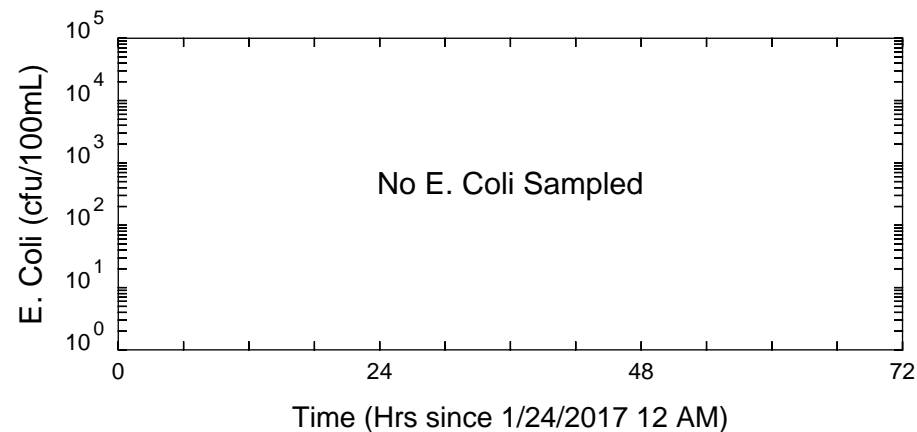
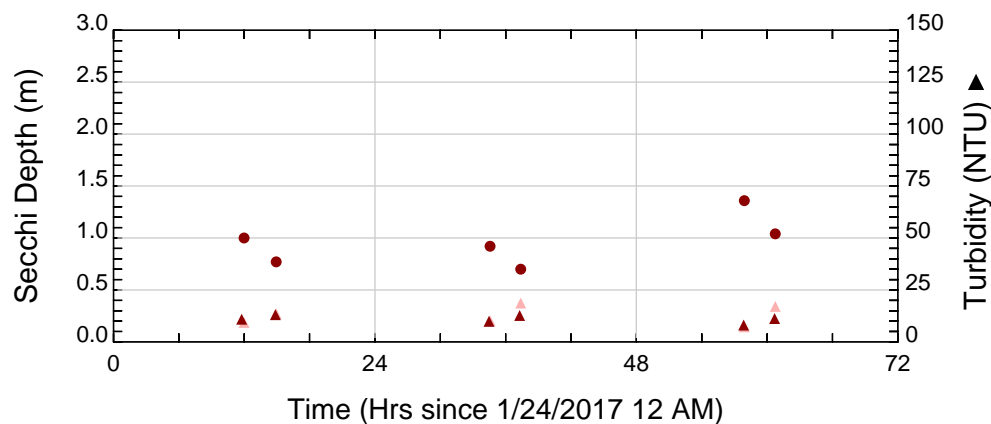
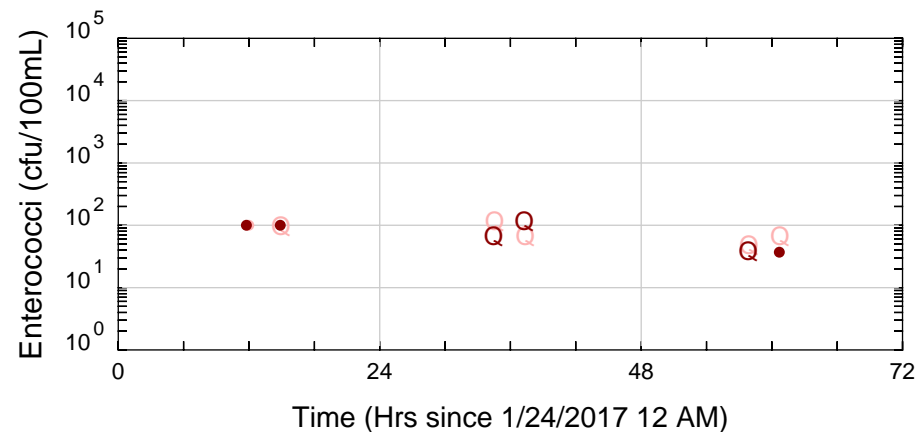
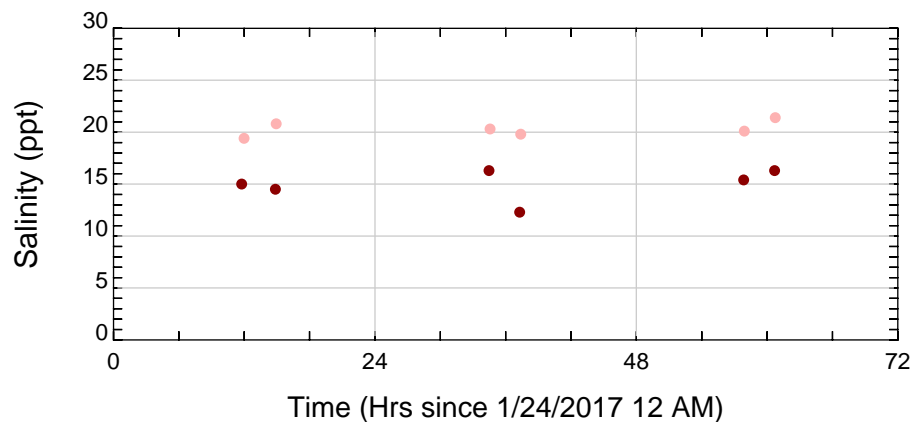
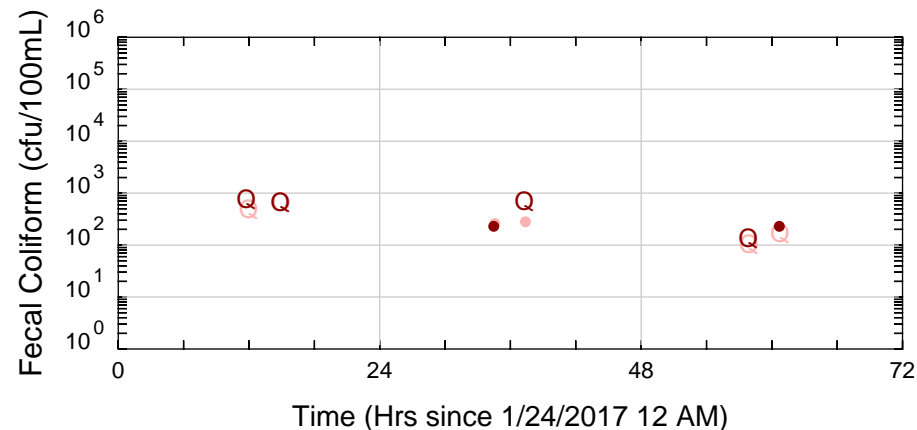
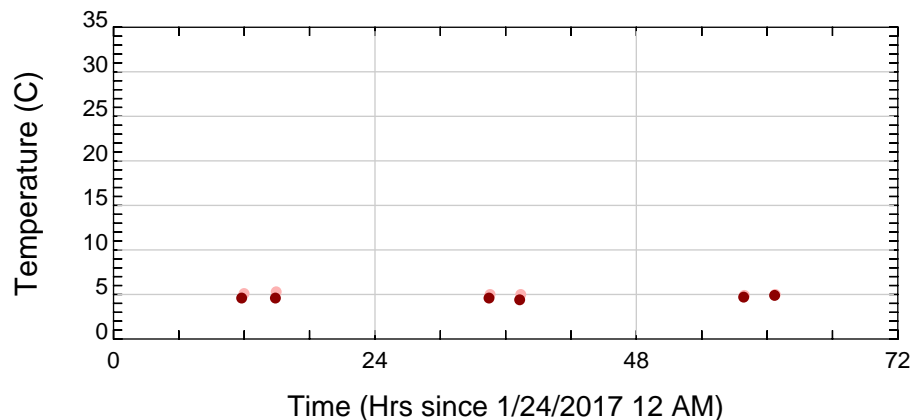
Passaic River & Tributaries, Passaic River, B24, (FW2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



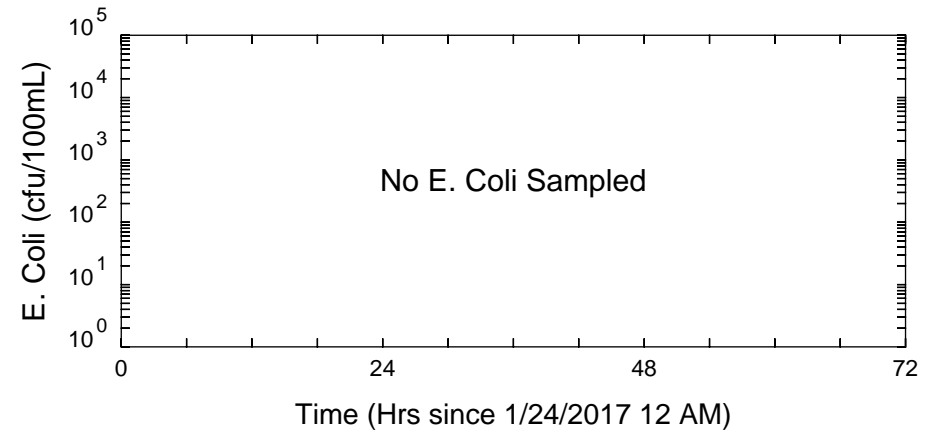
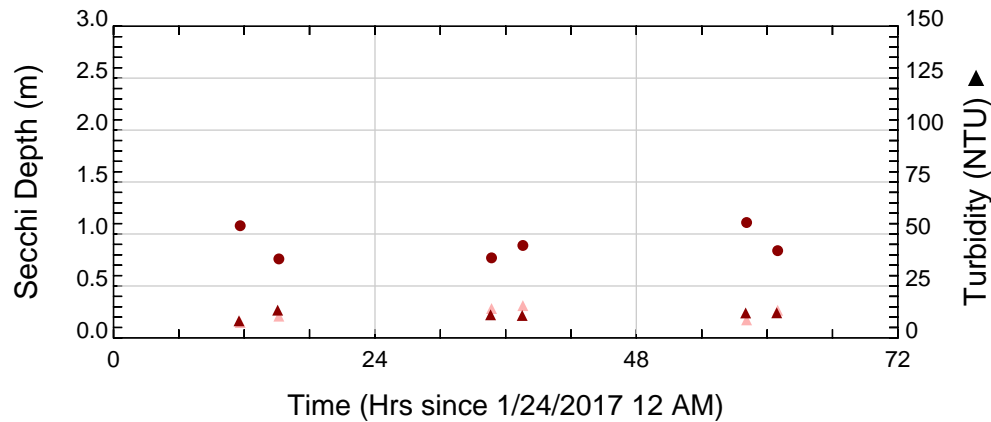
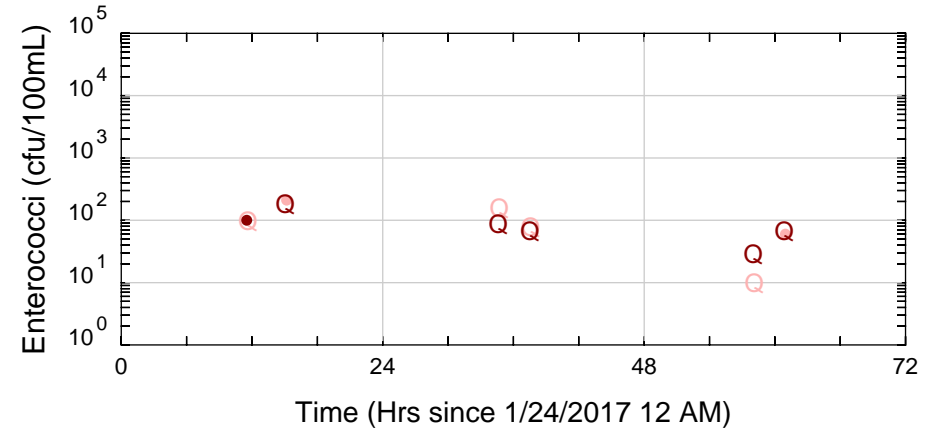
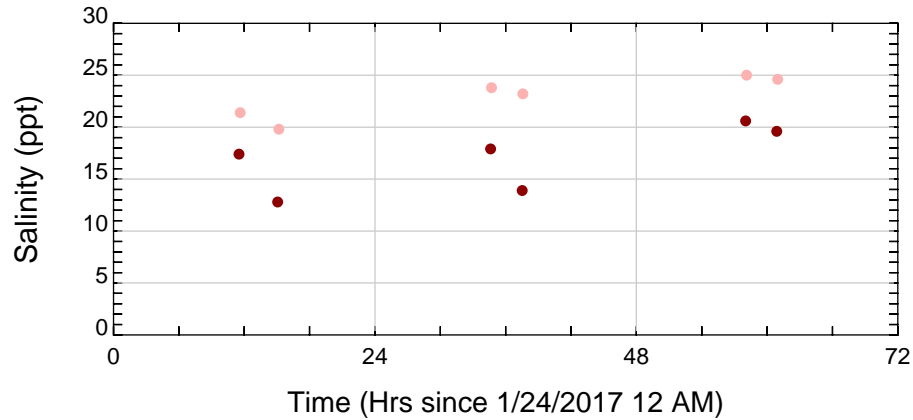
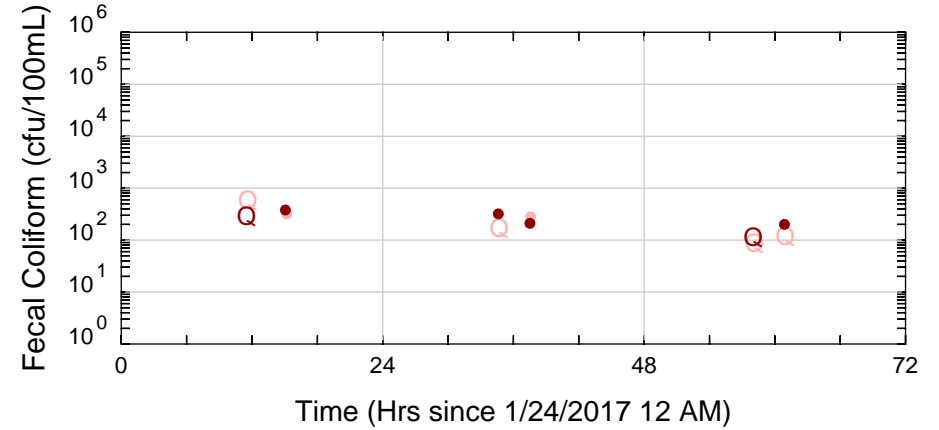
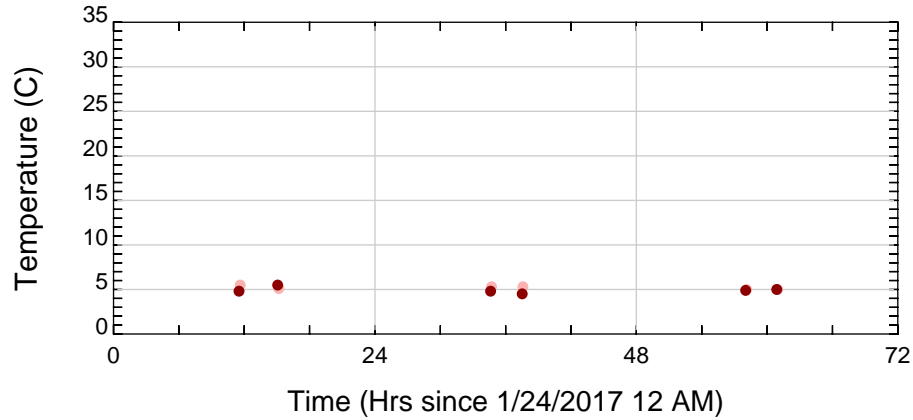
Hudson River, Upper Bay, Upper Bay, B26, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



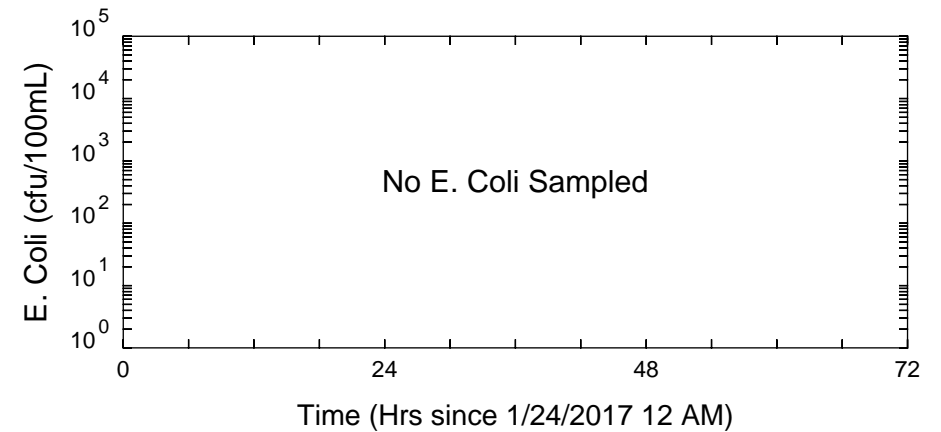
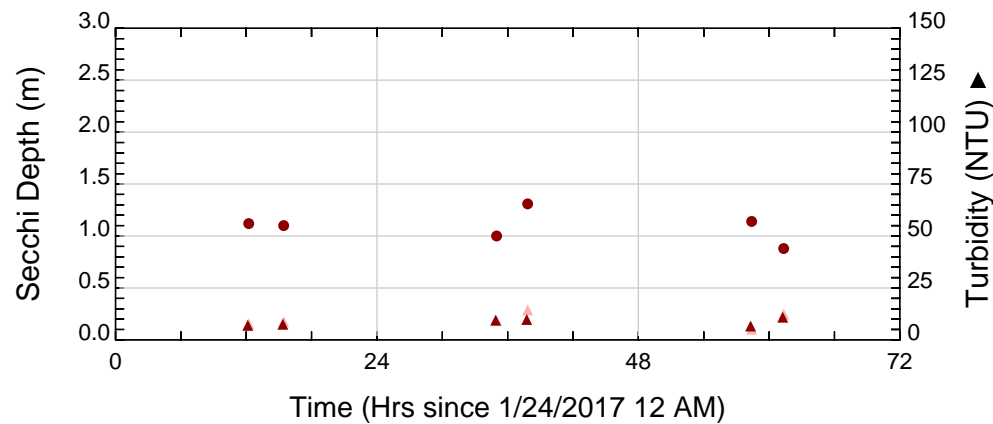
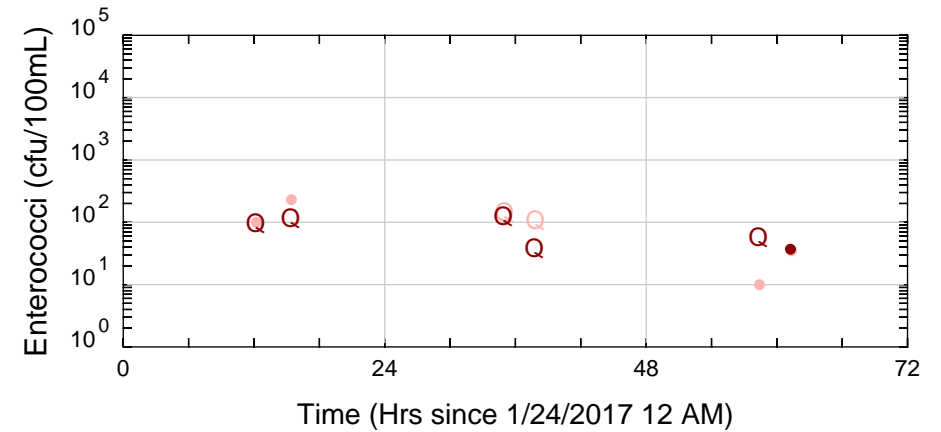
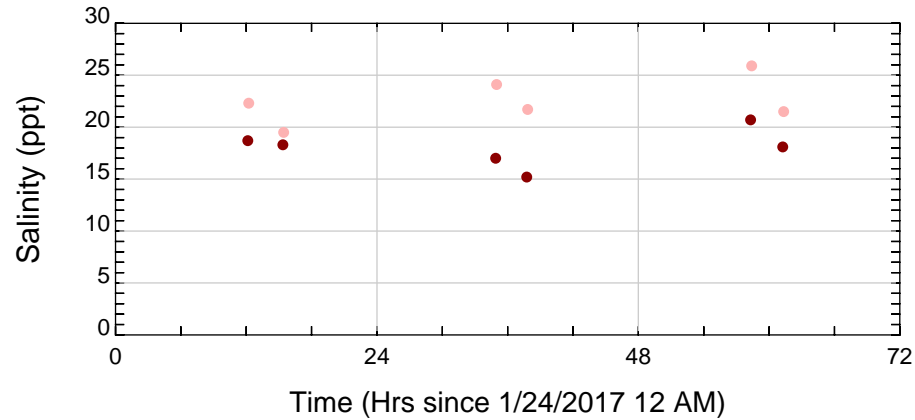
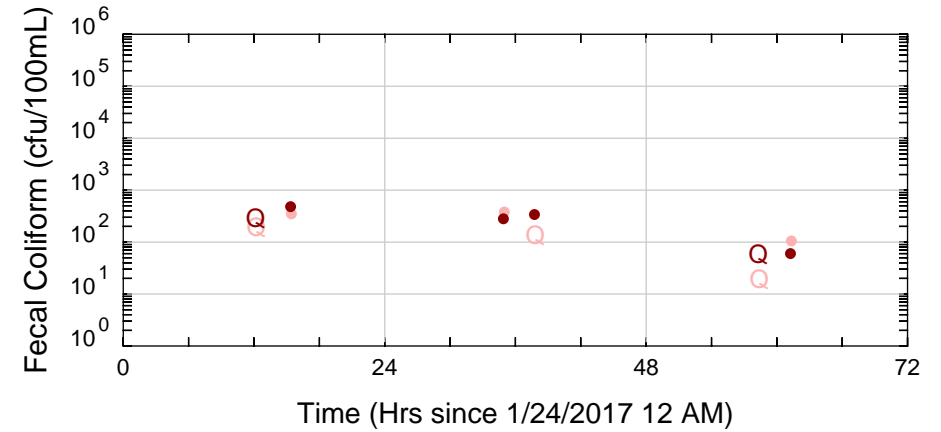
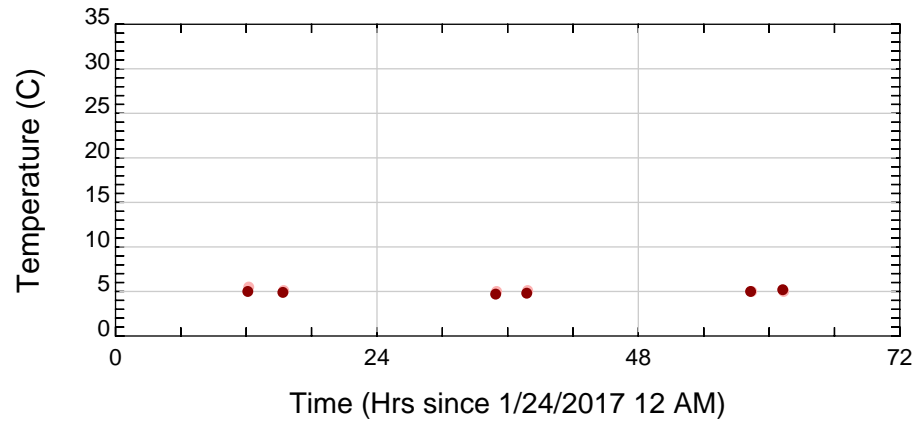
Hudson River, Upper Bay, Upper Bay, B27, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



