Truro Planning Board Agenda

Remote Meeting

Wednesday, November 18, 2020 – 5:00 pm

www.truro-ma.gov

Open Meeting

This will be a remote meeting. Citizens can view the meeting on Channel 18 in Truro and on the web on the "Truro TV Channel 18" button under "Helpful Links" on the homepage of the Town of Truro website (www.truro-ma.gov). Click on the green "Watch" button in the upper right corner of the page. Please note that there may be a slight delay (approx. 15-30 seconds) between the meeting and the television broadcast/live stream.

Citizens can join the meeting to listen and provide public comment via the link below, which can also be found on the calendar of the Board's webpage along with the meeting Agenda and Packet, or by calling in toll free at 1-866-899-4679 and entering the following access code when prompted: 498-250-165. Citizens will be muted upon entering the meeting until the public comment portion of the hearing. If you are joining the meeting while watching the television broadcast/live stream, please mute the volume on your computer or television during public comment so that you may be heard clearly. Citizens may also provide written comment via postal mail or by emailing the Town Planner at *planner1@truro-ma.gov*.

Meeting link: global.gotomeeting.com/join/498250165

Public Hearing – Continued

2020-004/SPR – Daniel F. Roche, Jr. for property located at 7 Coast Guard Road, Truro MA (Atlas Map 34, Parcel 5, Registry of Deeds title reference: Book 13174, Page 177). Applicant seeks a Residential Site Plan Review under Section 70 of the Truro Zoning Bylaw for a 2-story addition to an existing 3,018 net sq. ft. residence on a lot located in the Seashore District containing three acres.

Board Action/Review

2020-013/PB – Dorothy Nearen and Marilyn Cubberley seek approval of Form A – Application for Determination that Plan Does Not Require Approval (ANR) pursuant to Section 2.2 of the Town of Truro Rules and Regulations Governing the Subdivision of Land with respect to property at 627 Shore Road, Truro MA, Map 3, Parcel 2.

Update on proposed Joint Project with the Climate Action Committee (see attachment)

Final review of Marijuana Application Packet Parts 1 & 2

Housing Initiative

Cloverleaf update

Discussion for setting dates for future Board public workshops

Public Comment Period

The Commonwealth's Open Meeting Law limits any discussion by members of the Board of an issue raised to whether that issue should be placed on a future agenda. Speakers are limited to no more than 5 minutes.

- Letter with attachments from Scott Warner/Pond Village Residents

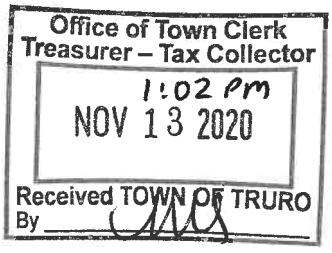
Minutes

None

Next Meeting

Wednesday, December 2, 2020, at 5:00 p.m.

Adjourn



PRATT
CONSTRUCTION CO.
BUILDING & REMODELING CONTRACTORS
PO Box 731 ♦ Marstons Mills MA 02648
Tel (508) 420-9333 ♦ Fax (508)420-9733

To: Truro Planning Board

Re: RFI Reply: SF Existing & Proposed

7 Coast Guard Rd Site Plan Review

Date: 12 Nov 2020

Tally of existing & proposed square footage of structures

Provided are stamped architectural drawings of main house existing & proposed SF w/ ridge height + existing cottage assessors card field verified. 3 acre site. Ridge 29'-7"

Main House	existing	new	total
1st fl	1100	719	1819
2nd fl	1249	686	1935
	2349	1405	3745
Cottage	576	n/a	576
Totals	2925 (1)	1405	4330 (2)