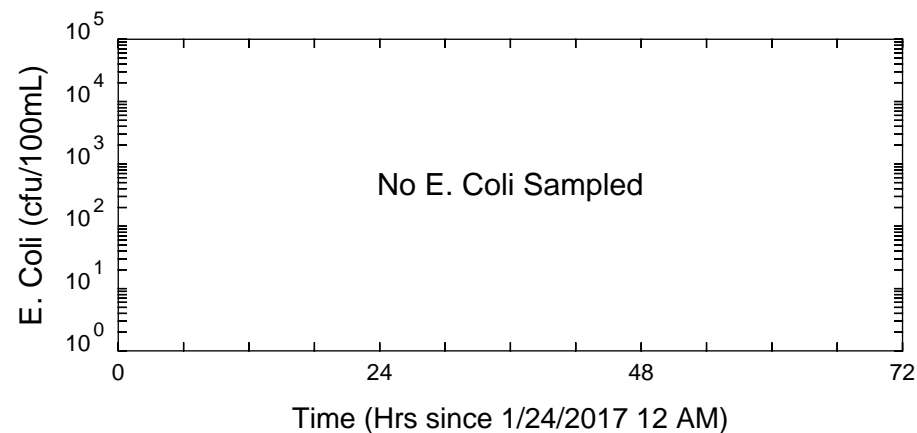
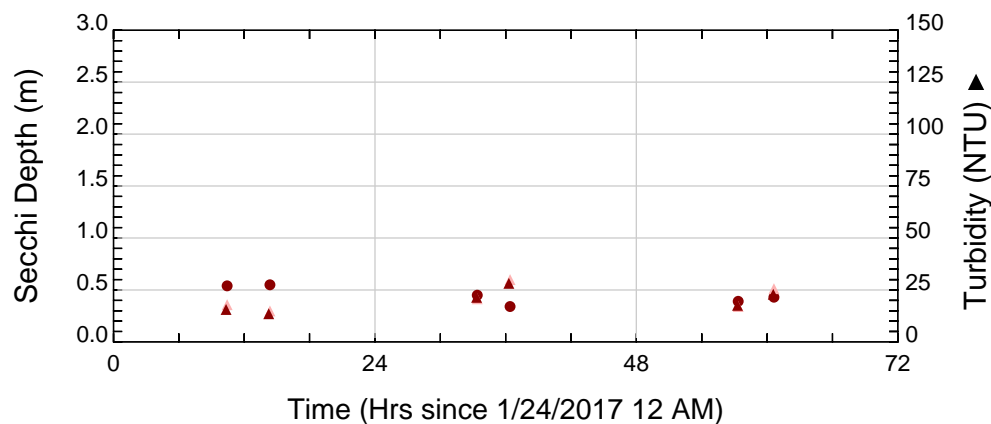
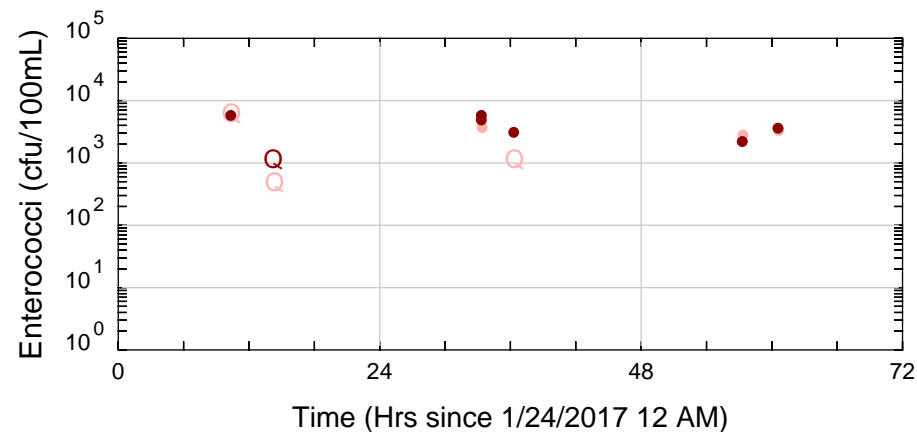
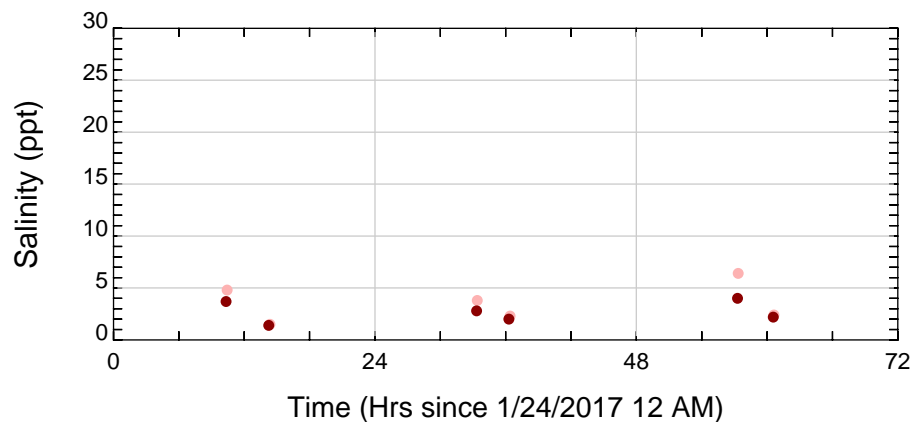
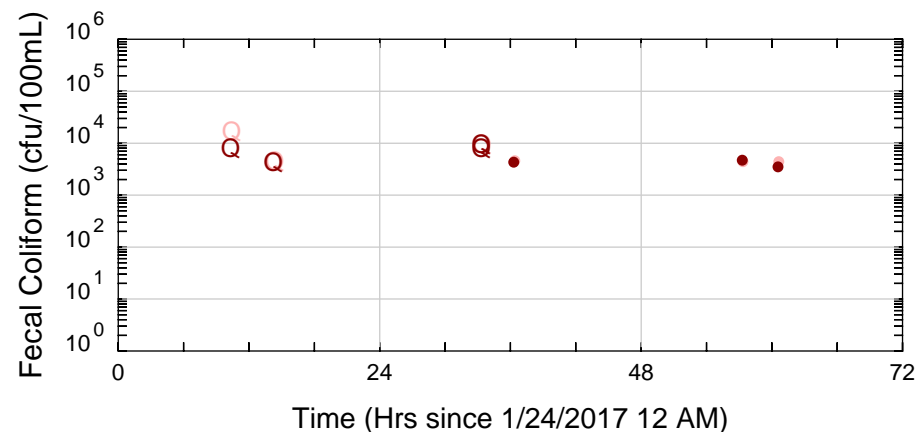
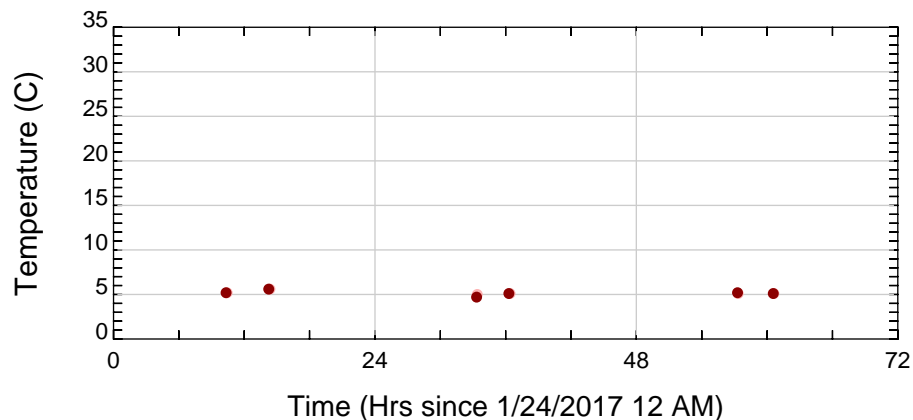
Hudson River, Upper Bay, Upper Bay, B28, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



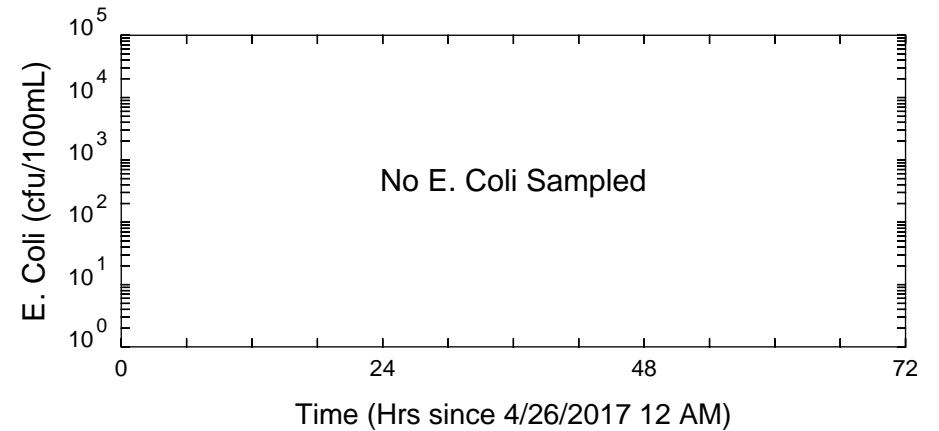
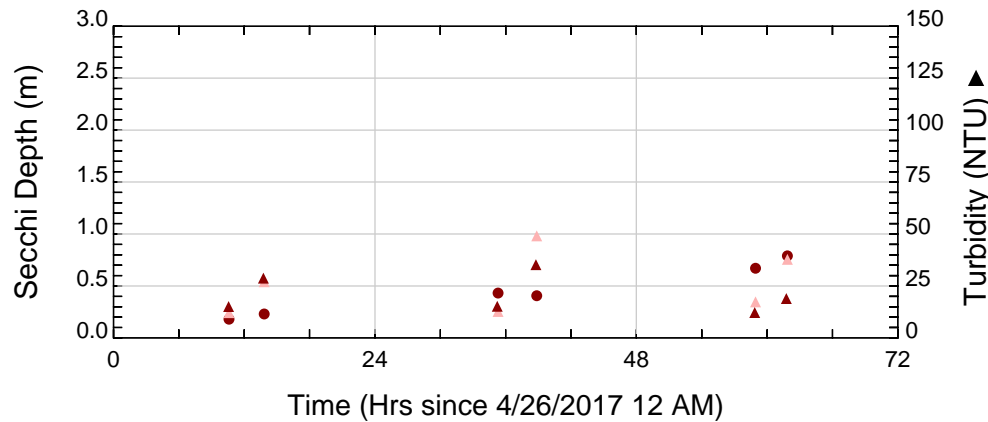
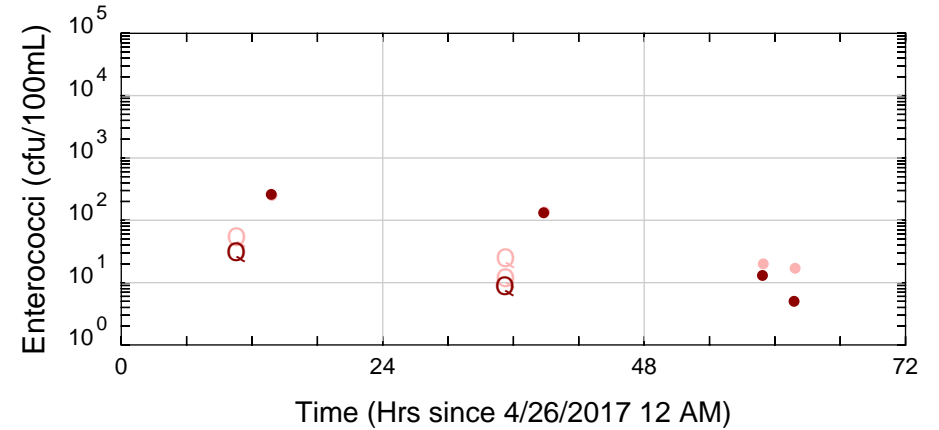
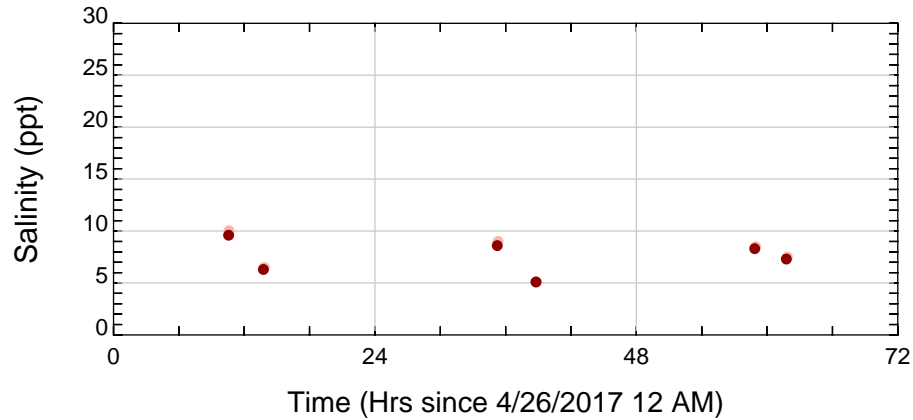
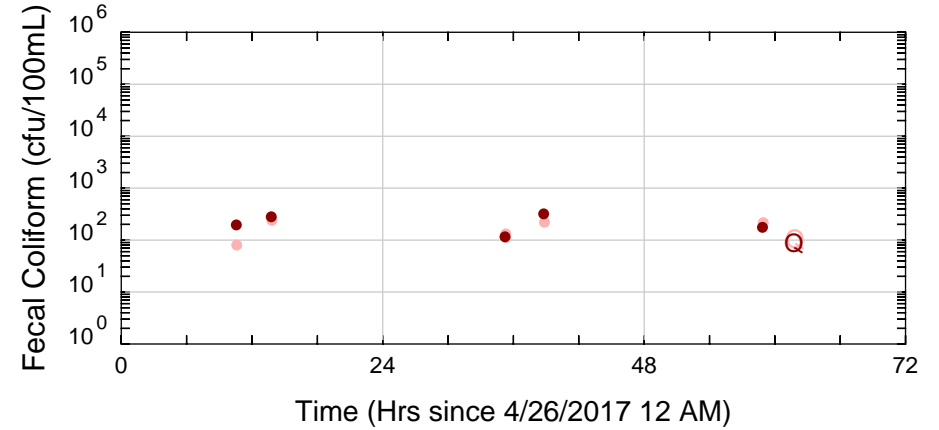
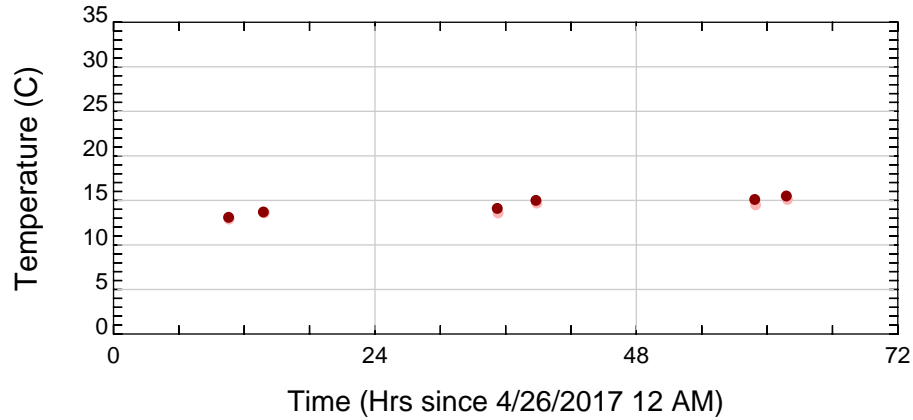
Passaic River & Tributaries, Passaic River, B6, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



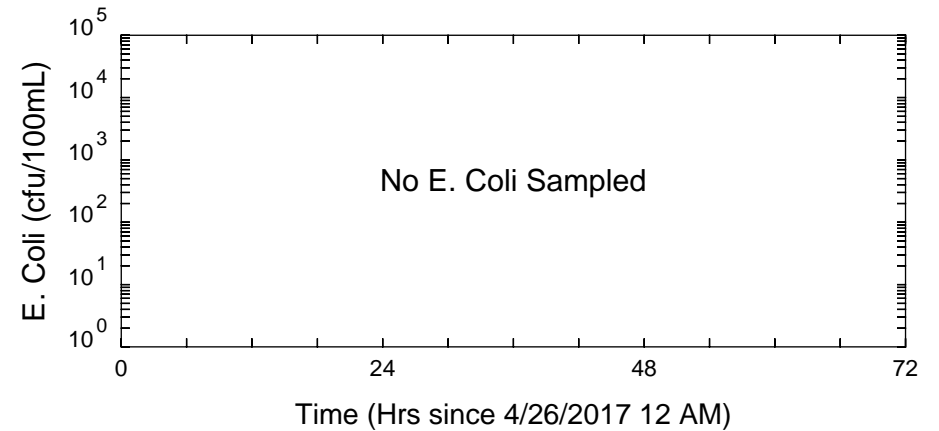
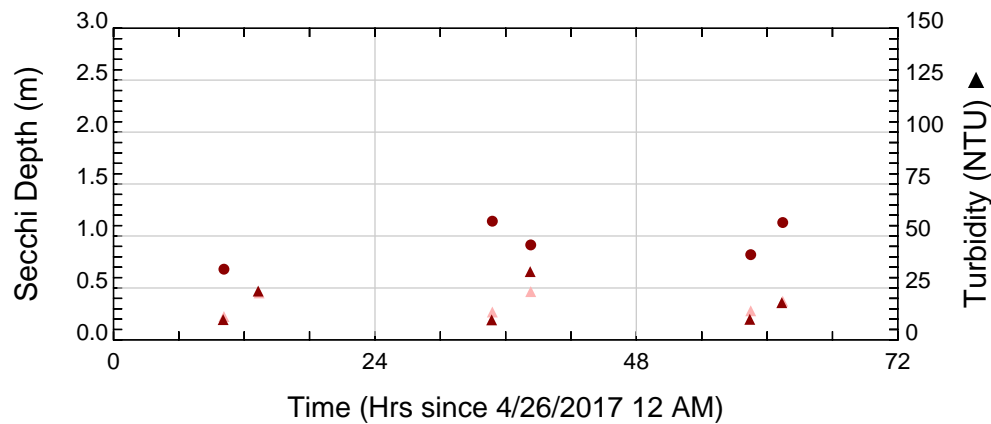
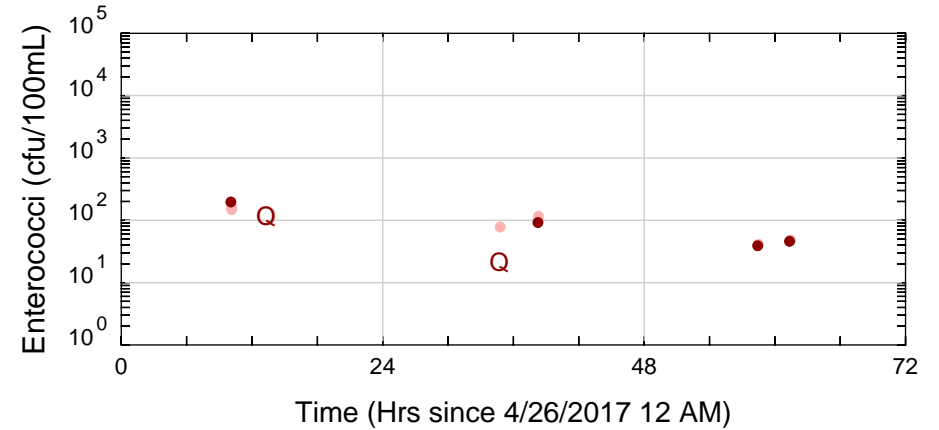
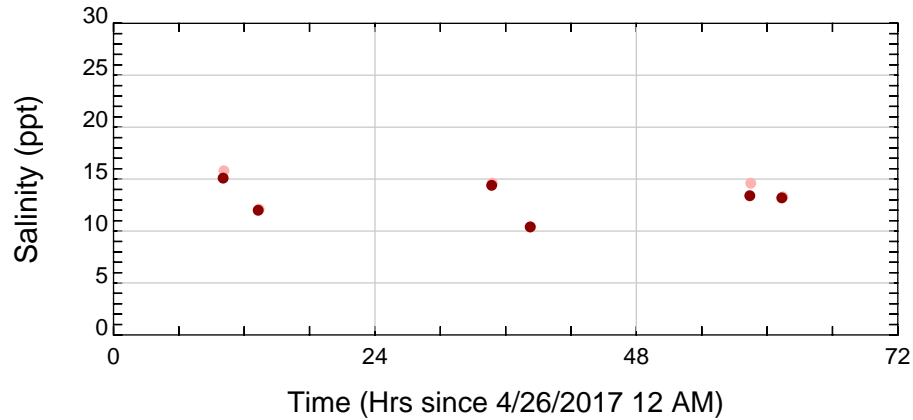
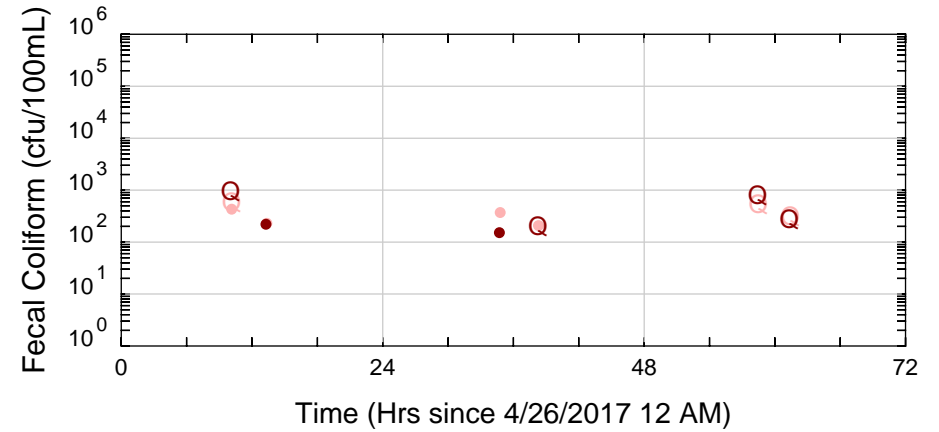
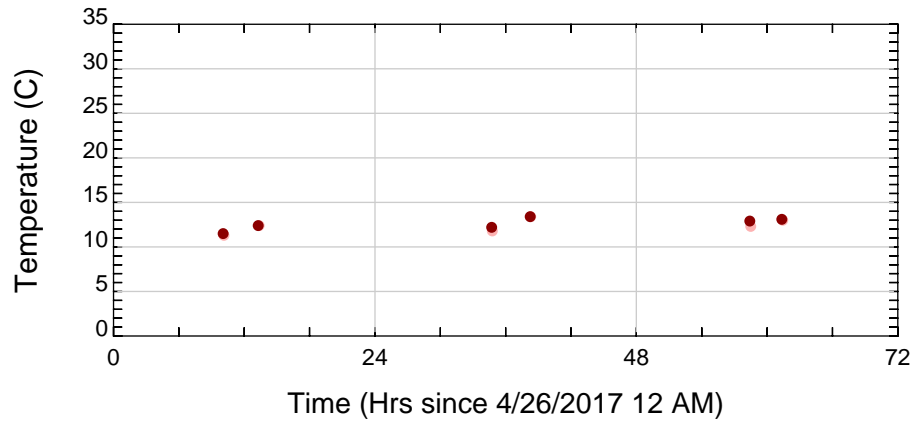
Hackensack River & Tributaries, Hackensack River, 14, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



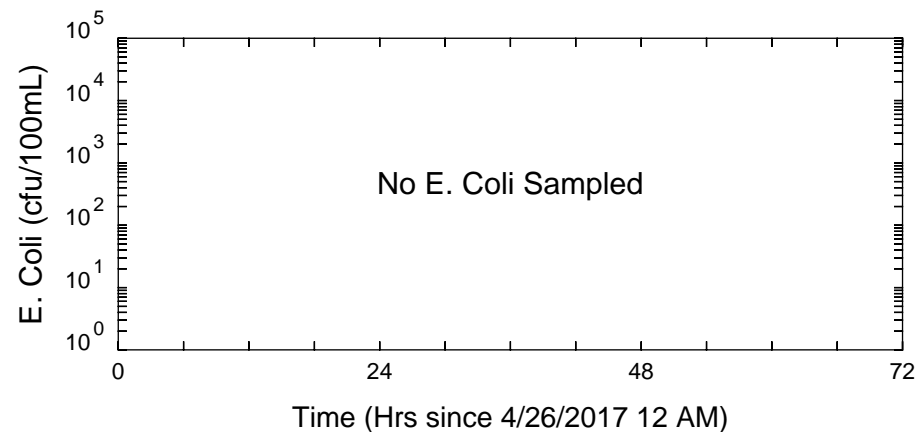
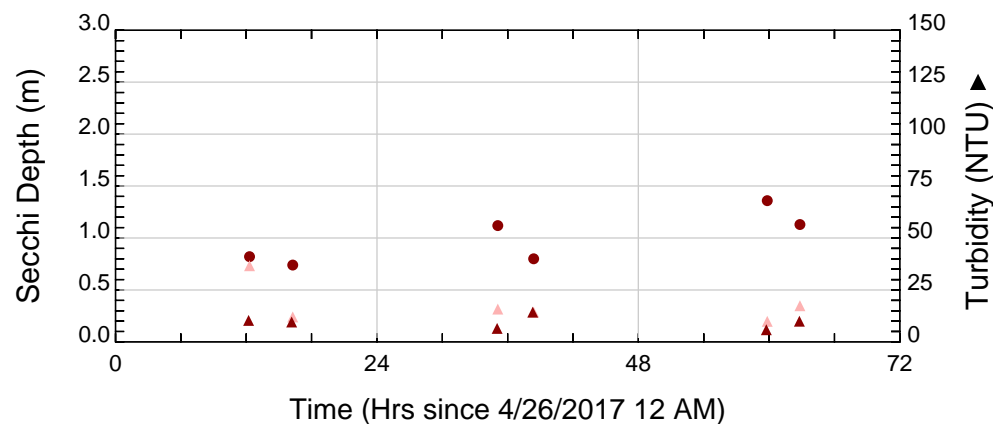
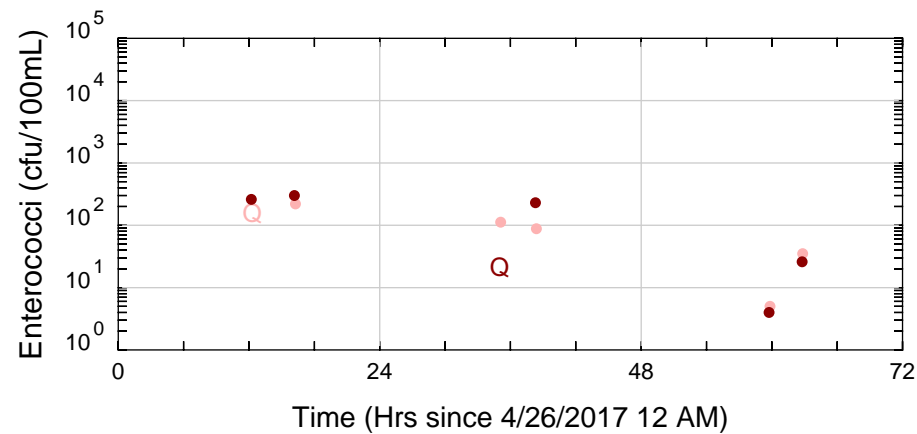
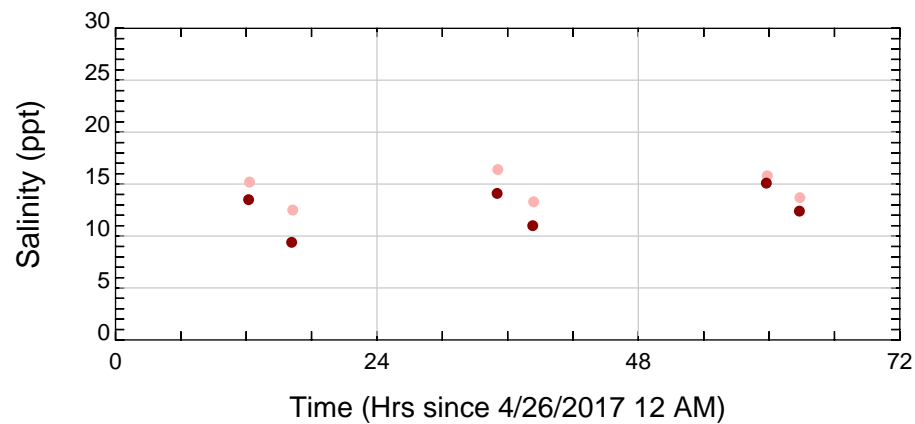
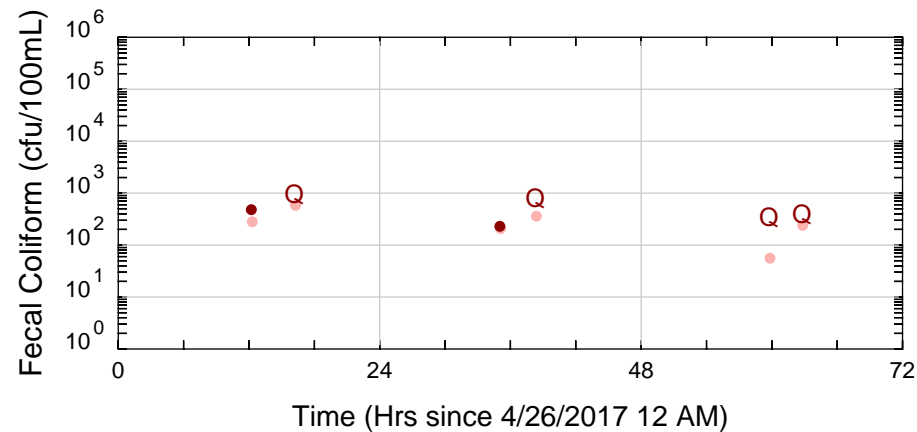
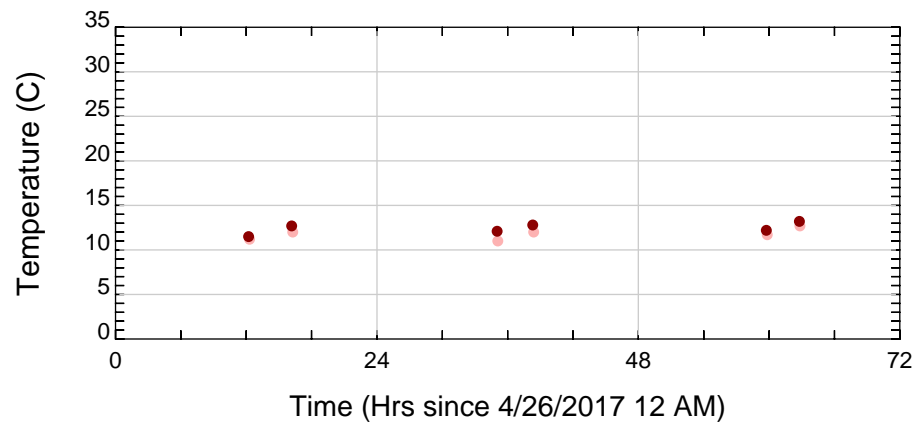
Hackensack River & Tributaries, Hackensack River, 15, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



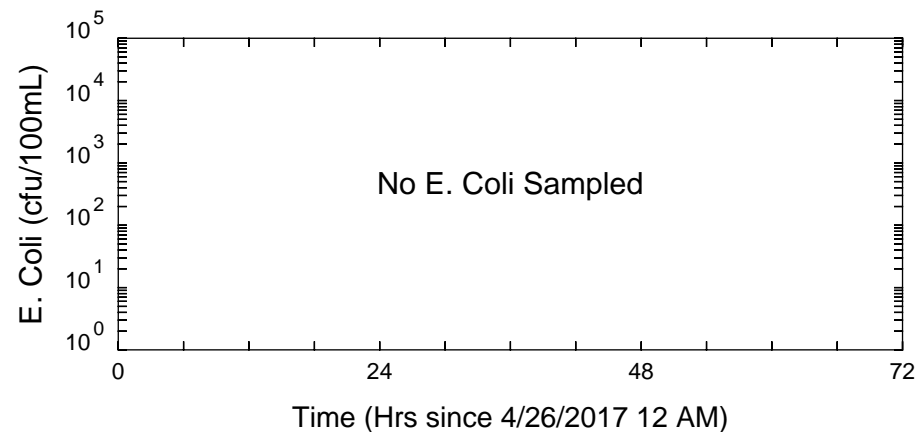
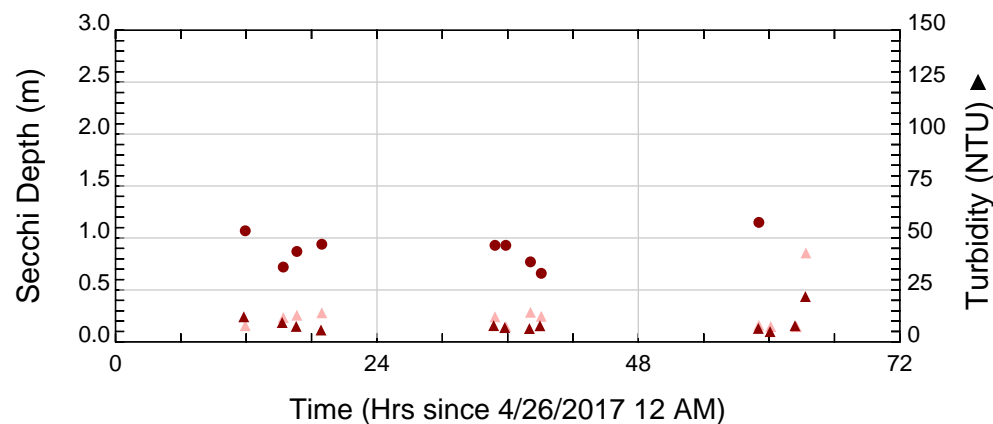
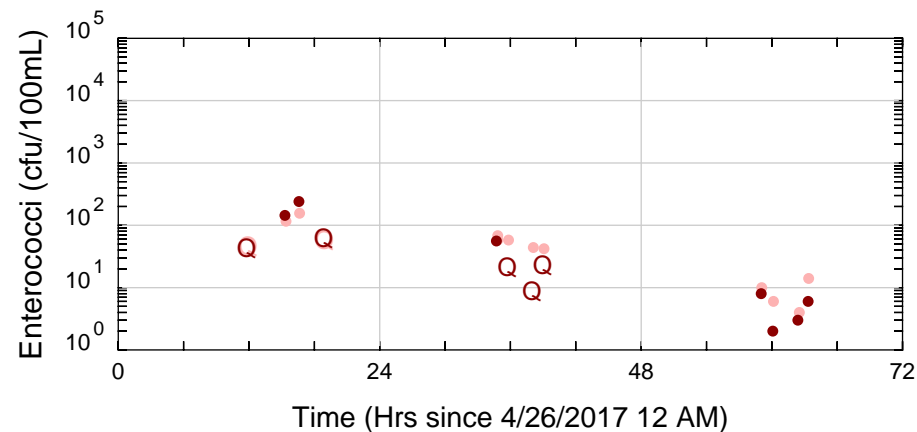
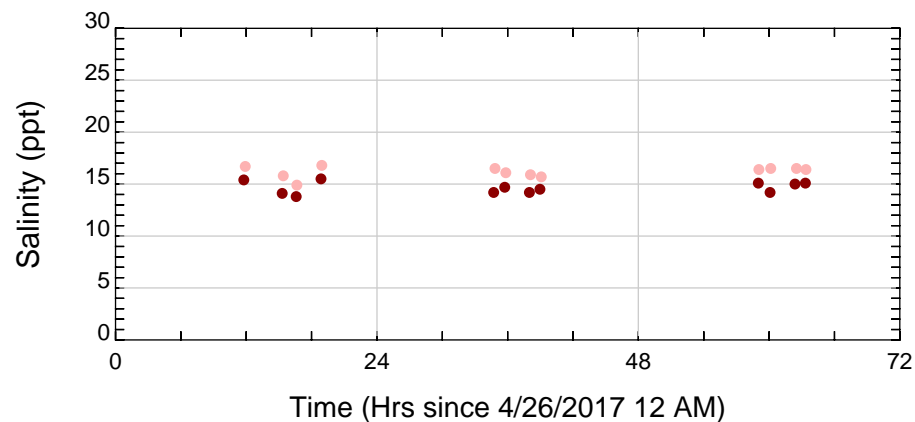
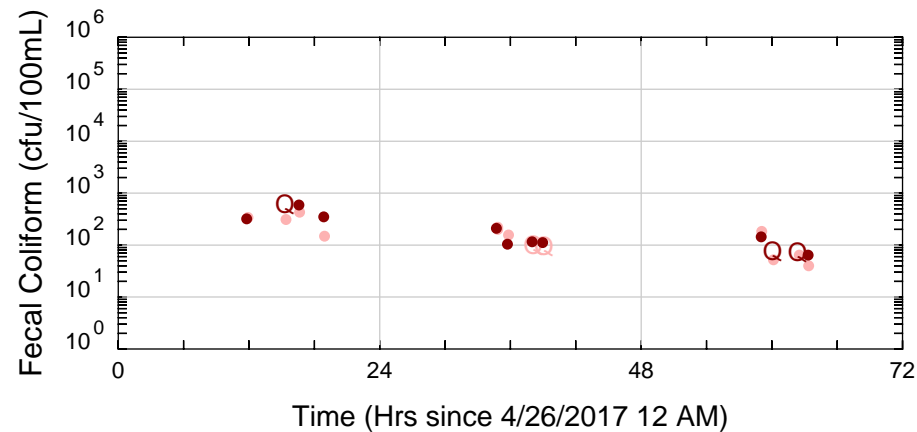
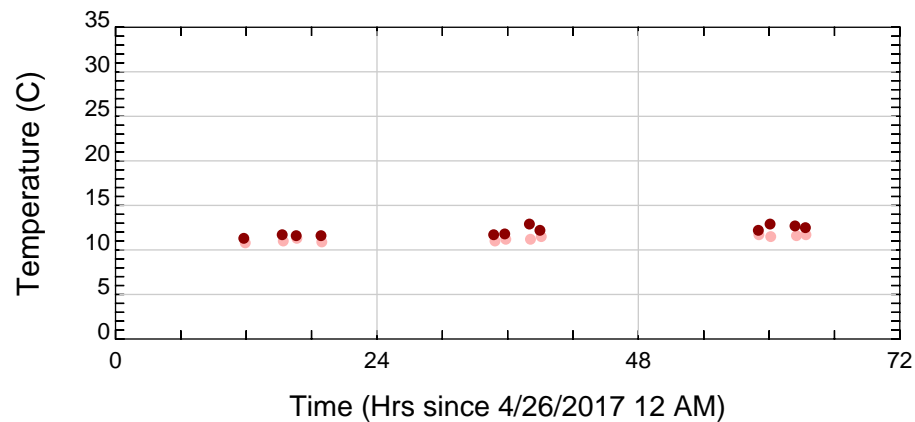
Newark Bay & Tributaries, Newark Bay, 17, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