1. *3600 as of right*
2. *4600 allowable SP*

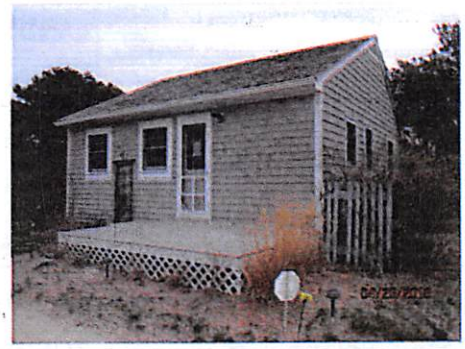
Forward electronically 2 sends

15 paper copies to Twn Hall a.m. fri

patrick@pratt.construction 5082804688 c

TOWN OF TRURO - PROPERTY SUMMARY REPORT

BUILDING	2	KEY:	742	LOCATION:	7 COAST GUARD RD
YEAR BUILT	1959				
STYLE	COTTAGE/BUNG				
QUALITY	A				
NET SF	576				



DATE MEASURED	25-Apr-2016
DATE LISTED	25-Apr-2016

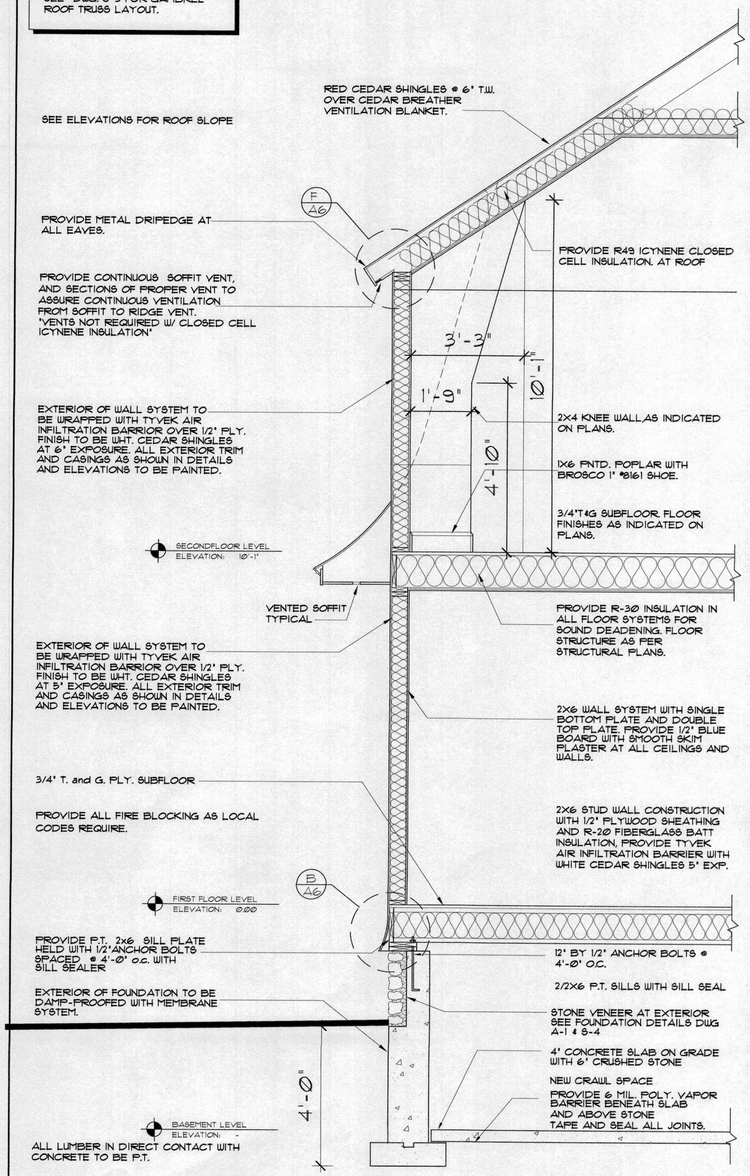
ELEMENT	DESCRIPTION	CD
STORIES(FAR)		1
EXT. COVER	WOOD SHINGLES	1
ROOF SHAPE	GABLE	1
ROOF COVER	WOOD SHINGLES	2
FLOOR COVER	SOFTWOOD	2
INT. FINISH	DRYWALL	2
HEATING/COOL	FORCED AIR	1
FUEL SOURCE	ELECTRIC	3