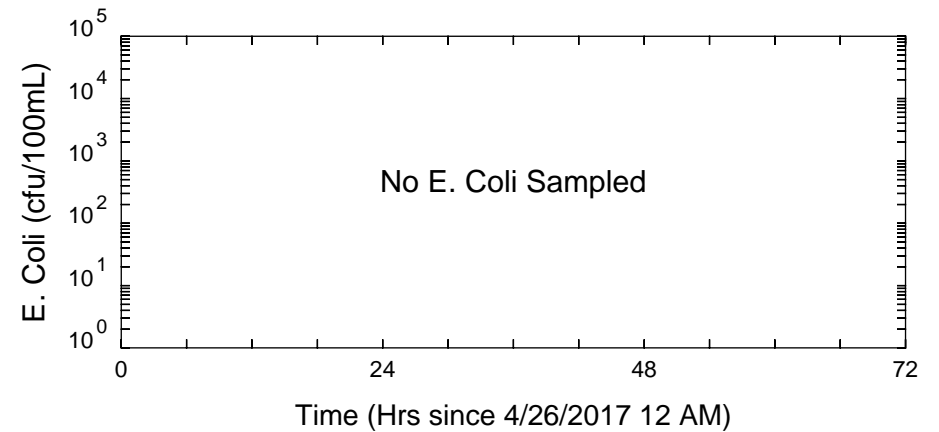
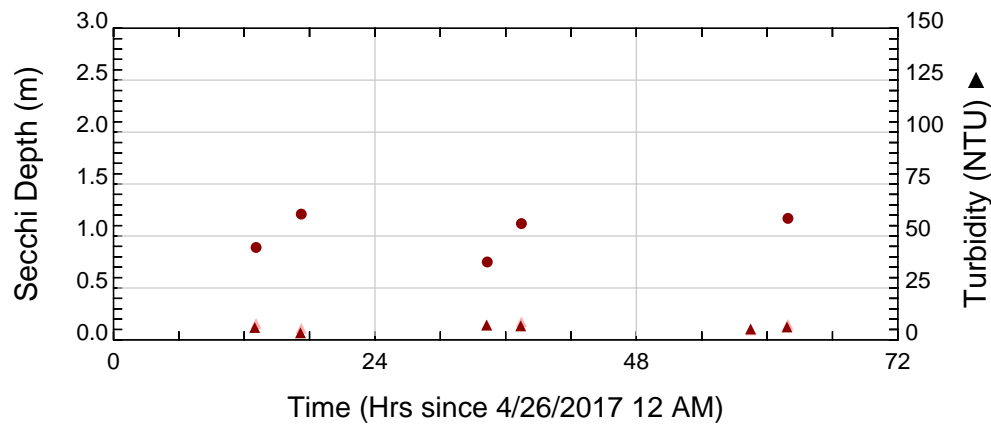
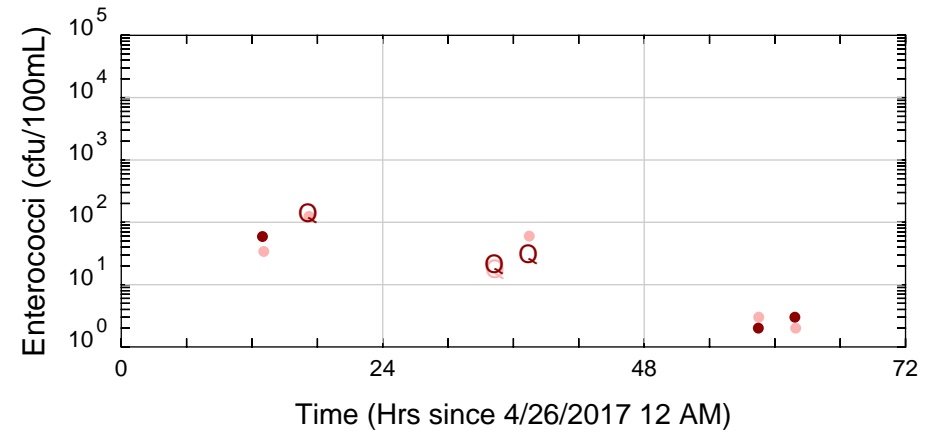
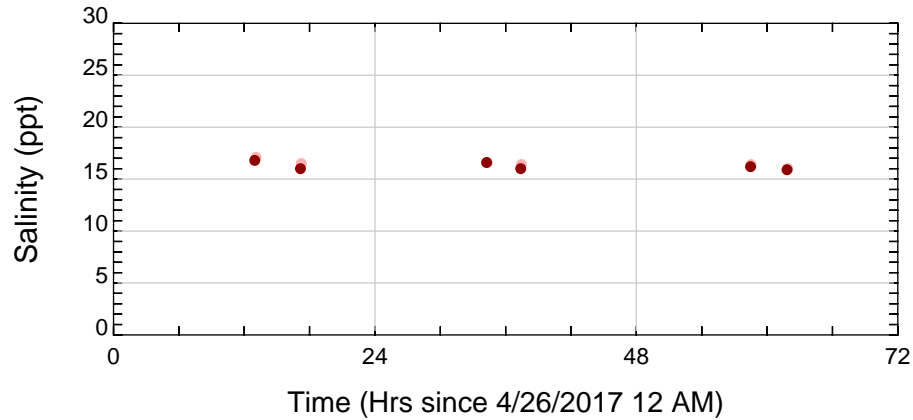
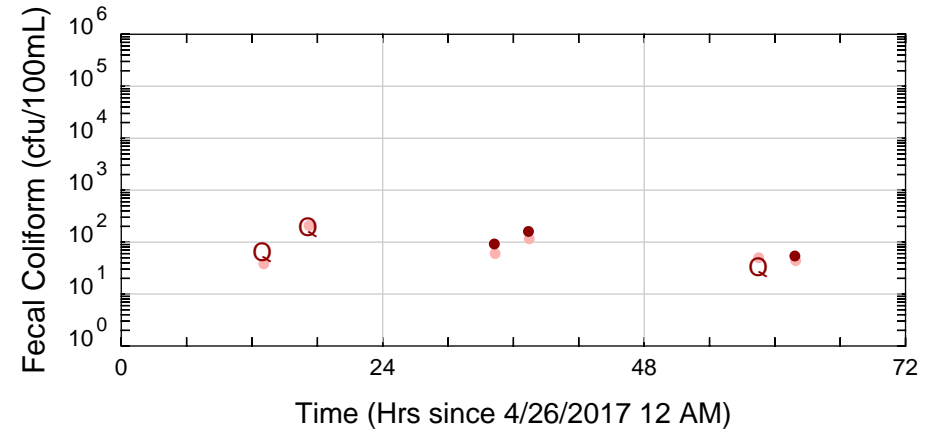
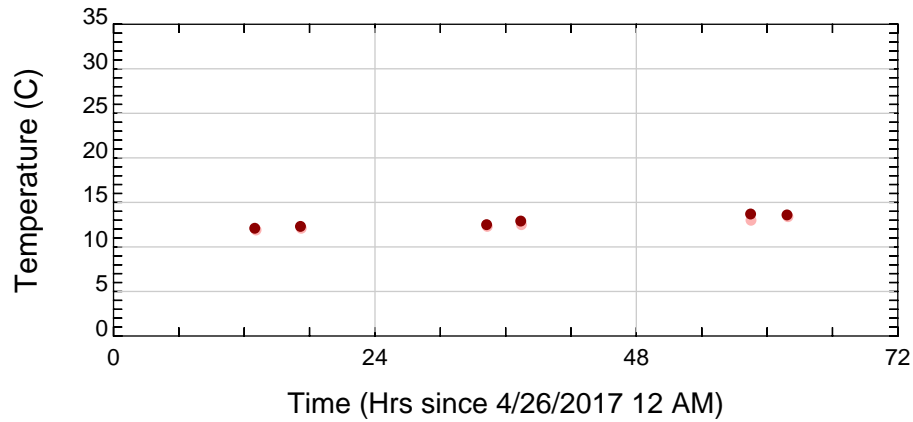
Newark Bay & Tributaries, Newark Bay, 18, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



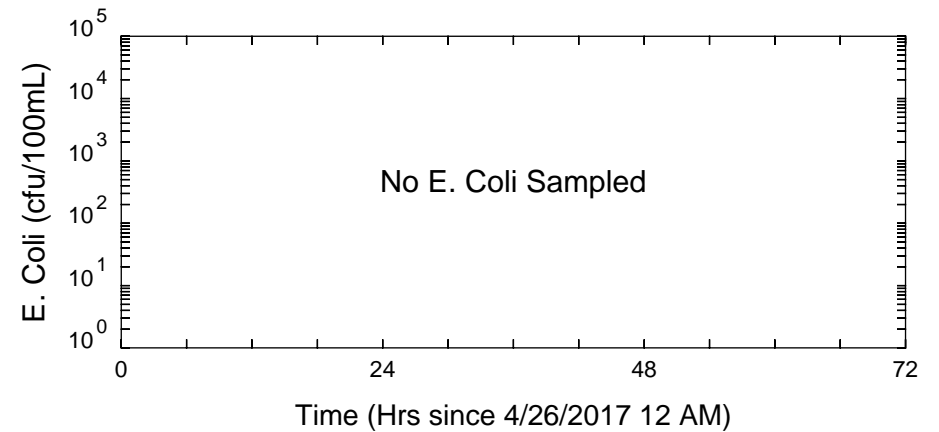
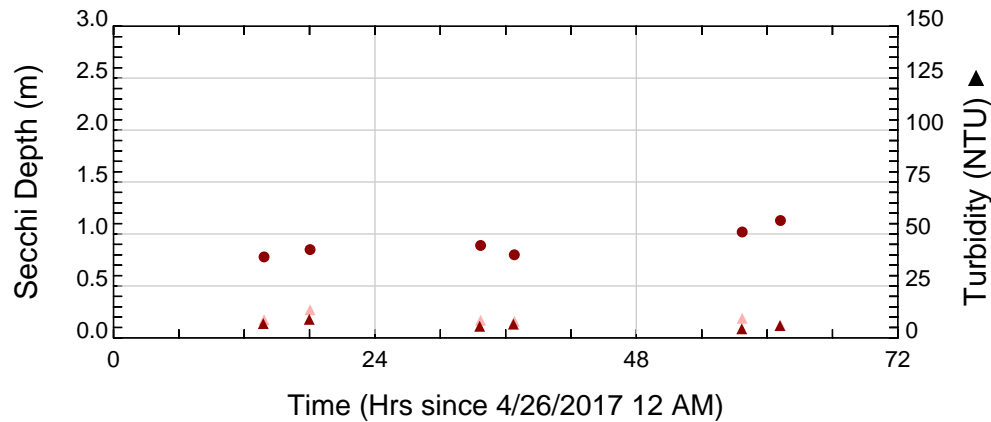
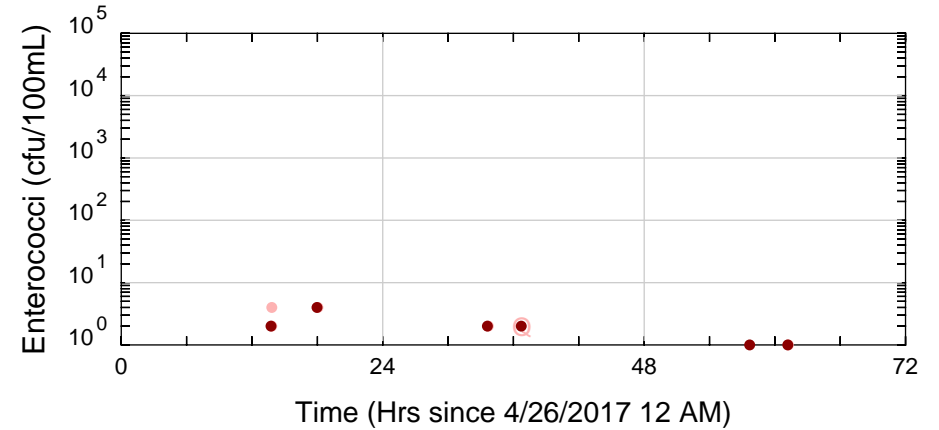
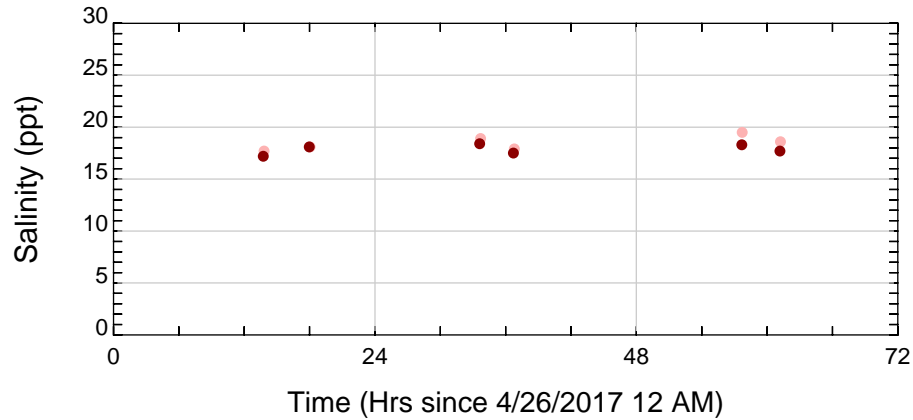
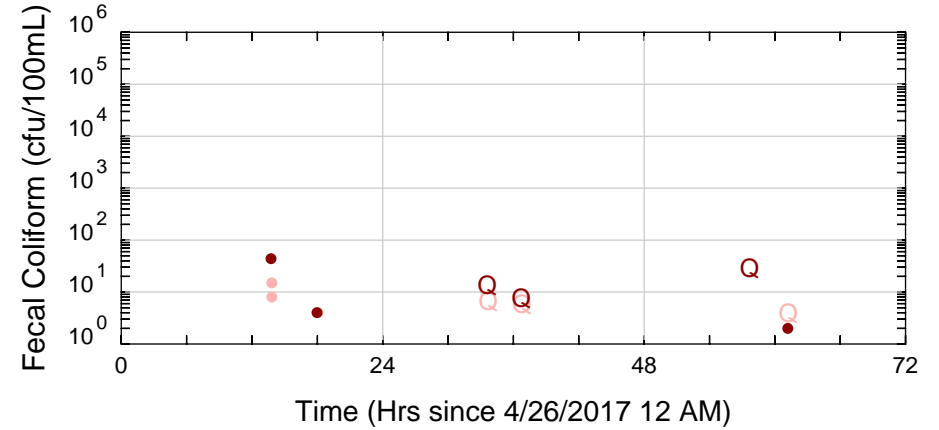
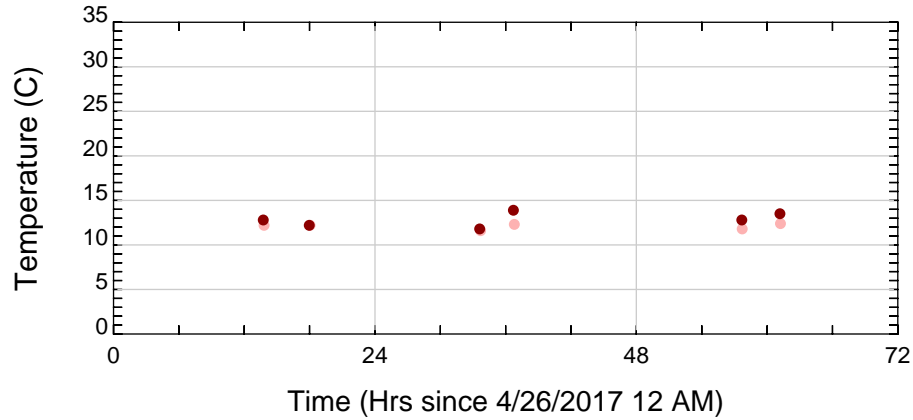
Arthur Kill, Raritan River/Bay & Tributaries, Arthur Kill, 24, (SE3)

- ● Surface/Mid-depth HDR
- ● ● Surface/Mid/Bottom NJHDG



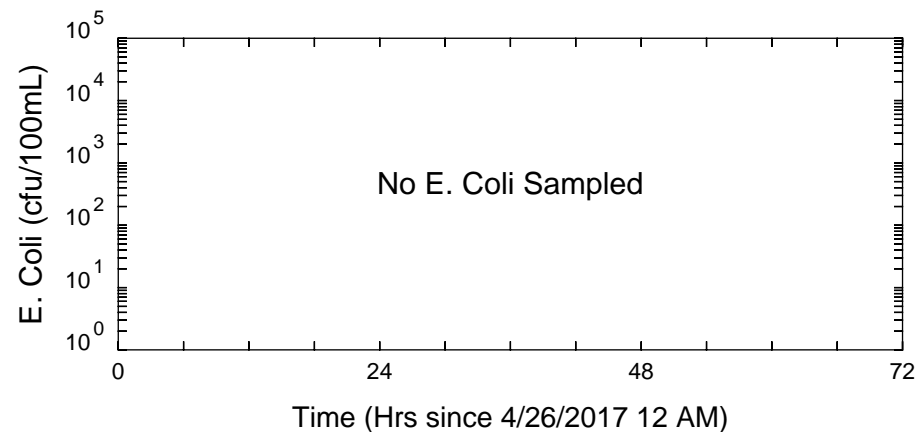
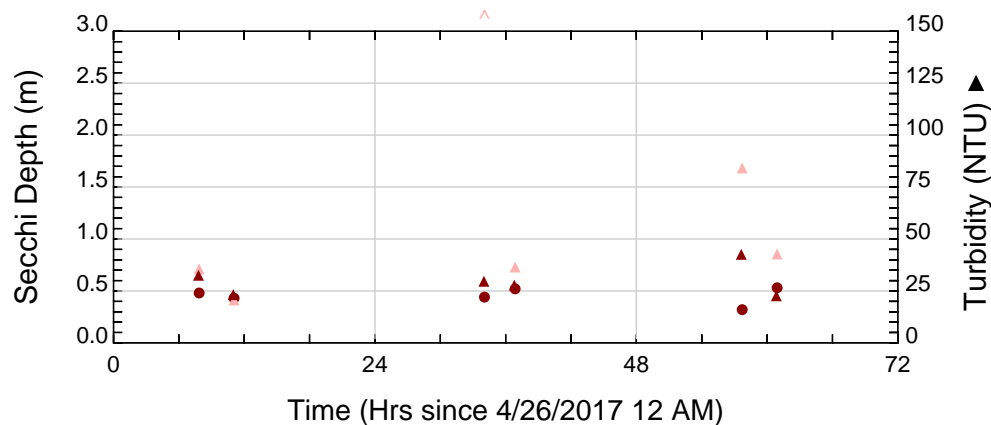
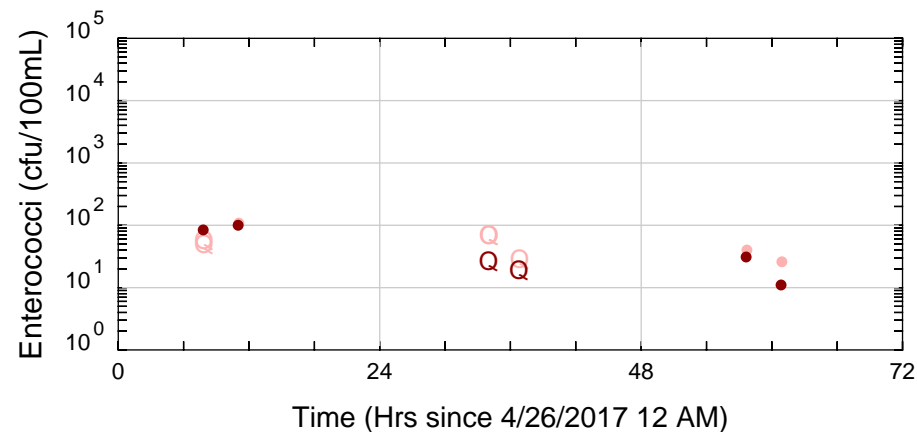
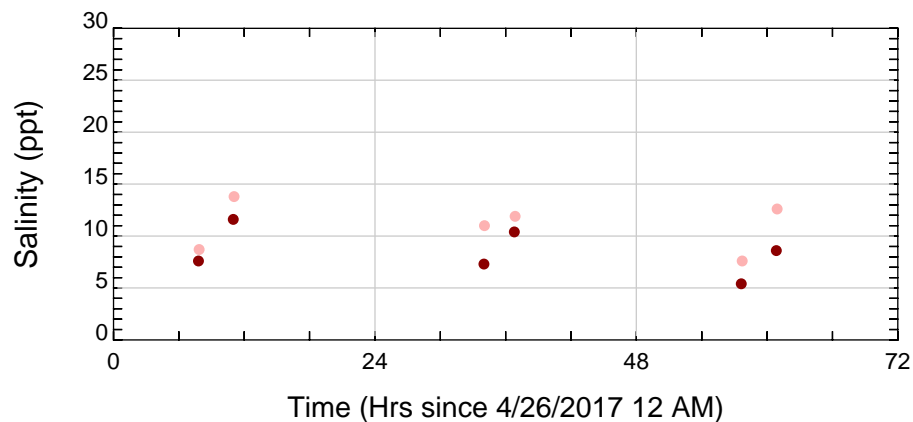
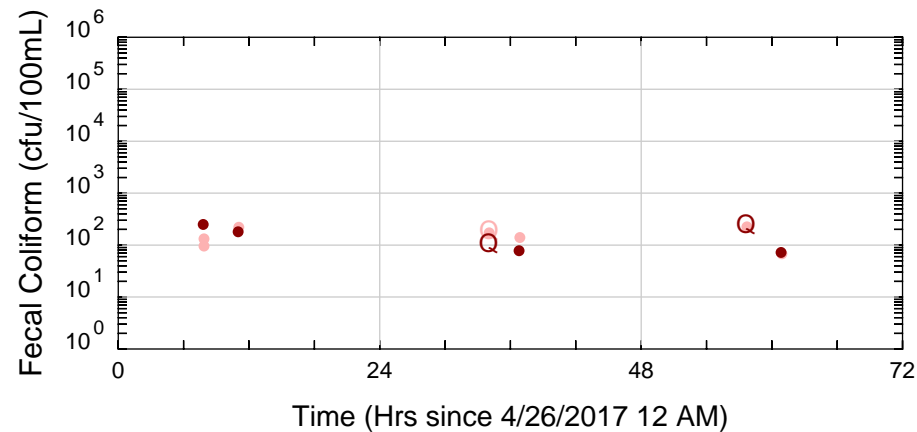
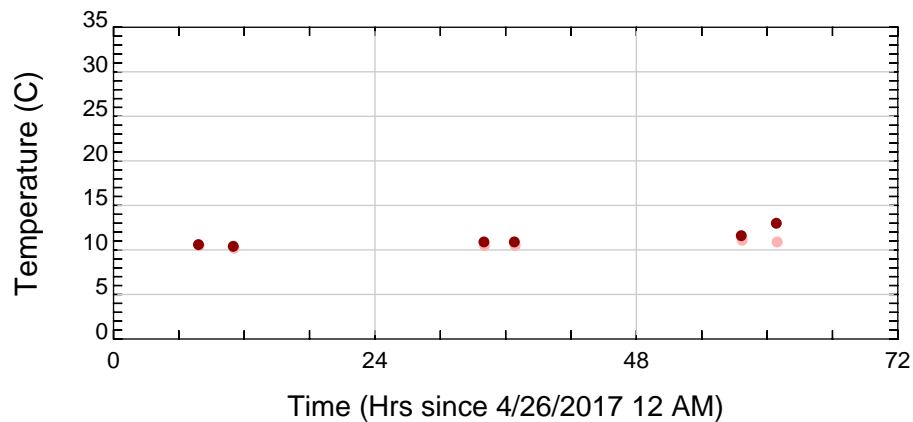
Arthur Kill, Raritan River/Bay & Tributaries, Raritan Bay, 29, (Shellfish)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