CAPACITY	UNIT
ROOMS	0
BEDROOMS	1
BATHROOMS	1
FIXTURES	3
UNITS	0

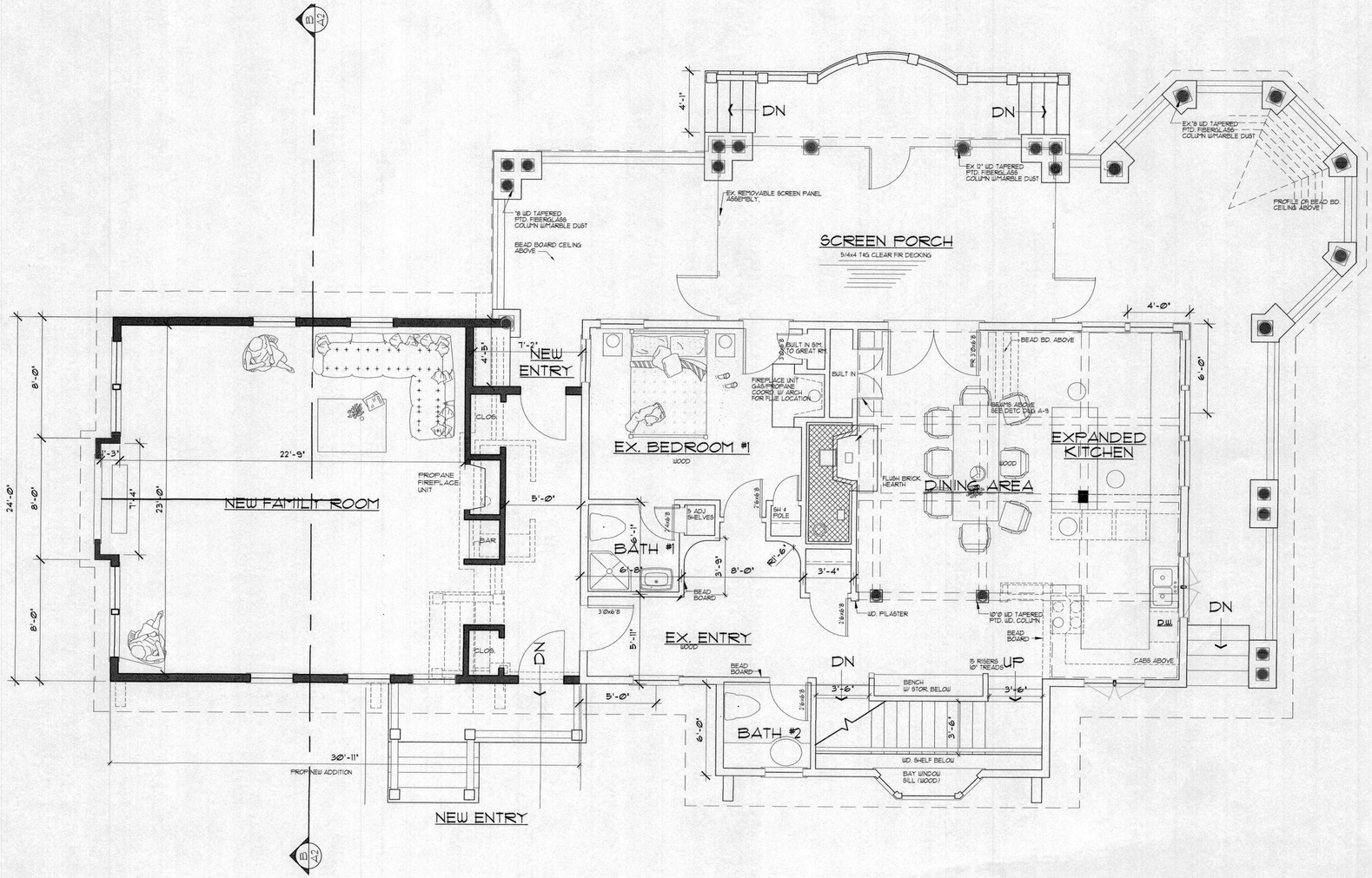
ONSITE TAPE MEASURE CONFIRMED

24 x 24 = 576 SF

SEE DWG. S-3 FOR GAMBREL ROOF TRUSS LAYOUT.



PARTIAL BUILDING SECTION B
SCALE: 1/2" = 1'-0"



NEW 1ST FL ADDITION 719 SQFT

TOTLAL EXISTING/NEW 1ST FL 1,819 SQFT

EXISTING 1ST FL 1,100 SQFT

B A-2 FIRST FLOOR PLAN
SCALE: 1/4" = 1'-0"

0 2 4 8 12
SCALE IN FEET

AS NOTED ON SITE PLAN PREPARED BY FELCO, INC.
ENGINEERS-LAND SURVEYING
PROPOSED T.O.F. ELEV. 79 DATED 2001
(AVG. GRADE 77.00' (REL. FLAT SITE)
(AVG. GRADE TO PEAK IS 29'-7"+-
BASED ON 2001 BUILDING PERMIT SET

PROPOSED RIDGE WILL BE EQUAL TO EX.