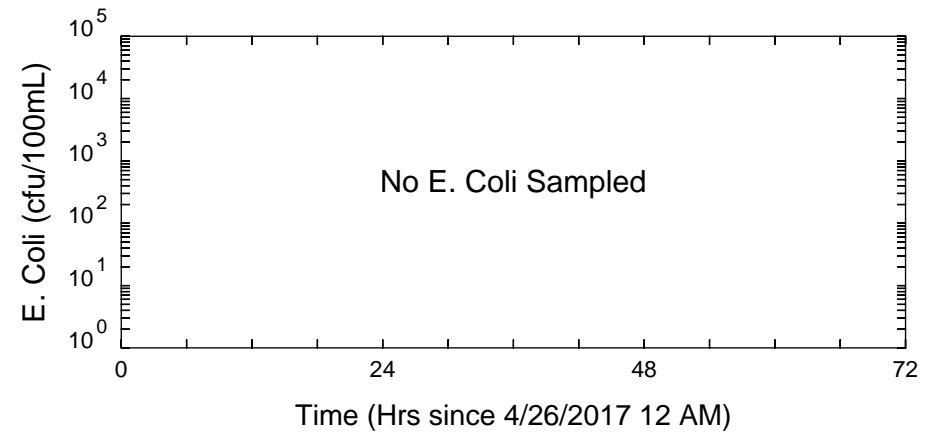
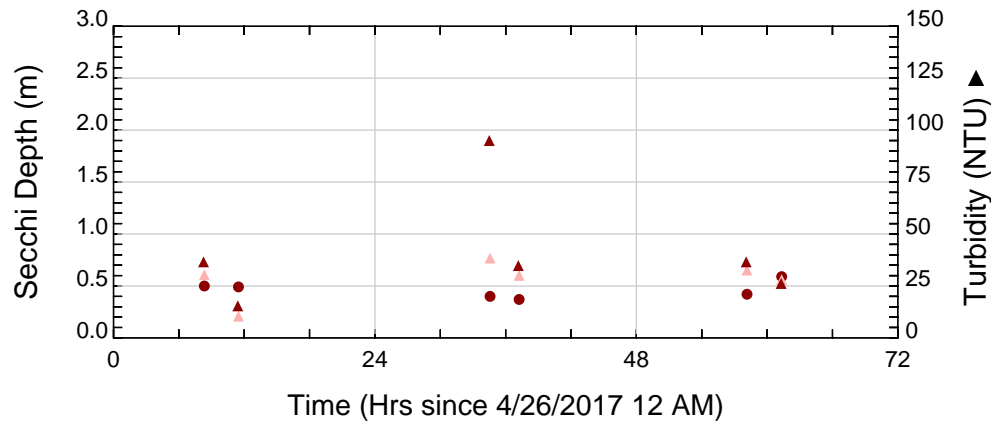
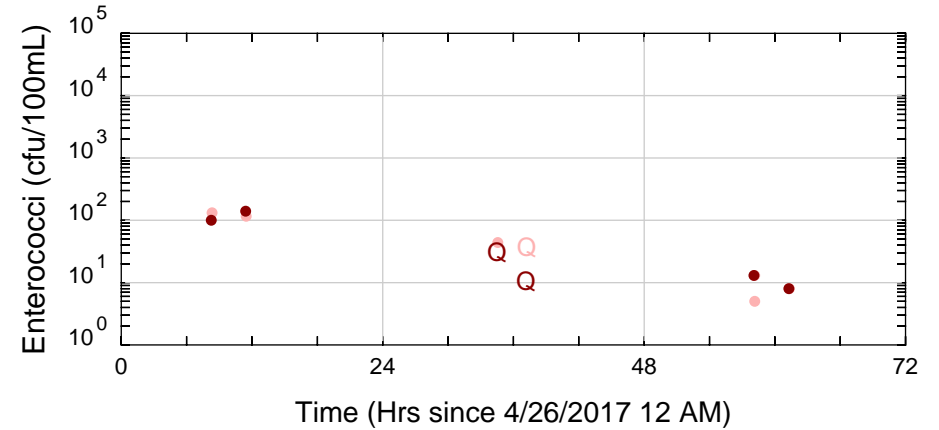
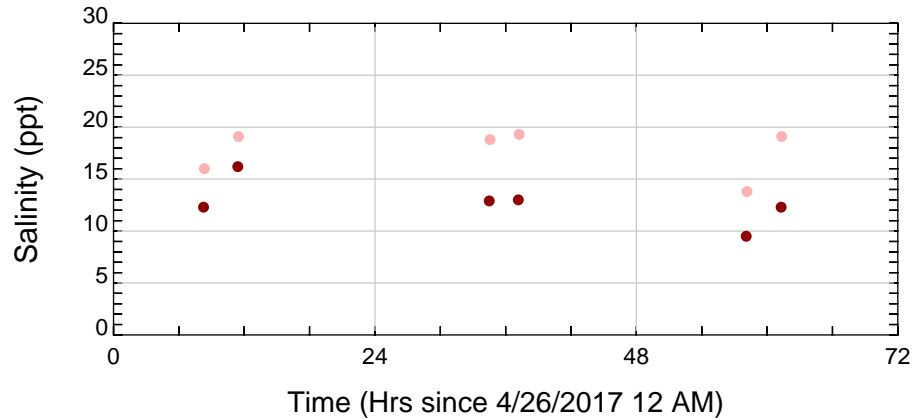
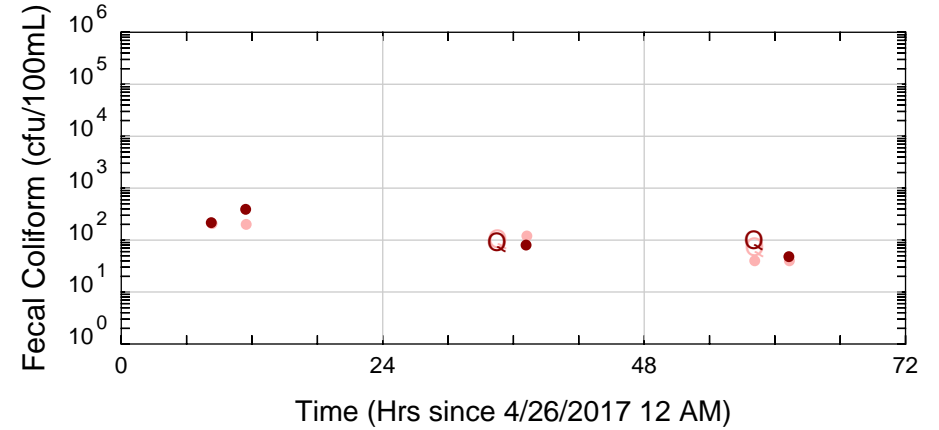
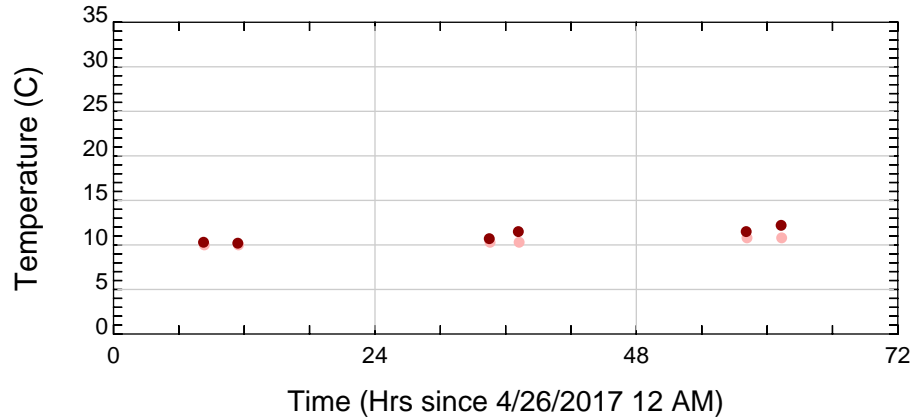
Hudson River, Upper Bay, Hudson River, 31, (SE2)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



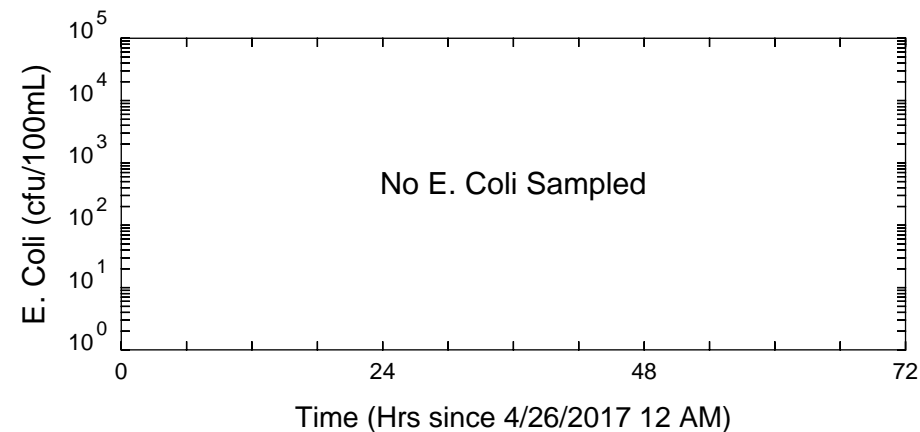
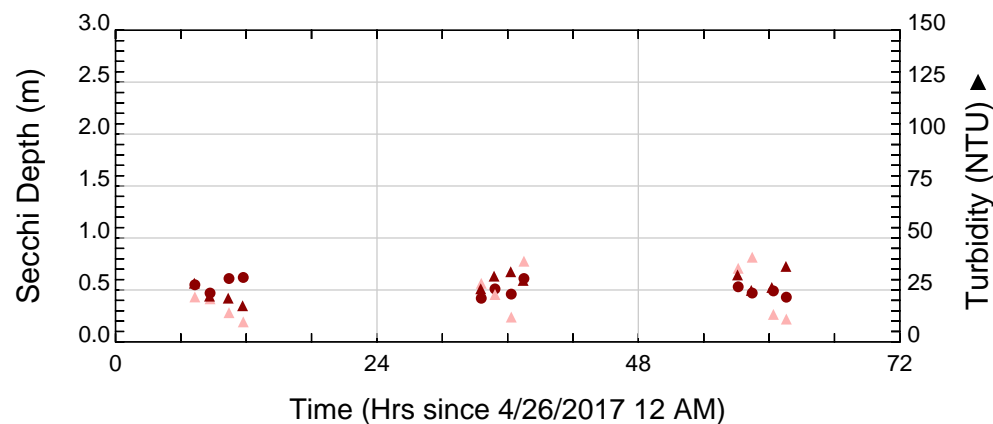
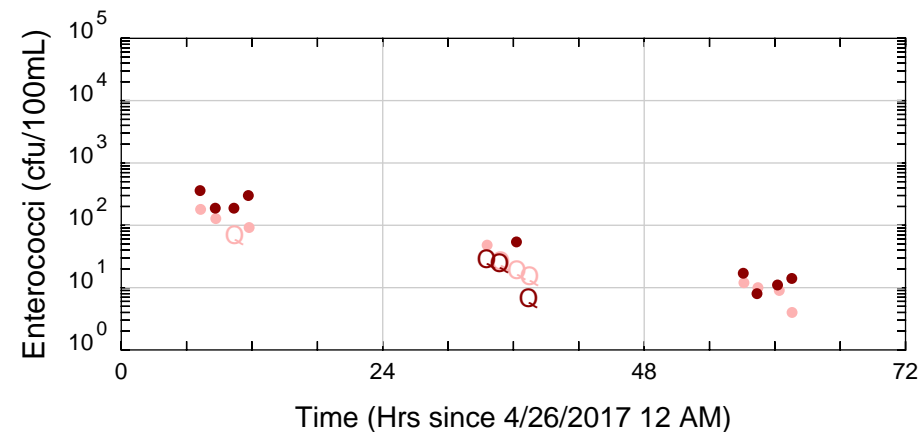
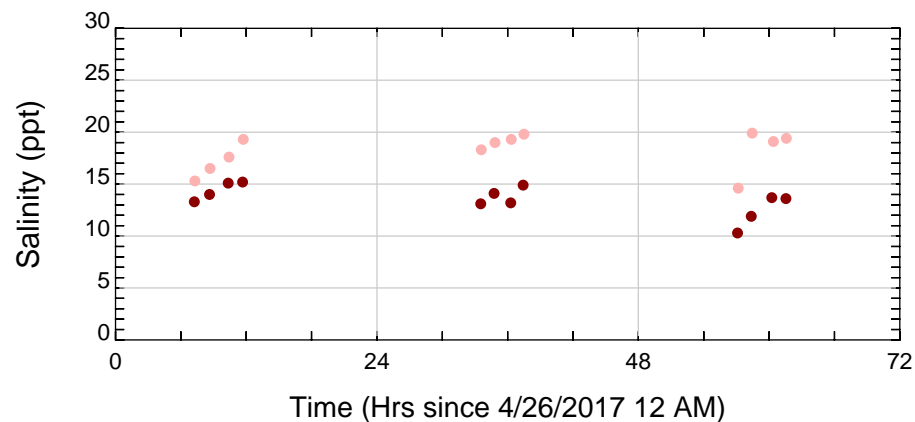
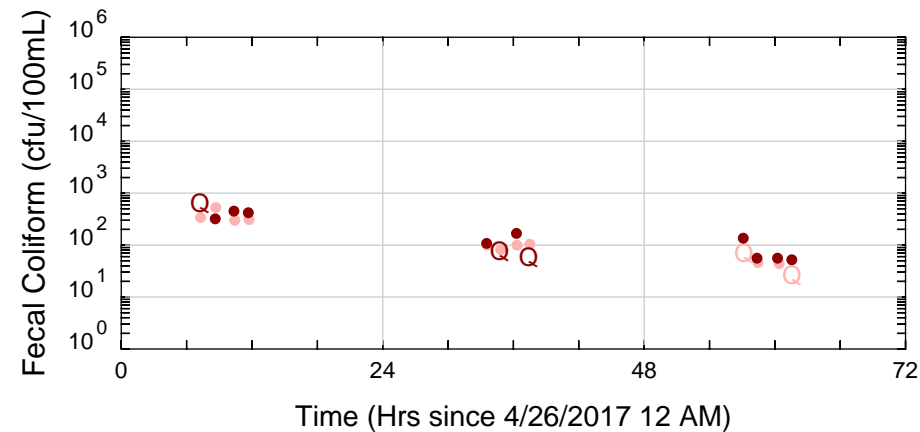
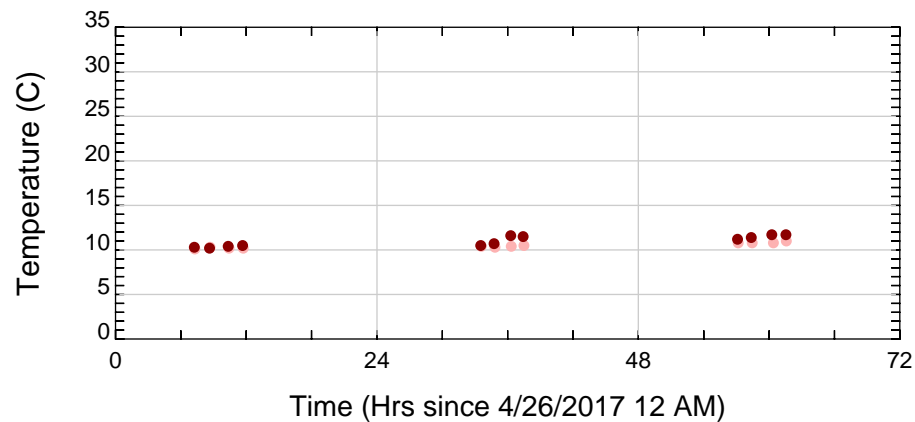
Hudson River, Upper Bay, Hudson River, 32, (SE2)

- ● Surface/Mid-depth HDR
- ● ● Surface/Mid/Bottom NJHDG



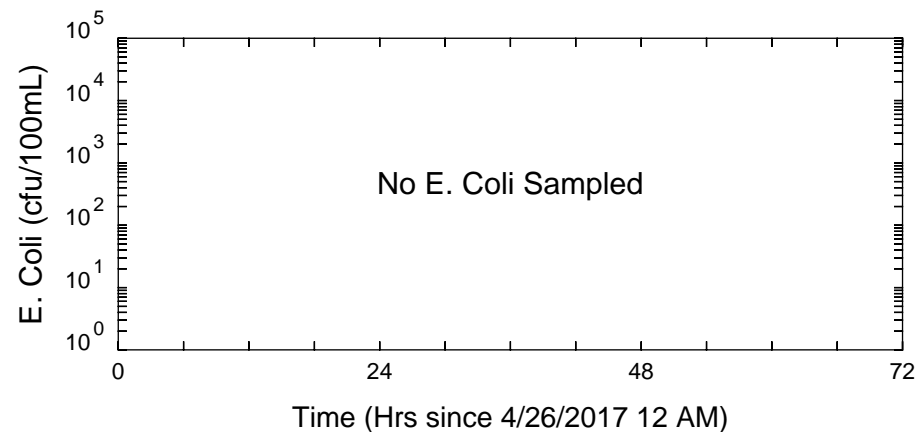
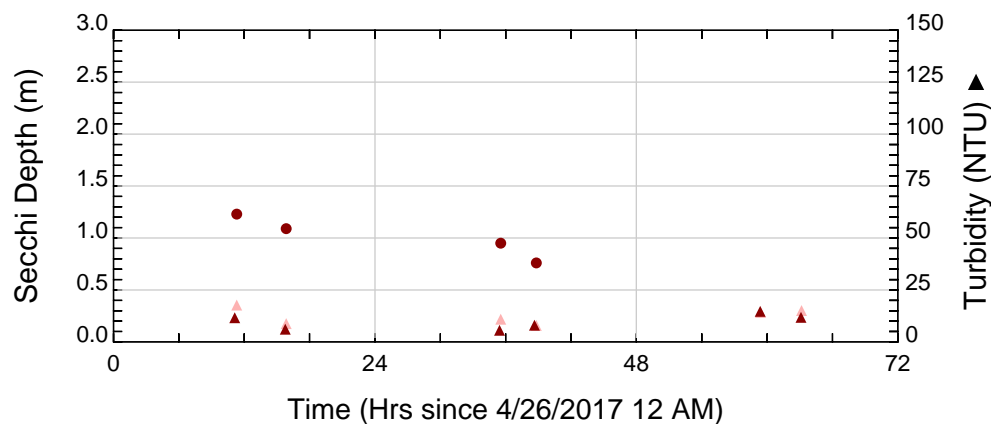
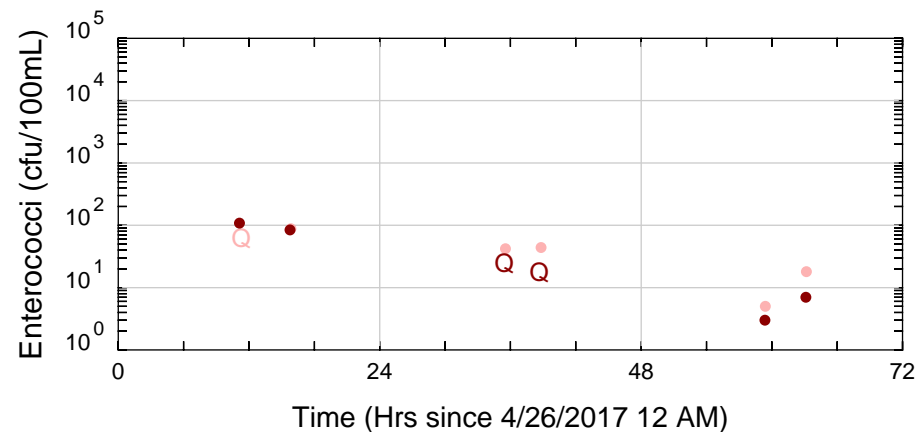
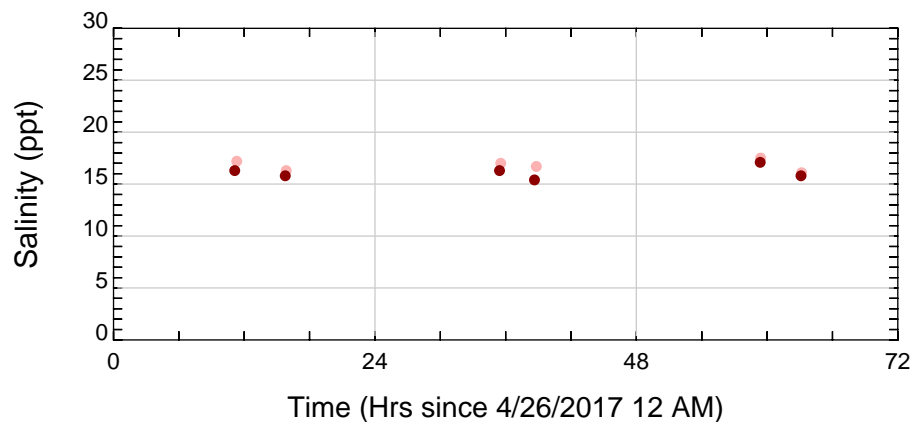
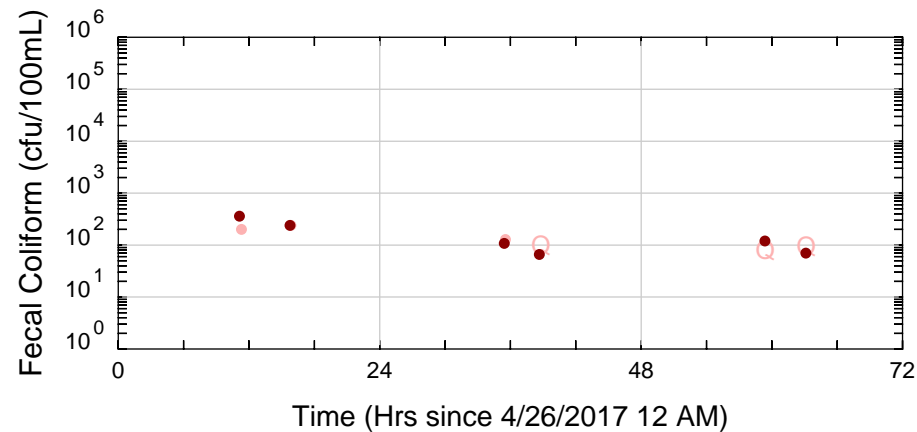
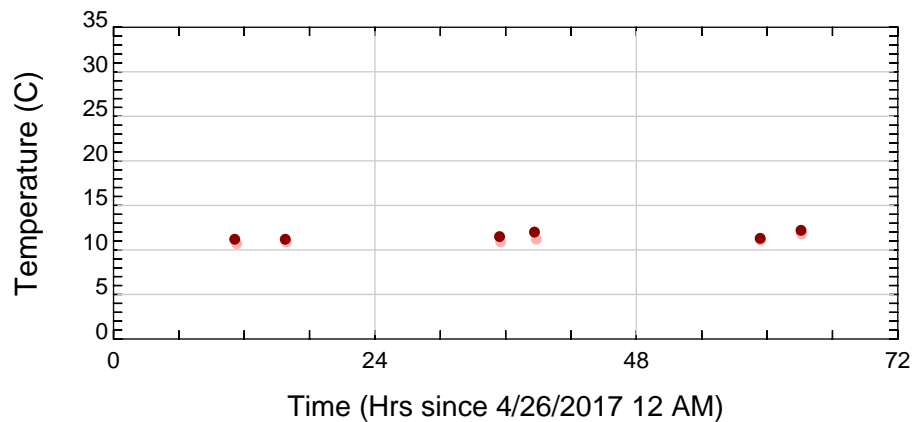
Hudson River, Upper Bay, Hudson River, 33, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



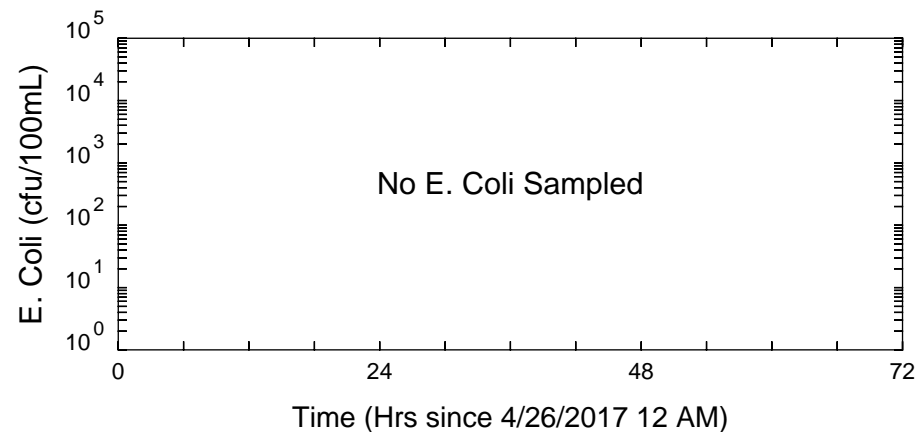
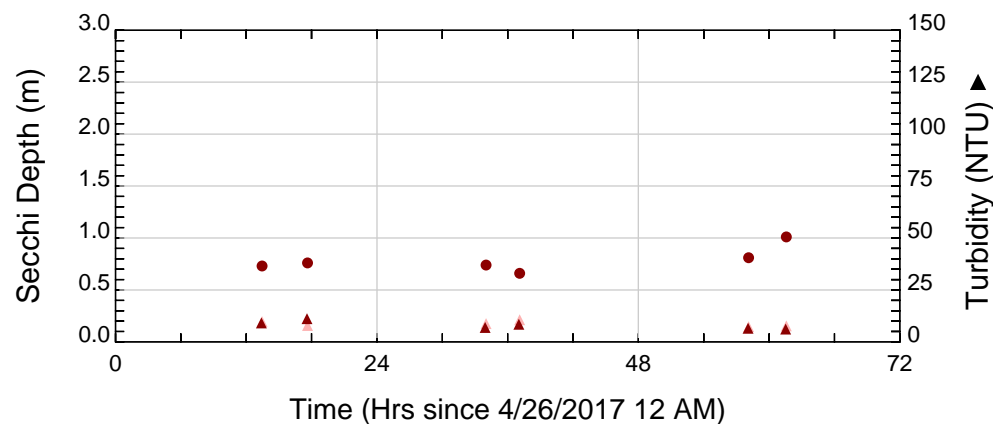
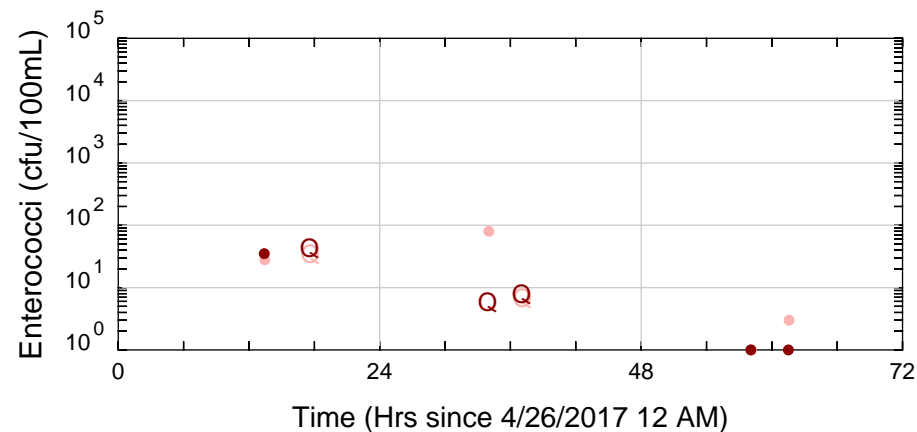
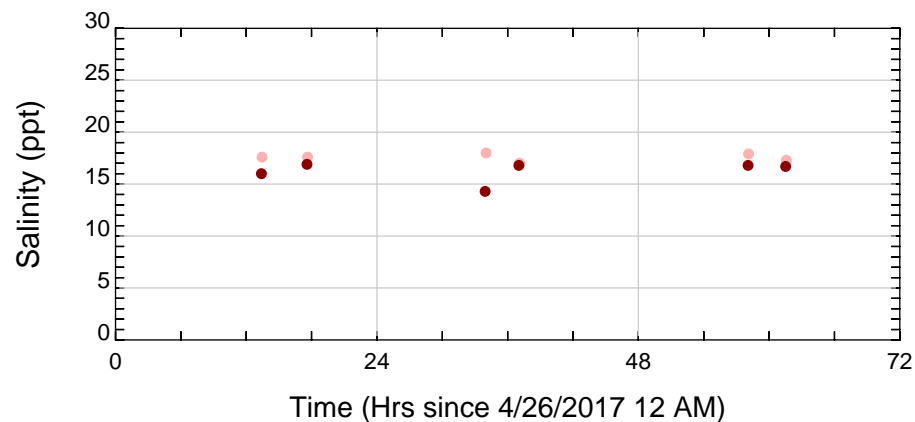
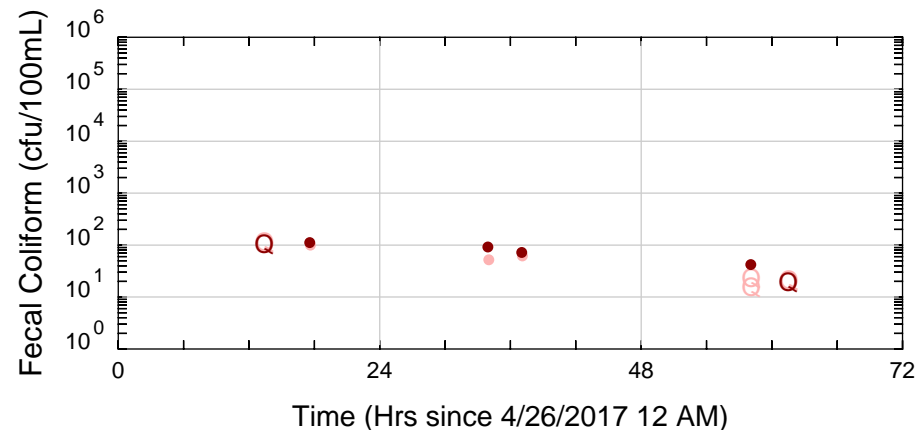
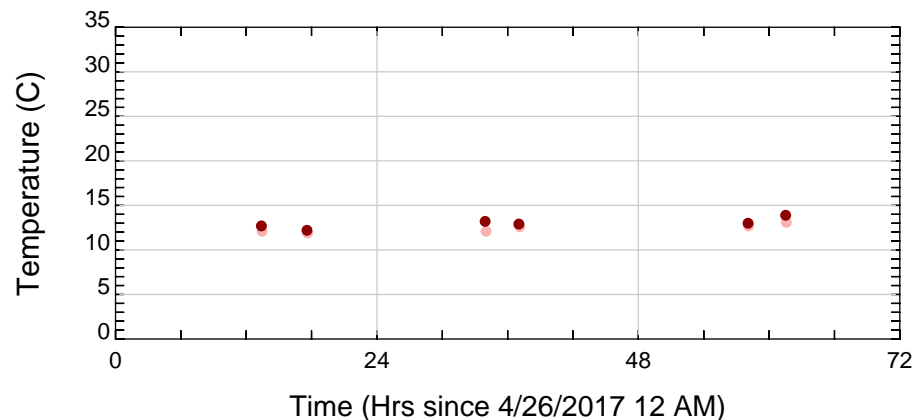
Hudson River, Upper Bay, Kill Van Kull, B12, (SE3)

- ● Surface/Mid-depth HDR
- ● ● Surface/Mid/Bottom NJHDG



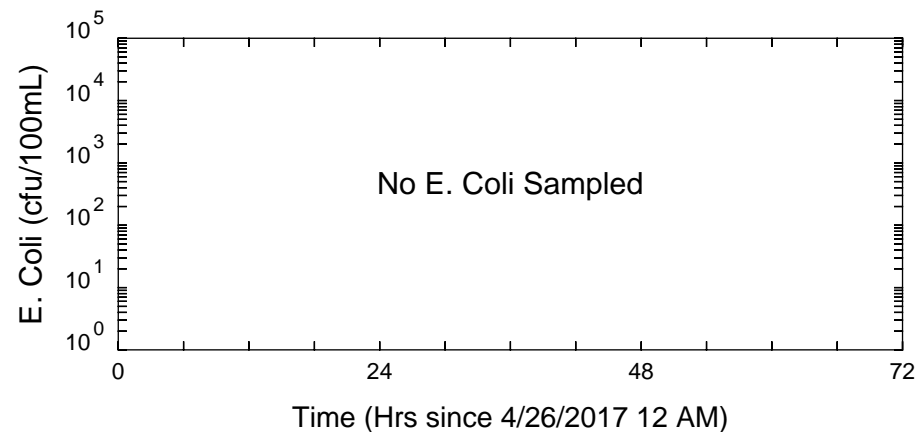
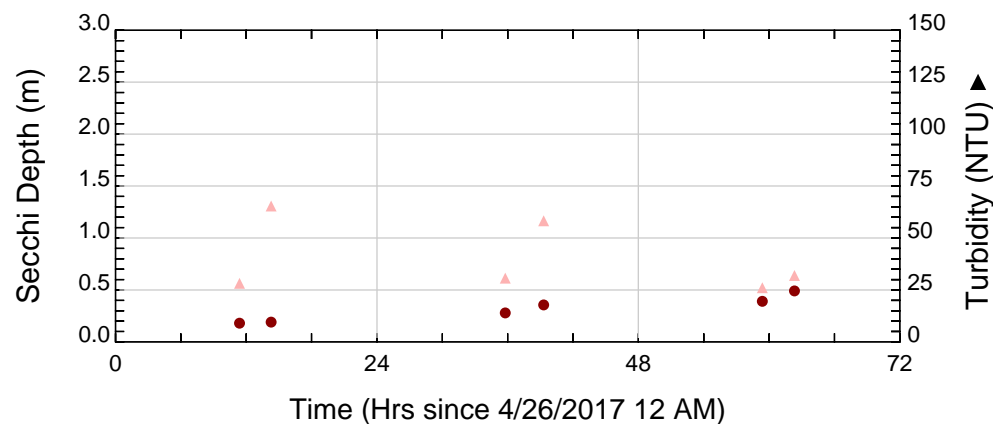
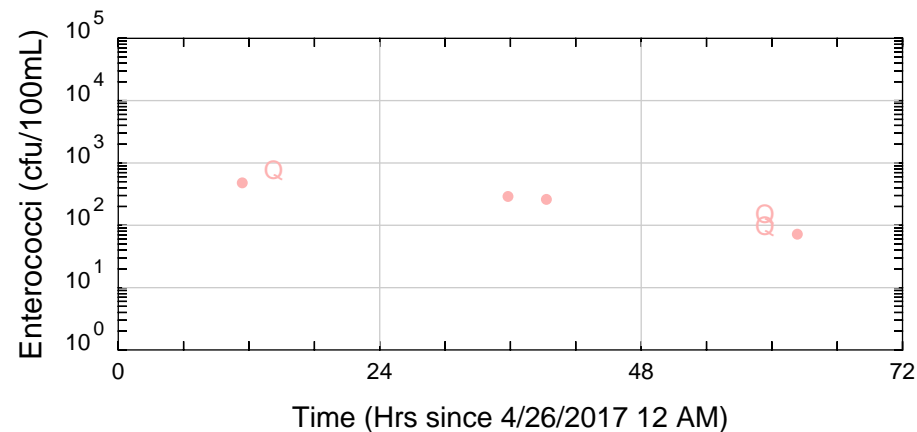
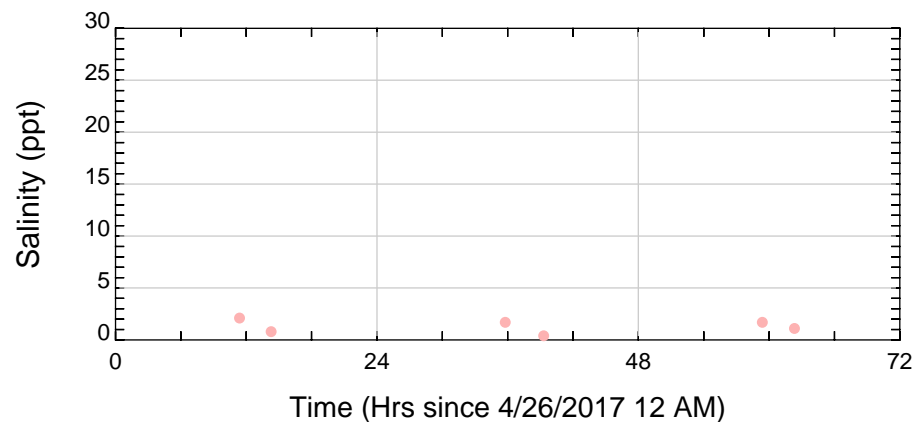
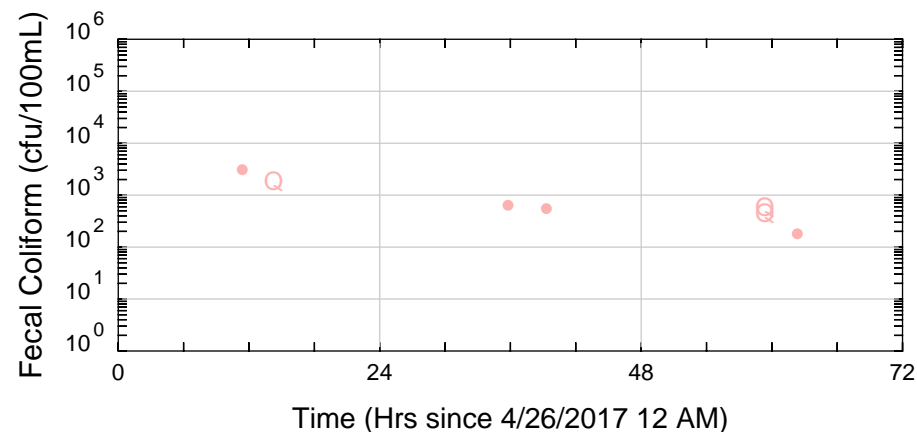
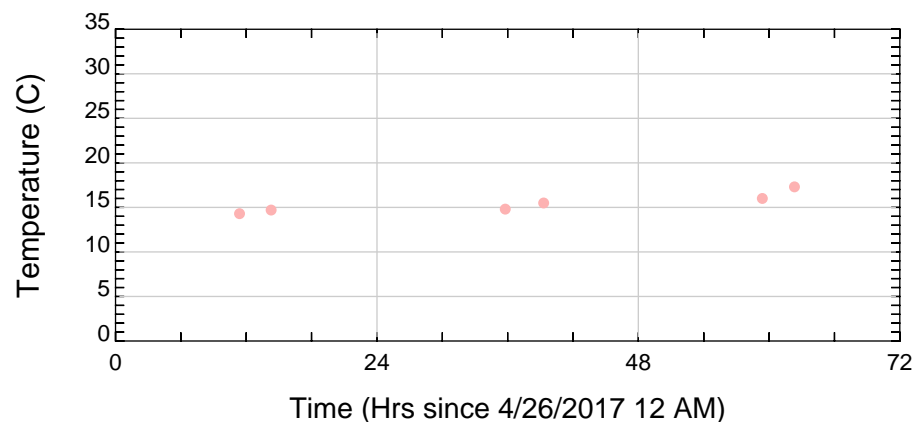
Arthur Kill, Raritan River/Bay & Tributaries, Arthur Kill, B15, (SE2)