REGISTERED ARCHITECT ROBERT S. ROSE NO. 8658 BOSTON MA COMMONWEALTH OF MASSACHUSETTS
11-12-20

REV 2 PROGRESS 11-12-20
REV 1 PROGRESS 4-30-20

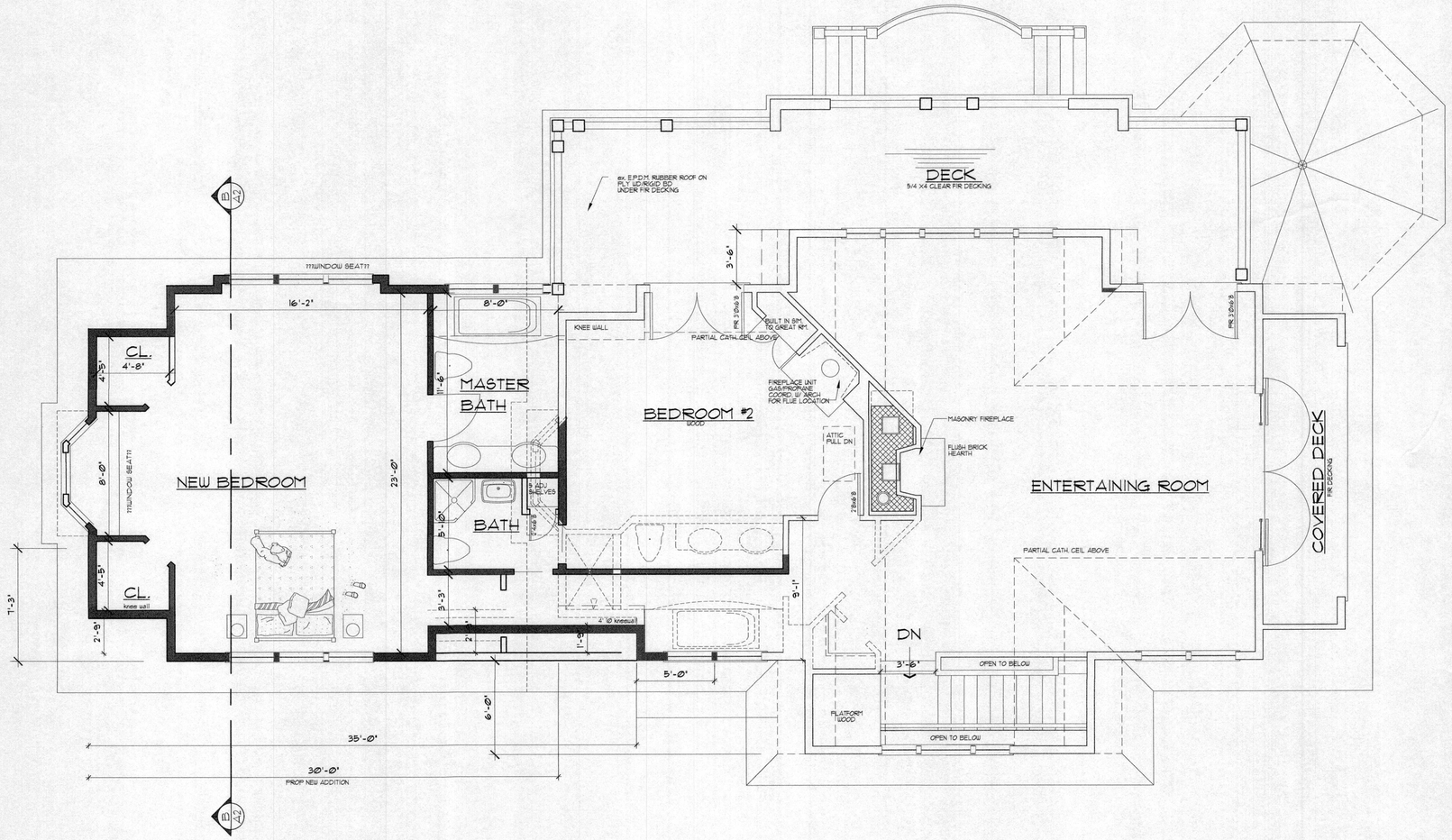
NEW ADD. SUMMER RESIDENCE FOR
DANIEL F. ROCHE JR.
7 COAST GUARD ROAD
N. TRURO, MASSACHUSETTS

FIRST FLOOR PLANS

SCALE: 1/4"=1'-0" DATE: AUG. 23 2019

ROBERT S. ROSE ARCHITECT
P.O. BOX 761, HINGHAM, MA 02043
(781) 749-0060 NAN. (508) 228-5081

A-2



NEW 2ND FL ADDITION 686 SQFT

EXISTING 2ND FL 1,249 SQFT

NEW 2ND FL ADDITION/NEW 1,935 SQFT

A-3 SECOND FLOOR PLAN
SCALE: 1/4" = 1'-0"

0 2 4 8 12
SCALE IN FEET

AS NOTED ON SITE PREPARED BY FELCO, INC.
ENGINEERS-LAND SURVEYING
PROPOSED T.O.F. ELEV. 79 DATED 2001
(AVG. GRADE 77.00' (REL. FLAT SITE)
(AVG. GRADE TO PEAK IS 29'-7"+-
BASED ON 2001 BUILDING PERMIT SET

PROPOSED RIDGE WILL BE EQUAL TO EX.