- ● Surface/Mid-depth HDR
- ● ● Surface/Mid/Bottom NJHDG



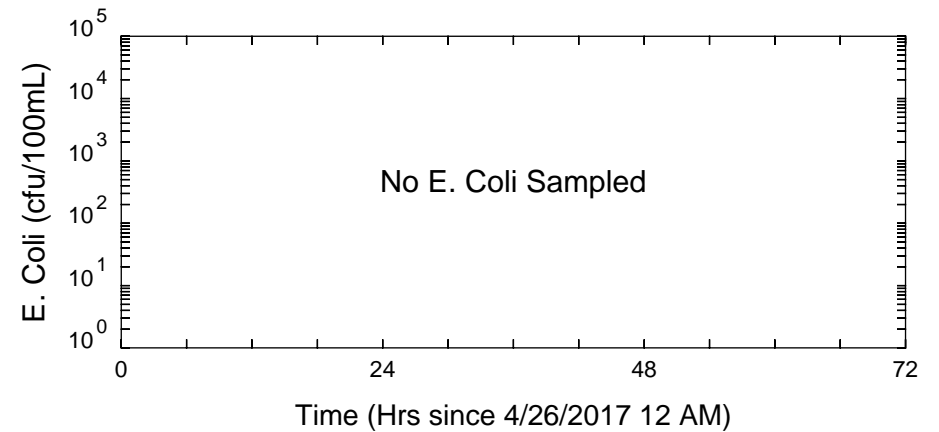
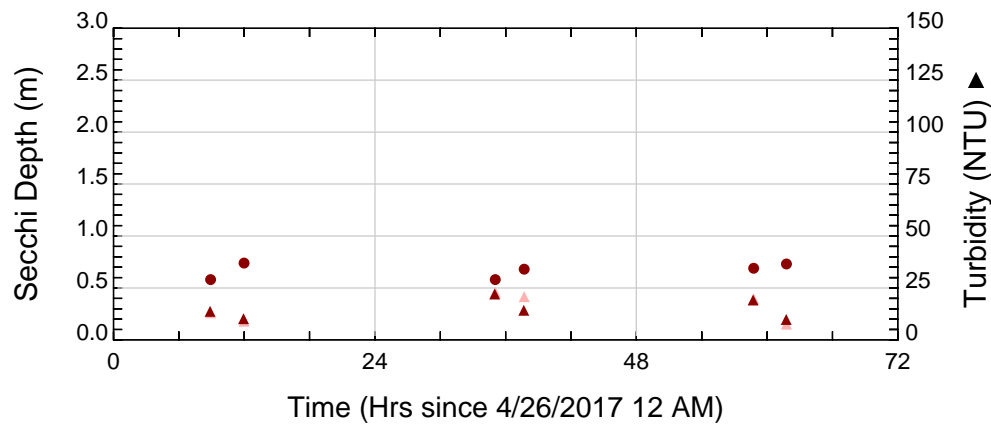
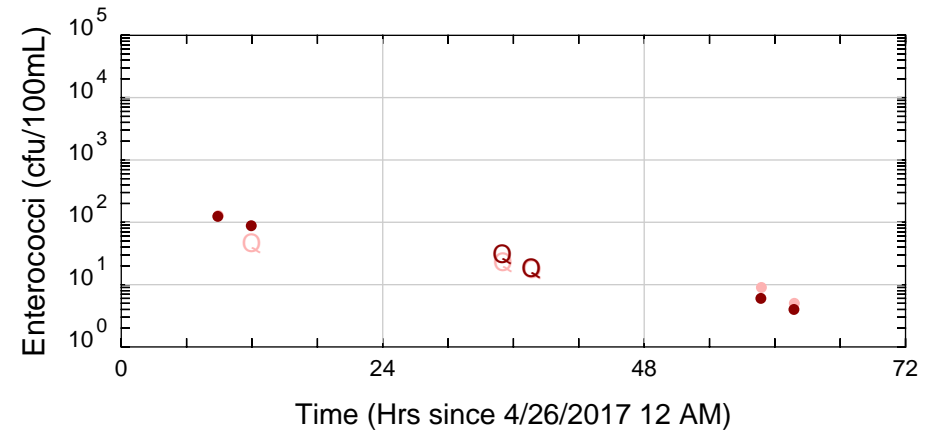
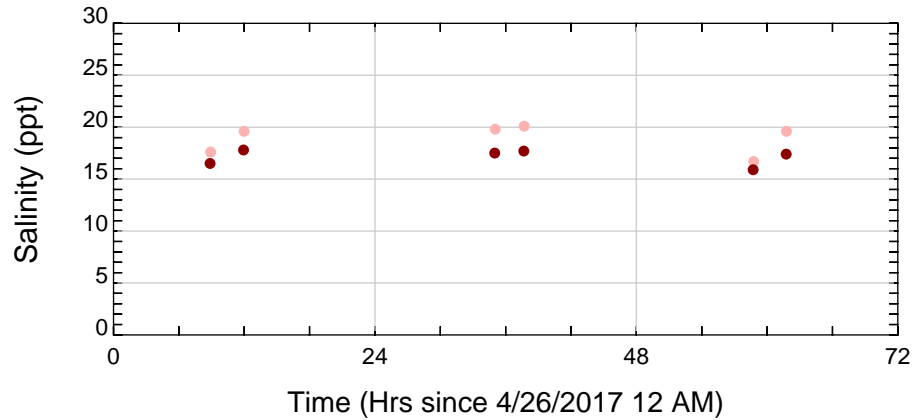
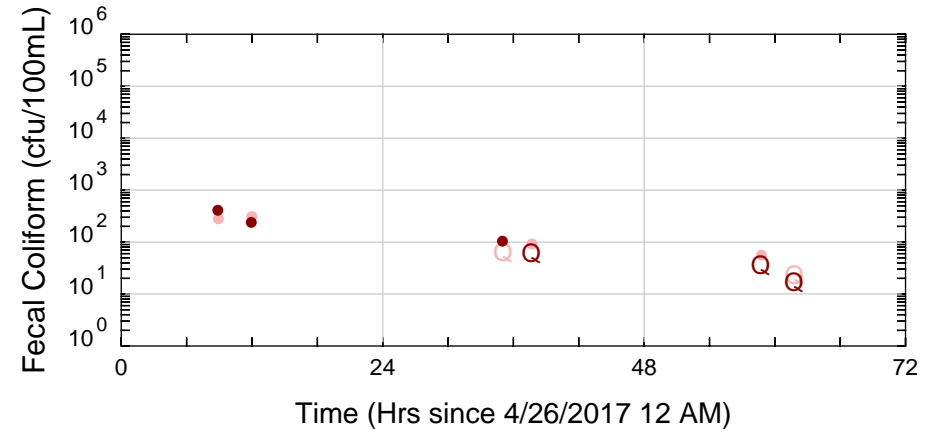
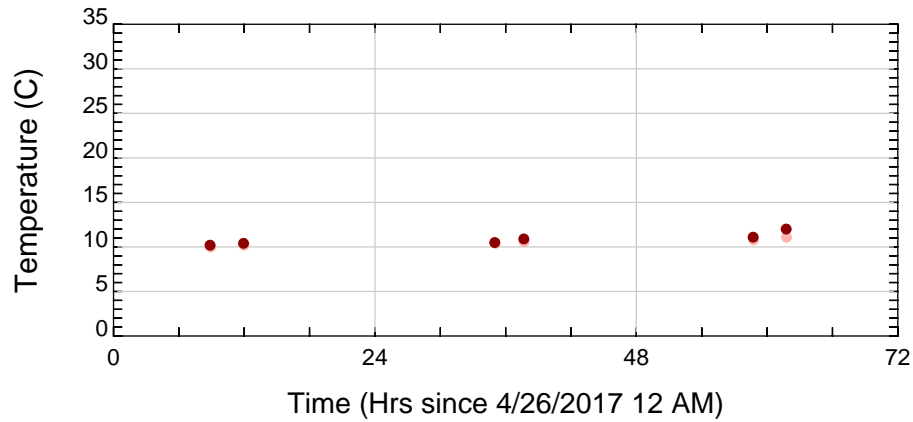
Hackensack River & Tributaries, Hackensack River, B2, (SE1)

● ● Surface/Mid-depth HDR
● ● Surface/Mid/Bottom NJHDG



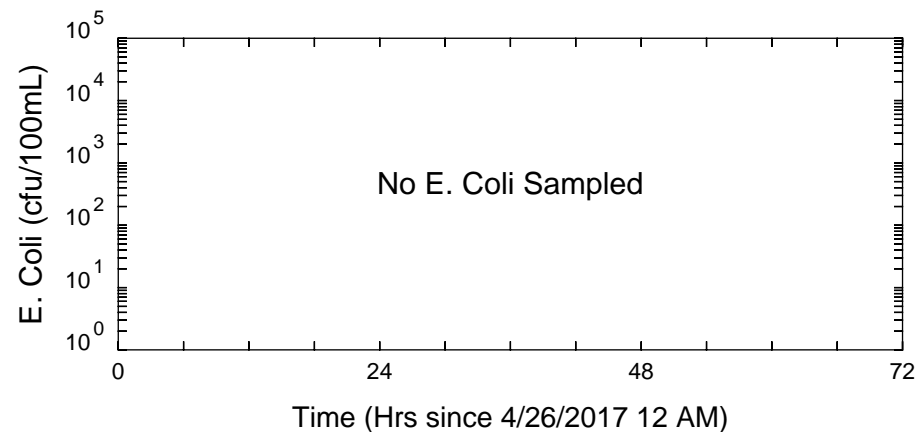
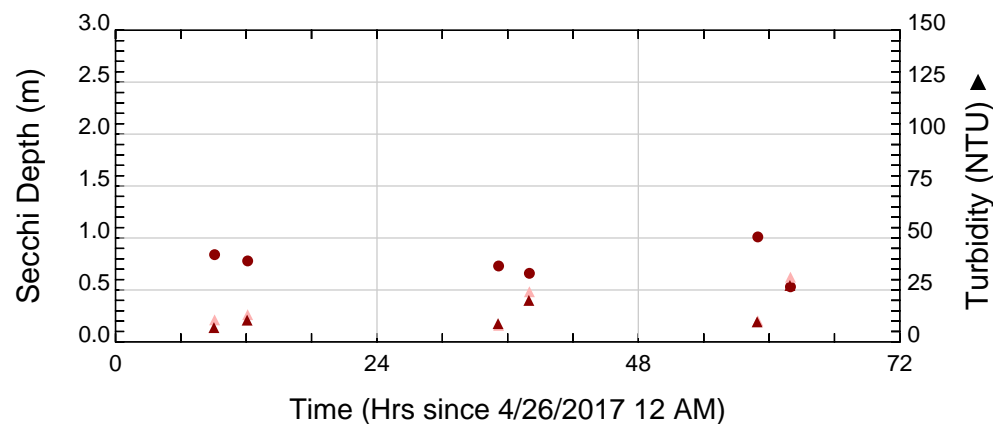
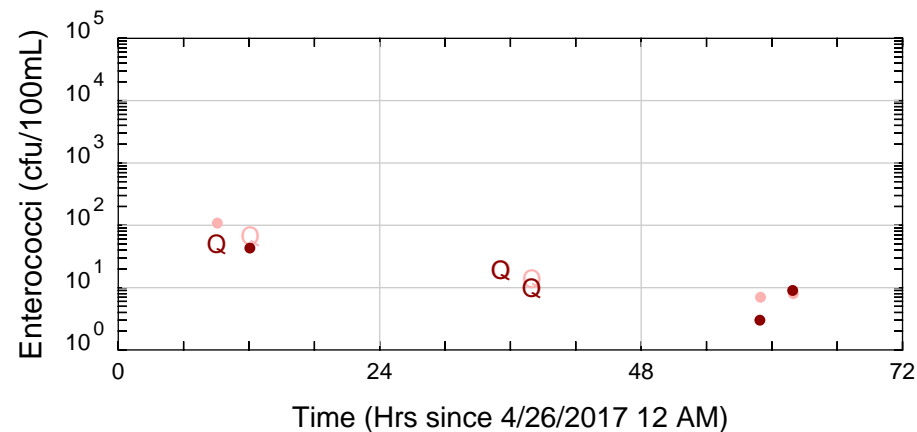
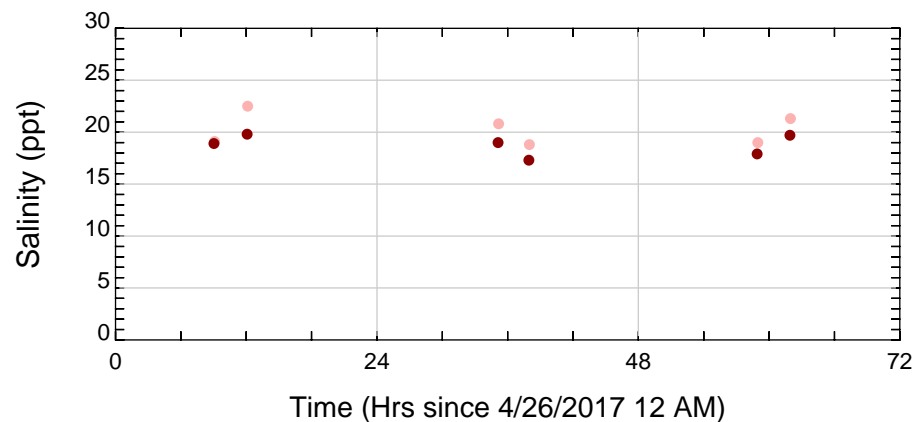
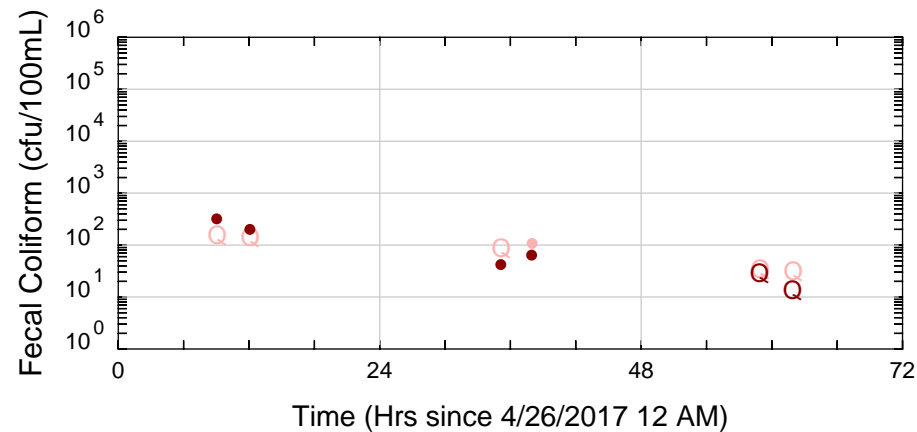
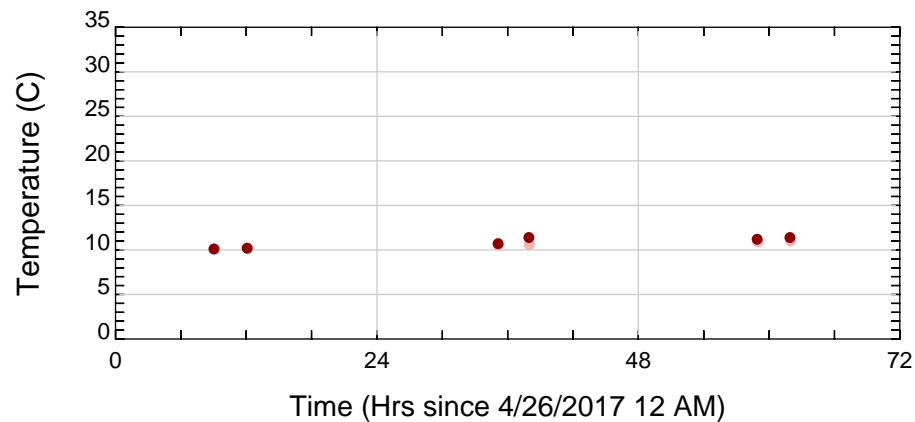
Hudson River, Upper Bay, Upper Bay, B26, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



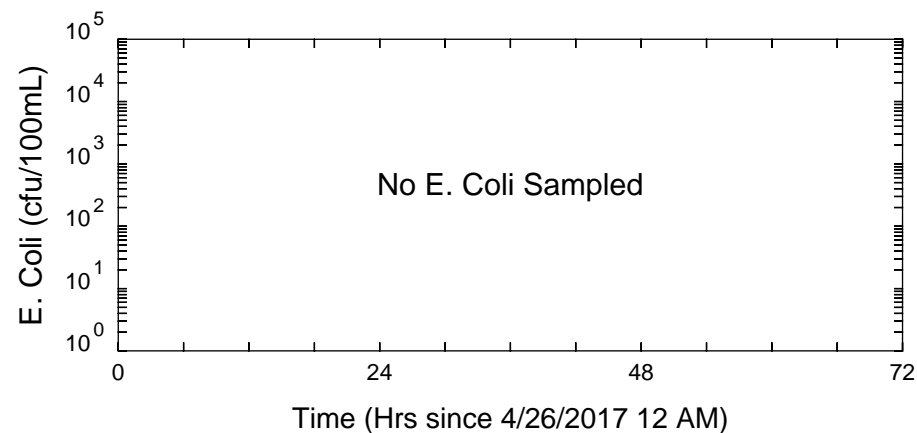
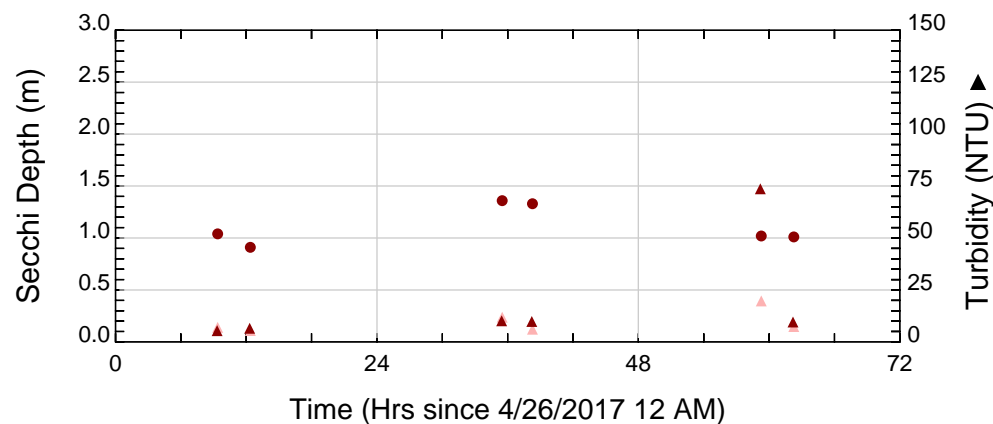
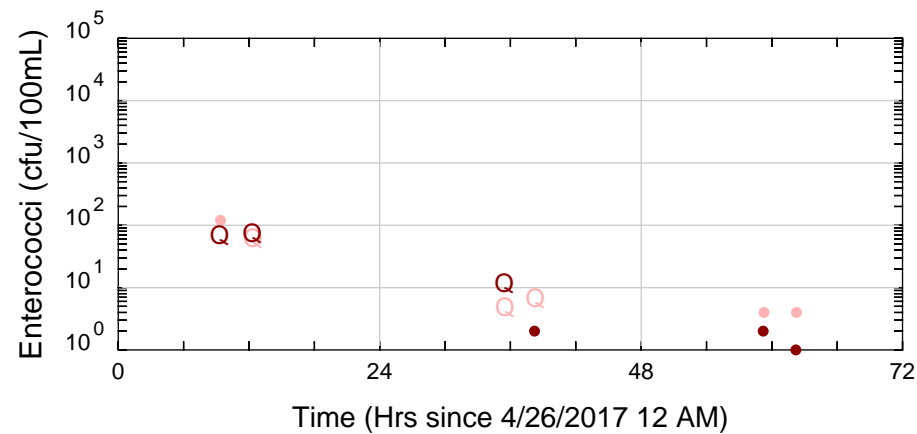
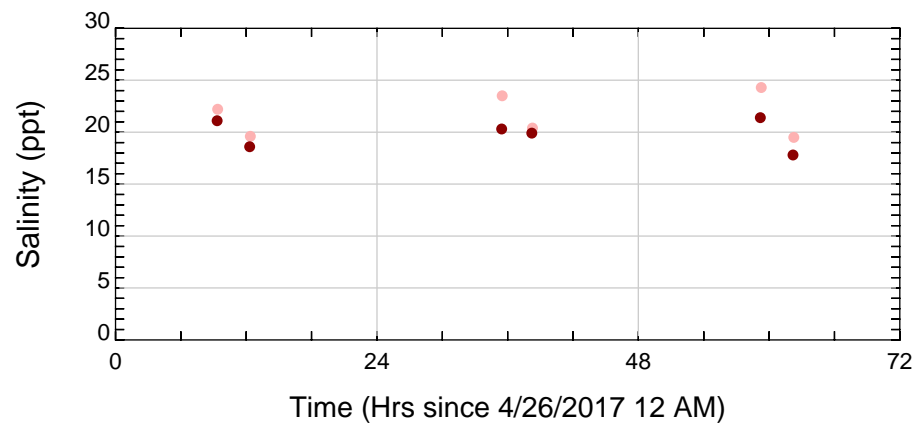
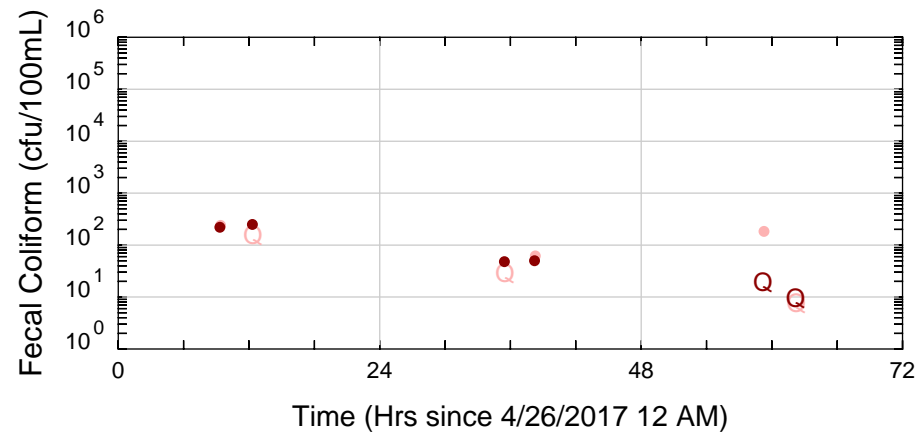
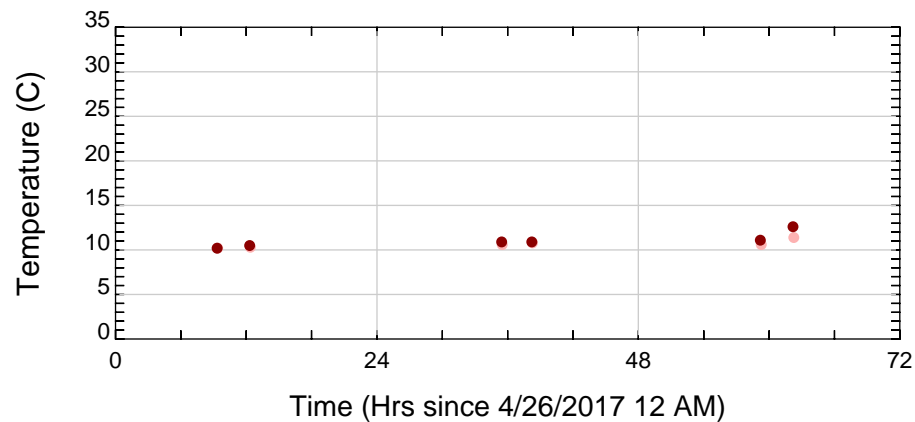
Hudson River, Upper Bay, Upper Bay, B27, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



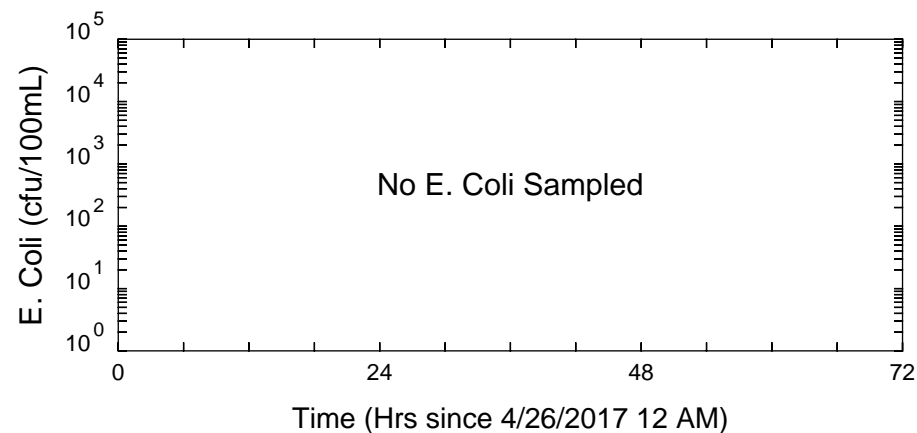
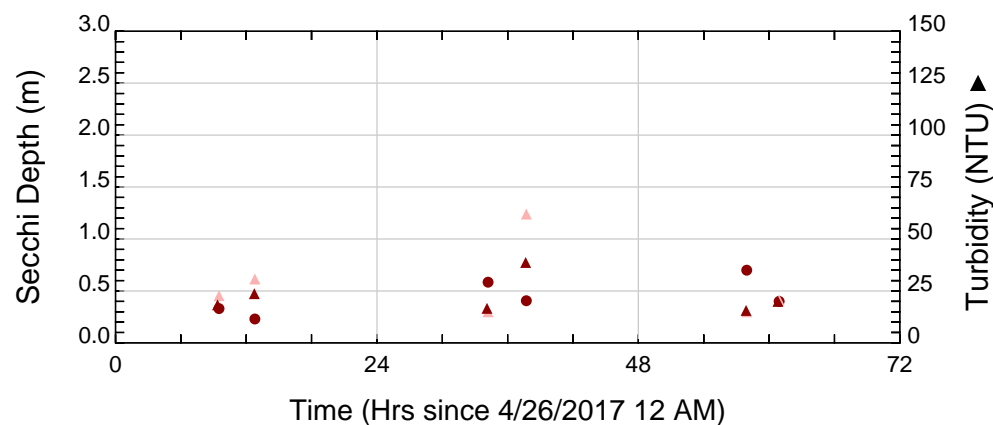
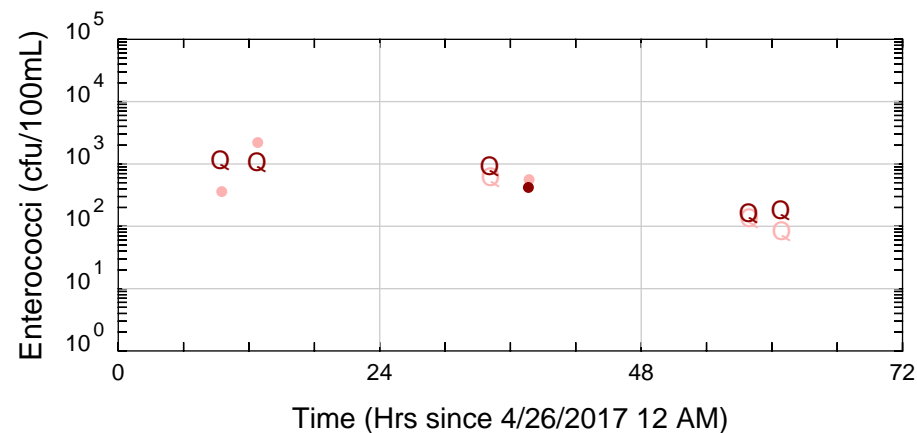
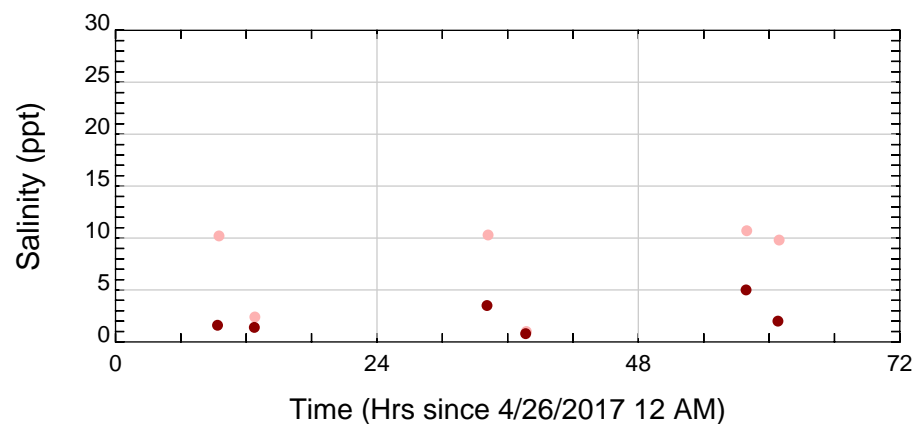
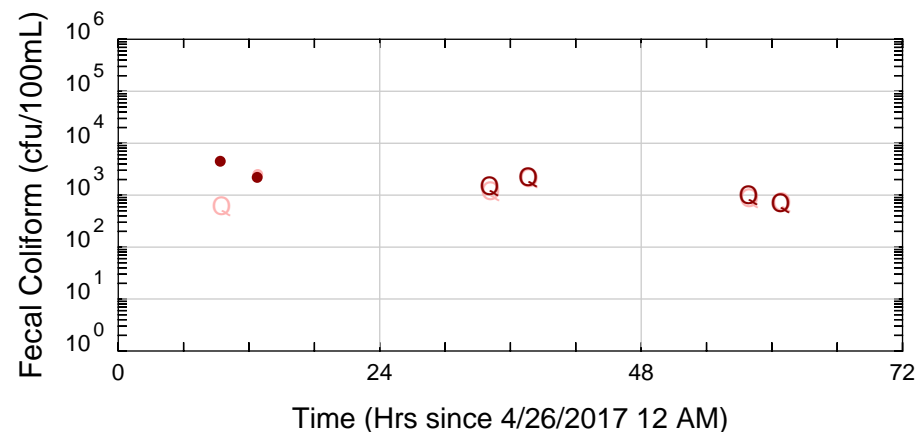
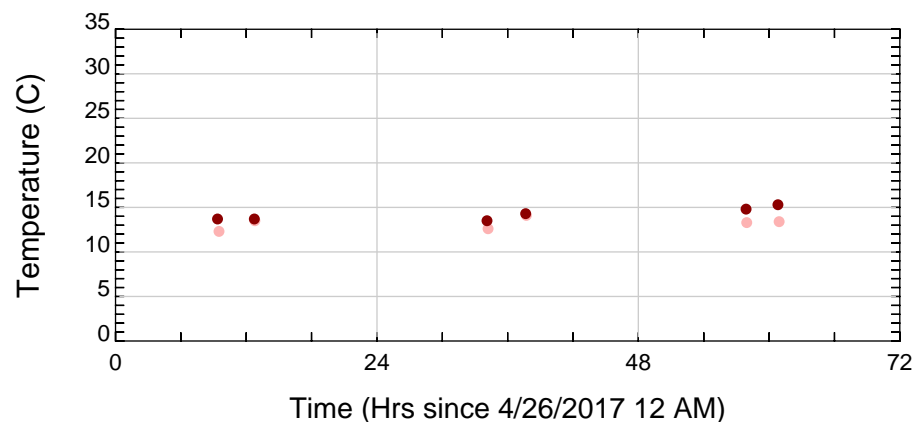
Hudson River, Upper Bay, Upper Bay, B28, (SE2)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



Passaic River & Tributaries, Passaic River, B6, (SE3)

- ● Surface/Mid-depth HDR
- ● Surface/Mid/Bottom NJHDG



ATTACHMENT 4 – COMMENT LETTER FROM NJDEP



State of New Jersey

PHIL MURPHY
Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Mail Code – 401-02B

CATHERINE R. McCABE
Commissioner

SHEILA OLIVER
Lt. Governor

Water Pollution Management Element
Bureau of Surface Water Permitting
P.O. Box 420 – 401 E State St
Trenton, NJ 08625-0420
Phone: (609) 292-4860 / Fax: (609) 984-7938

September 7, 2018

To: Distribution List

Re: Technical Comments on “NJCSO Group Compliance Monitoring Program Report”

Passaic Valley Sewage Commission, NJPDES Permit No. NJ0021016
Bayonne City Municipal Utilities Authority, NJPDES Permit No. NJ0109240
Borough of East Newark, NJPDES Permit No. NJ0117846
Town of Harrison, NJPDES Permit No. NJ0108871
Jersey City Municipal Utilities Authority, NJPDES Permit No. NJ0108723
Town of Kearny, NJPDES Permit No. NJ0111244
City of Newark, NJPDES Permit No. NJ0108758
North Bergen Municipal Utilities Authority, NJPDES Permit No. NJ0108898
City of Paterson, NJPDES Permit No. NJ0108880
Joint Meeting of Essex and Union, NJPDES Permit No. NJ0024741
Middlesex County Utilities Authority, NJPDES Permit No. NJ0020141
North Bergen MUA Woodcliff STP, NJPDES Permit No. No. NJ0029084
Town of Guttenberg, NJPDES Permit No. NJ0108715
North Hudson Sewage Authority – Adams Road STP, NJPDES Permit No. NJ0026085
North Hudson Sewage Authority - River Road STP, NJPDES Permit No. NJ0025321
Borough of Fort Lee, NJPDES Permit No. NJ0034517
City of Hackensack, NJPDES Permit No. NJ0108766
Ridgefield Park Village, NJPDES Permit No. NJ0109118
City of Elizabeth, NJPDES Permit No. NJ0108782
City of Perth Amboy, NJPDES Permit No. NJ0156132
Bergen County Utilities Authority, NJPDES Permit No. NJ0020028

Dear Permittees:

Thank you for your submission dated June 30, 2018 as submitted cooperatively by Passaic Valley Sewage Commission on behalf of the above referenced permittees. The Department acknowledges that the above referenced permittees have committed to submitting single, coordinated Long Term Control Plans for each of the respective hydraulically connected groups and this report represents all above permittees for the purposes of permit compliance. This letter serves to provide technical comments on your submission.

Regulatory Background

This Baseline Compliance Monitoring Program (BCMP) report was submitted in accordance with Part IV.D.3.d and Part IV.G.1.d.3 and 9 of your NJPDES CSO permit. This submission serves as a necessary element to the Long-Term Control Plan (LTCP) as due on June 1, 2020 for all the above referenced NJPDES permits. An excerpt of Part IV.G.9.a and Part IV.G.9.b is provided as follows to frame the review objectives of this letter:

9. Compliance Monitoring Program (CMP)

- “a. The monitoring information collected from the ambient baseline monitoring phase of the CMP, in accordance with D.3.a., will be compared to subsequent CMP events during and after LTCP implementation to evaluate the effectiveness of implemented CSO controls.
- b. The permittee shall implement a CMP adequate to: verify baseline and existing conditions, the effectiveness of CSO controls, compliance with water quality standards, and protection of designated uses. This CMP shall be conducted before, during and after implementation of the LTCP and shall include a work plan to be approved by the Department that details the monitoring protocols to be followed...”

The Department prepared technical guidance entitled “Receiving Waters Monitoring Work Plan Guidance for the CSO Program” (see <https://www.state.nj.us/dep/dwq/pdf/cso-receiving-water-mon-work-plan-guid-03-2015.pdf>). As required by Part IV.G.1.d.3 and 9.b above, a work plan was required and was submitted on December 30, 2015 (revised on February 19, 2016 and May 10, 2016) as entitled “Baseline Compliance Monitoring Program Quality Assurance Project Plan (QAPP).” This QAPP set forth the sampling locations, data quality criteria, field measurement parameters, sampling methods and other key QAPP elements. The QAPP was approved by the Department on February 24, 2016 with a subsequent approval on June 8, 2016 (for the May 10, 2016 revisions).

Summary of Report

The stated objective of the BCMP report is included on page 24:

“This report and its attachments summarize the data that HDR has collected in support of PVSC’s LTCP modeling under the Baseline Compliance Monitoring Program (BCMP). The BCMP was designed to generate sufficient data to establish existing ambient water quality conditions for pathogens in the CSO receiving waters and to update, calibrate and validate a pathogen water quality model of the receiving water bodies.”

Similarly, the February 19, 2016 BCMP QAPP states on page 34:

“The Baseline Compliance Monitoring Program is a one-year sampling effort to characterize ambient waters receiving CSO discharges from participating NJCSO Group members to the extent necessary to gain confidence in the receiving water modeling, i.e., successfully calibrating and validating the receiving water quality model, that will be used to establish attainment of relevant water quality standards. An additional objective of the program is to provide water quality data that will represent pre-LTCP conditions.”

As described on page 24 of the BCMP report, the report summarizes three parallel data collection efforts:

- “1) Baseline Sampling, which was modeled after and intended to supplement the approved routine sampling program of the New Jersey Harbor Discharges Group (NJHDG), of which PVSC is a member. The sampling frequency matched NJHDG, varying with time of year as follows:
 - a. Spring (May-Jun): Biweekly (4 dates);
 - b. Summer (Jul-Sep): Weekly (12 dates); and
 - c. Winter (Oct-Apr): Monthly (7 dates).
- 2) Source Sampling, which targeted the major influent streams within the study area to establish non-CSO loadings, and coincide with the NJHDG and Baseline Sampling. Any discussion of field activities applicable to Baseline Sampling is also applicable to Source Sampling because both sets of stations were sampled during the same field efforts.

- 3) Event Sampling, which was timed to coincide with rainfall to capture three discrete wet weather events over the course of the year on each segment of the NY-NJ Harbor complex impacted by CSOs.

...A total of 23 baseline and source sampling events were completed. The goal of the event sampling was to capture three significant wet-weather events (precipitation >0.5 inches in 24 hours) at each targeted location, which was completed across four sampling events (one set of samples was collected across two precipitation events because of sampling logistics). All samples collected were analyzed for fecal coliform and enterococcus; freshwater samples were also analyzed for E. coli.”

As further described on page 32:

“...In total, 1,439 samples out of a targeted 1,449 samples were collected during the 23 baseline surveys (99.4%), and a 100% success rate was attained during 19 of the 23 routine surveys....”

“...In total, 792 of a targeted 810 samples were collected during the event sampling surveys....”

As stated on page 26:

“The BCMP is modeled in part on the program performed by the New Jersey Harbor Dischargers Group. NJHDG is a similarly allied collaborative undertaking that has been collecting data since 2003.”

A portion of Attachment 1 from the BCMP report is included as an attachment to this letter to depict the locations of baseline sampling, source sampling and event sampling for the affected study area.

NJDEP Technical Review

General Findings

A great deal of effort went into the data collection under the BCMP; nevertheless, sampling results must be interpreted with caution due to unforeseen conditions that impact both data quality and/or data representativeness of an average annual rainfall conditions. For example:

- **Weather Conditions:** Water quality samples were collected during a 377-day span (April 17, 2016 – April 28, 2017). During this period, rainfall totals and number of days exceeding the target threshold (precipitation > 0.5 inches) were well below normal conditions. Specifically, as shown on “Table 9. Precipitation Summary, April 17, 2016 – April 28, 2017” the rainfall total for this period was 41.89 inches as compared to the standardized three-decade average (1981-2010) of 47.89 inches. Therefore, data collected during the BCMP period is more representative of dry weather conditions rather than wet conditions, which is the more needed sampling condition.
- **Data with Qualifiers:** Given the enormousness of the monitoring effort, it is expected that some data points will have qualifiers associated with them. Such data are usually estimated values, not from direct measurements, or fail the quality control requirements and thus cannot be used in a regulatory setting and/or for conducting water quality assessment. Roughly half of the data collected during the event sampling surveys were estimates due to sample dilutions and/or failure to follow proper laboratory procedures. Specifically, event sampling surveys to obtain targeted wet-weather events for model calibration and validation were performed during a 4-day span; however, of the data collected, 54% of the enterococcus samples and 47% of the fecal samples were deemed to have qualifiers associated with them (see “Table 13. Counts for Qualified Data”).
- **Preliminary Conclusions:** Any conclusions pertaining to water quality assessment should be omitted from the report as the data collected under the BCMP was not designed to provide sufficient data for

assessing attainment of water quality standards. In fact, this concern was stated within the BCMP report on page 35:

“The BCMP was not designed to provide an adequate data volume for assessing attainment of water quality standards, which would have required five samples per month at each sampling location to compute monthly geometric means. However, a review of the data collected can indicate the likelihood of attainment in a particular area...”

Despite the above referenced limitations, the BCMP effort did result in valuable data that can be used to populate the receiving water model; and, to provide a snapshot to characterize the water quality conditions in the NY/NJ Harbor Area to represent pre-LTCP conditions. While specific comments are included below regarding required revisions to the BCMP report, the Department finds that the data collection effort does provide sufficient information for the purposes of data characterization for “baseline and existing conditions.” As referenced in Part IV.G.9 “this CMP shall be conducted before, during and after implementation of the LTCP.” A key factor in this finding of acceptability of the BCMP is the ongoing data collection efforts of the NJHDG Monitoring Network which is performed under a Department approved QAPP. Data collected as part of the on-going NJHDG Monitoring Network, with additional stations as needed, can be used to supplement the BCMP data for future conditions. In fact, any subsequent approval of the BCMP report, pending the revisions described below, will be conditional on the continuation of this monitoring program.

Provided the permittee(s) chooses the Demonstration Approach, ultimate attainment of water quality standards can be evaluated through modeled results, in addition to NJHDG data, which may require multi-year simulations. The use of modeling is allowable as described on page 4-7 of EPA’s January 1999 guidance entitled “Combined Sewer Overflows Guidance for Monitoring and Modeling” (EPA 832-B-99-002):

“Models should be chosen to simulate the physical and hydraulic characteristics of the CSS and the receiving water body, characteristics of the pollutants of concern, and the time and distance scales necessary to evaluate attainment of WQS [Water Quality Standards].”

As stated in the Pathogen Water Quality Model (PWQM) Quality Assurance Project Plan (QAPP)” as dated May 19, 2016 (revised January 14, 2017):

“The enhanced, validated model will be used to project bacteria concentrations in the waters of the NY/NJ Harbor complex under existing and anticipated future conditions to demonstrate attainment of applicable water quality standards.”

In addition to the above *General Findings*, the Department’s specific comments are as follows:

Specific Comments

Comment 1: On page 25 the second paragraph states:

“The data itself is provided in two attachments and includes preliminary NJHDG data collected between March and December 2016 in addition to the data collected by HDR.”

It is unclear why this excerpt specifies data only between March and December 2016? Why not all data during the BCMP sampling period namely April 2016 thru April 2017? Please clarify.

Comment 2: On page 28, Section 2.2, please clarify if the PVSC laboratory or other laboratories were used for any of the analyses for this sampling project or if analyses were exclusively performed by Eurofins QC analytical laboratories.

Comment 3: On page 31, “Table 10. Summary of Precipitation during Field Collection Days”, it is stated that there were five (5) days of “wet weather” sampling events where the rainfall was greater than the target of 0.5 inches. However, on the next page under “Table 12. Baseline Compliance Monitoring Event Sampling Dates and Completeness” only four (4) sampling dates are specified namely 6/6/2016, 1/4/20017, 4/26/2017 and 1/24/2017. Also, on 1/4/2017, rainfall was below the target of 0.5 inches (0.36 inches). Please clarify.

Comment 4: On page 31, Footnote 1 for Table 12 states “Sampling locations split across two rain events due to sampling logistic limitations.” Please specify the sampling locations sampled on each of the two days: 1/4/2017 and 4/26/2017.

Comment 5: On page 35, the first paragraph states:

“The data collected under the Baseline Compliance Monitoring Program is sufficient for the intended goal of calibrating the water quality model to be used for PVSC and NJCSO communities’ LTCPs.”

Please insert this phrase at the beginning of this sentence: “A preliminary review indicates that...” This clarification is needed as it is premature to conclude that the collected data is sufficient for this purpose since the Department has not been provided with the necessary information for a complete review. Additionally, this contradicts the statement on page 25 which states “...a preliminary review indicates the data have met the goals of the QAPP and will be acceptable for its intended uses (baseline conditions assessment and model development).”

Comment 6: On page 131, the end of the second paragraph states:

“Data collected during these events were meant to assess the trend of bacteria concentrations after a wet-weather event for the purposes of water quality modeling, and not to assess attainment of geometric mean standards”.

The Department concurs with this statement but it contradicts other statements in the report that pertain to water quality assessment in the Harbor area and/or likelihood of attainment. Specifically, on page 35, please revise the fourth bullet by deleting the last sentence which begins with “However”:

“The BCMP was not designed to provide an adequate data volume for assessing attainment of water quality standards, which would have required five samples per month at each sampling location to compute monthly geometric means. However, a review of the data collected can indicate the likelihood of attainment in a particular area.”

Comment 7: Similar to **Comment 6**, please delete bullets 5 thru 8 (as specified below) as included on page 35 which state the following:

- “• The lower regions of the Passaic and Hackensack Rivers appear likely to violate water quality criteria, but attainment appears to improve closer to Newark Bay.
- The larger waterbodies (Newark Bay, Hudson River, Arthur Kill, Kill Van Kull) appear to meet existing water quality criteria. Newark Bay and the Kills are primarily SE3 waterbodies, and Raritan Bay is subject to more stringent shellfishing water quality standards.
- Several smaller riverine waterbodies appear unlikely to meet attainment. This includes the Rahway River, Saddle River, Second River, and Elizabeth River. The Raritan River may also have attainment issues.

- Many rivers without CSOs have high bacteria loads. Data collected at source sampling locations indicate non-attainment of waters entering the Passaic and Hackensack Rivers, contributing pollutant loads into the study area from areas that do not have CSOs.”

Comment 8: Regarding pages 57 and 131, please note that there are no approved shellfish designated uses in the Harbor area.

Comment 9: An electronic copy of the raw water quality data must be submitted in Excel or electronic tabular format in addition to the data provided in tabular format in the attachments.

Comment 10: Attachments 1, 2 and 3: Please indicate on the chart if any of the data with qualifiers was included in the information plotted on the chart.

Comment 11: Regarding “Attachment 3-Wet Weather Events”, pathogen concentrations from the Event Sampling on April 26, 2017 appear, on average, to be lower than those samples concentrations sampled on the other three events. Please provide discussion to clarify.

Please incorporate these changes to the final report and submit a revised version to the Department no later than 30 days from the date of this letter.

Thank you for your continued cooperation.

Sincerely,



Susan Rosenwinkel
Acting Bureau Chief
Bureau of Surface Water Permitting

Attachment – Map from Attachment 1

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