REGISTERED ARCHITECT
ROBERT S. ROSE
NO. 8658
BOSTON MA
COMMONWEALTH OF MASSACHUSETTS
11-12-20

REV 2 PROGRESS 11-12-20
PROGRESS 9-11-19

NEW ADD. SUMMER RESIDENCE FOR
DANIEL F. ROCHE JR.
7 COAST GUARD ROAD
N. TRURO, MASSACHUSETTS

SECOND FLOOR PLAN

SCALE: 1/4"=1'-0" DATE: AUG. 23 2019

ROBERT S. ROSE
ARCHITECT
P.O. BOX 761, HINGHAM, MA 02043
(781) 749-0060 NAN. (508) 228-5081

A-3

TOWN OF TRURO

PLANNING BOARD

Office of Town Clerk
Treasurer – Tax Collector
2020-013/PB
OCT 28 2020
$275.00 fee paid
Received TOWN OF TRURO
By Molly Stevens

FORM A
APPLICATION FOR DETERMINATION THAT PLAN DOES NOT REQUIRE APPROVAL (ANR)

Date: October 27, 2020

To The Planning Board of the Town of Truro Massachusetts,

The undersigned owners of all the land described herein submitted the accompanying plan entitled: PLAN OF LAND IN NORTH TRURO, AS SURVEYED FOR NEAREEN AND CUBERLY NOMINEE TRUST and dated October 27, 2020, requests a determination and endorsement by said Board that approval by it under the Subdivision Control Law is not required.

Property Location: 627 SHORE ROAD Map(s) and Parcel(s): MAP 3 PARCEL 2

Number of Lots Created: ONE Total Land Area: 12,924 ± SQ. FT

The owner's title to said land is derived under deed from DOROTHY M. NEAREEN AND MARILYN B. CUBERLEY,

dated OCT. 16, 1992, and recorded in the Barnstable Registry of Deeds Book and Page: 8309/134

or Land Court Certificate of Title No. 12 8407 registered in Barnstable County.

The undersigned believes that such approval is not required for the following reasons: *(Check as appropriate)*

☒ The accompanying plan is not a subdivision because the plan does not show a division of land.

☐ The division of the tract of land shown on the accompanying plan is not a subdivision because every lot shown on the plan has frontage of at least such distance as is presently required by the Truro zoning by-law under Section 50.1 (A) which requires 150 feet for erection of a building on such lot; and every lot shown on the plan has such frontage on:

☐ a public way or way which the Town Clerk certifies is maintained and used as a public way, namely _____, or

☐ a way shown on a plan theretofore approved and endorsed in accordance with the subdivision control law, namely _____ on _____ and subject to the following conditions _____; or

☐ a private way in existence on December 8, 1955, the date when the subdivision control law became effective in the Town of Truro having, in the opinion of the Planning Board, sufficient width, suitable grades, and adequate construction to provide for the needs of vehicular traffic in relation to the proposed use of the land abutting thereon or served thereby, and for the installation of municipal services to serve such land and the buildings erected or to be erected thereon, namely

_____

☐ The division of the tract of land shown on the accompanying plan is not a "subdivision" because it shows a

proposed conveyance/other instrument, namely _____ which adds to/takes away from/changes the size and shape of, lots in such a manner that no lot affected is left without frontage as required by the Truro zoning bylaw under Section 50.1 (A), which requires 150 feet.

☐ The division of the tract of land shown on the accompanying plan is not a subdivision because two or more buildings, specifically _____ buildings were standing on the property prior to December 8, 1955 the date when the subdivision control law went into effect in the Town of Truro and one of such buildings remains standing on each of the lots/said buildings as shown and located on the accompanying plan. Evidence of the existence of such buildings prior to the effective date of the subdivision control law as follows:

☑ Other reasons or comments: *(See M.G. L., c.41, §81-L)*

PARCEL 1 & LOT 4 ARE TO BE COMBINED TO FORM LOT 5.

All other information as required in the Rules and Regulations Governing Subdivisions of Land shall be submitted as part of the application.

CHRISTOPHER J. SNOW, TRUSTEE

* _____ * _____
(Printed Name of Owner) (Signature)

KAREN AND CUSHALLY NOMINEE TRUSTEE

_____ _____
(Printed Name of Owner) (Signature)

P.O. BOX 291

* PROVINCETOWN, MA. 02657 _____
(Address of Owner(s)) (Address of Owner(s))

WILLIAM N. ROGERS II

_____ _____
(Printed Name of Agent) (Signature)

41 OFF CEMETERY ROAD, P.O. BOX 631, PROVINCETOWN, MA 02657

TEL. NO. 1-508-487-1565 (Address of Agent)

File twelve (12) copies each of this form and applicable plan(s) with the Town Clerk

2.2 - APPROVAL NOT REQUIRED (ANR) PLAN ENDORSEMENT REVIEW CHECKLIST - Applicant

Address: 627 Shore Road, N. Truro Applicant Name: William N. Rogers II Date: October 29, 2020

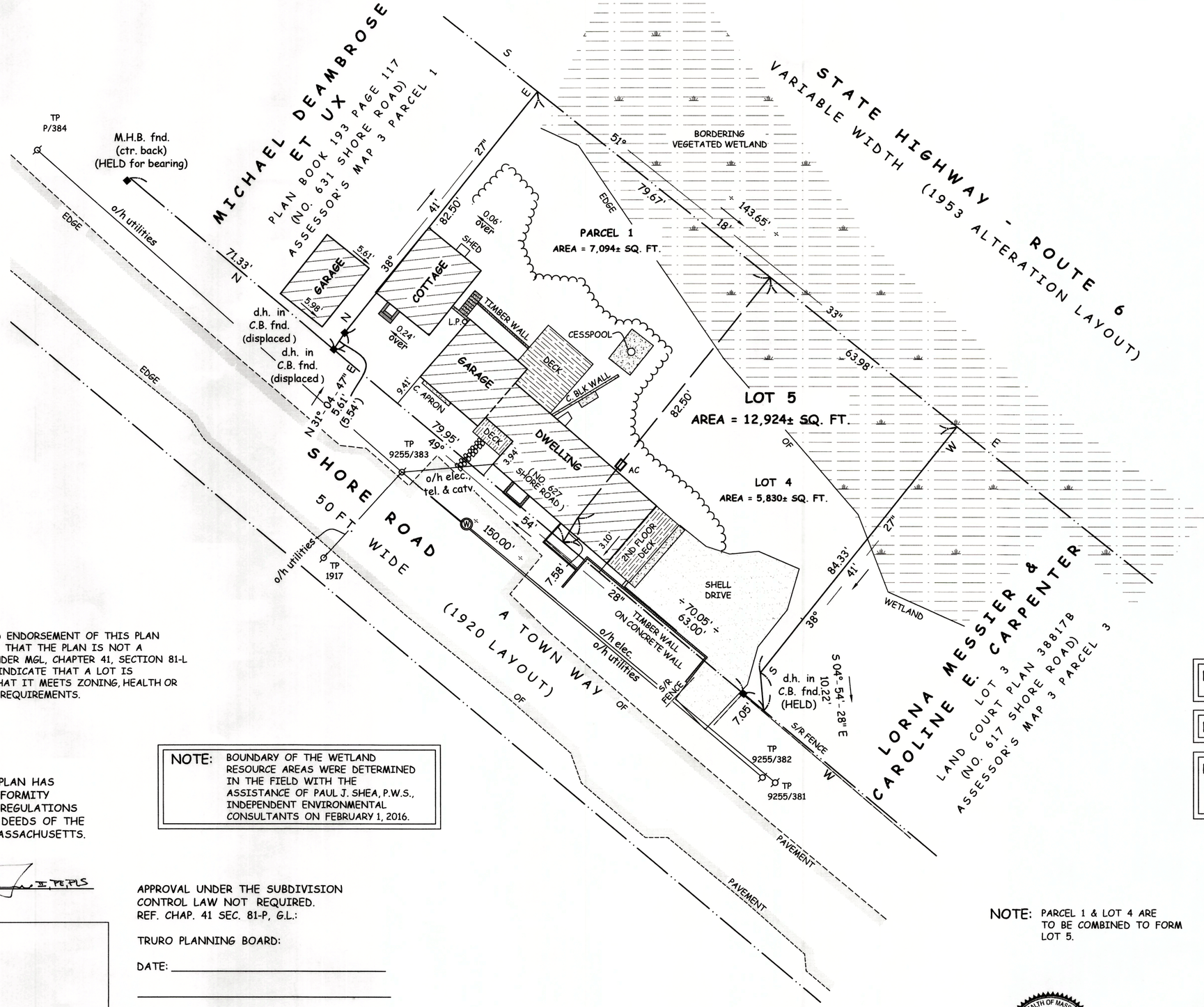
No.	Requirement	Included	Not Included	Explanation, if needed
2.2.2 Submission Requirements				
Any person may submit a plan seeking endorsement that the plan does not require approval under the Subdivision Control Law by providing the Board with the following:				
a.	A properly executed application for Approval Not Required Endorsement (Form A).	✓		
b.	Twelve (12) paper prints of the plan. Said plan shall be prepared in such a manner as to meet the Registry of Deeds and/or Land Court requirements for recording and shall contain the following information:	✓		
b.1	The boundaries, area, frontage and dimensions of the lot or lots for which ANR endorsement is sought.	✓		
b.2	The date of the plan, scale, north arrow and assessor's map and parcel number of all land shown on the plan and directly abutting the land shown on the plan.	✓		
b.3	The name(s) of the owner(s) of record of the lots shown on the plan and of the applicant, together with the name, address seal and signature of the land surveyor who prepared the plan.	✓		
b.4	Relevant zoning classification data.			
b.5	A locus plan containing sufficient information to locate the land and showing streets bounding or providing access to the property.	✓		
b.6	The name(s) of the way(s) on which the lots front, information as to ownership of the way(s) and the physical condition of the way(s) including actual width, surface type and condition.	✓		
b.7	The location and dimension of any natural features which might affect the use of the frontage for access.	✓		
b.8	The location, including setbacks to all lot lines, of all buildings and other structures on the proposed ANR lots shown on the plan.	✓		
b.9	The location of any wetland on the land shown on the plan or within one hundred (100) feet of its boundaries.	✓		
b.10	The location of all bounds and easements on the proposed ANR lots shown on the plan.	✓		

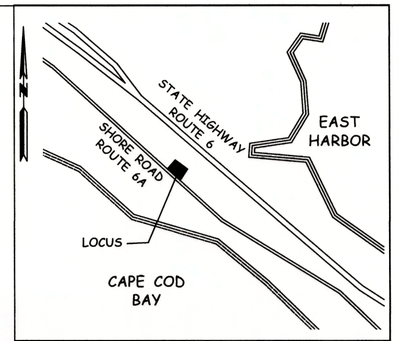
2.2 - APPROVAL NOT REQUIRED (ANR) PLAN ENDORSEMENT REVIEW CHECKLIST - Applicant

Address: 627 Shore Road, N. Truro Applicant Name: William N. Rogers II Date: October 29, 2020

No.	Requirement	Included	Not Included	Explanation, if needed
b.11	The statement "Approval under the Subdivision Control Law Not Required", and sufficient space for the date of the application submittal and the date of endorsement, docket number and the signatures of all Board members.	✓		
b.12	The statement "Planning Board endorsement of this plan indicates only that the plan is not a subdivision under MGL, Chapter 41, Section 81-L and does not indicate that a lot is buildable or that it meets Zoning, Health or General Bylaw requirements."	✓		

LAND COURT PLAN 38817B





LOCUS MAP SCALE: 1" = 800'

ZONING CLASSIFICATION:

LOT 5 IS LOCATED IN **LB BEACH POINT** (LIMITED BUSINESS DISTRICT , ROUTE 6A, NORTH TRURO).

NOTE: 627 SHORE ROAD ASSESSOR'S MAP 3 PARCEL 2.

NOTE: PLANNING BOARD ENDORSEMENT OF THIS PLAN INDICATES ONLY THAT THE PLAN IS NOT A SUBDIVISION UNDER MGL, CHAPTER 41, SECTION 81-L AND DOES NOT INDICATE THAT A LOT IS BUILDABLE OR THAT IT MEETS ZONING, HEALTH OR GENERAL BYLAW REQUIREMENTS.

NOTE: BOUNDARY OF THE WETLAND RESOURCE AREAS WERE DETERMINED IN THE FIELD WITH THE ASSISTANCE OF PAUL J. SHEA, P.W.S., INDEPENDENT ENVIRONMENTAL CONSULTANTS ON FEBRUARY 1, 2016.

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

October 27, 2020 William J. Rogers II, PE,PLS

APPROVAL UNDER THE SUBDIVISION CONTROL LAW NOT REQUIRED.
REF. CHAP. 41 SEC. 81-P, G.L.:

TRURO PLANNING BOARD:

DATE: _____

LEGEND:

D.M.H.	=	DRAINAGE MANHOLE
M.H.	=	MANHOLE
S.M.H.	=	SEWER MANHOLE
Ⓦ	=	WATER GATE
T.P.	=	UTILITY POLE
U/G	=	UNDERGROUND
L.P.	=	LIQUID PROPANE

NOTE: PARCEL 1 & LOT 4 ARE TO BE COMBINED TO FORM LOT 5.

COMMONWEALTH OF MASSACHUSETTS
WILLIAM N. ROGERS II
No. 28410
REGISTERED LAND SURVEYOR

William J. Rogers II, PE,PLS
October 27, 2020

NOTE: ALL BUILDING OFFSETS ARE MEASURED PERPENDICULAR TO THE PROPERTY LINES.

NOTE: () DENOTES RECORD INFORMATION.

REFERENCE: LAND COURT PLAN 38817B
PLAN BOOK 348 PAGE 93
CERTIFICATE OF TITLE NO. 128407
DEED BOOK 8309 PAGE 134

SCALE OF FEET
0 10 20 40

PLAN OF LAND
IN
NORTH TRURO
AS SURVEYED FOR
NEAREN AND CUBBERLEY NOMINEE TRUST

SCALE: 1 IN. = 20 FT. OCTOBER, 2020

WILLIAM N. ROGERS
PROFESSIONAL
CIVIL ENGINEERS & LAND SURVEYORS
41 OFF CEMETERY ROAD, PROVINCETOWN, MASS.
508.487.1565 / 508.487.5809 FAX

CHRISTOPHER J. SNOW, TRUSTEE

T-20-1704C

PB & CAC Proposal for Collaboration – Supporting Carbon Sequestration: Policy Requiring Native Plants on Cleared Building Lots

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Background

New buildings and additions to existing buildings often require removing plants to access and build on the building sites. This reduces the amount of carbon-sequestering and native plants in Truro. And while new plantings may be added after construction, these plants may not be native nor effective in removing carbon from the atmosphere. Developing a proposal to support integrating carbon sequestration into the building process while not imposing unreasonable requirements is a realistic goal for the next 6 months.

Goal

Improve carbon sequestration by developing a policy/bylaw/guideline that requires:

1. That plant removal be limited to that part of the property necessary for construction or for the removal of invasive, non-native plants, and
2. That any new building lots or building additions have an equivalent quantity of plants, to those that were removed, planted with the best carbon-sequestering plants on the impacted lot or another designated lot if not feasible on the construction lot after construction is complete.

High-Level Plan

Develop a policy/by-law/guideline for Truro.

1. PB & CAC review and refine this proposal
2. Assign a team of one to two people from each group to draft the policy/bylaw/guideline. Potential tasks include:
    - Research Truro, eastern Massachusetts towns, and the state to see if there is an existing policy that can be adopted.
    - Determine if this should be implemented as a policy, by-law or something else.
    - Ensure that the voices of builder and realtors are included in the process.
3. Potential issues to include:
    - Develop guidelines to define the limited area in which plants can be removed for construction and when, how, and how many carbon-sequestering plants must be planted to replace what can be removed.
    - Incorporate the CAC's list of carbon-sequestering plants.

    - Determine what committee/board/town department in Truro will be responsible for implementing and enforcing the policy.
4. Conduct public information sessions on the proposed policy for the voters of Truro
5. Policy review and approval by CAC and PB
6. If needed, draft warrant article for 2021 Annual Town Meeting
7. If needed, present warrant article at Town Meeting

Town of Truro

P.O. Box 2030, Truro, MA 02666

APPLICATION PACKET FOR
ADULT USE RECREATIONAL MARIJUANA ESTABLISHMENTS (RME)
AND MEDICAL MARIJUANA TREATMENT CENTERS (MMTC)

A. OVERVIEW OF STEPS IN THE STATE AND TRURO APPLICATION PROCESS

1. Signed Host Community Agreement with Town of Truro, then
2. Provisional License or Provisional Certificate of Registration from the State of Massachusetts, then

BOTH HOST COMMUNITY AGREEMENT AND PROVISIONAL LICENSE OR PROVISIONAL CERTIFICATE ARE REQUIRED BEFORE SUBMITTING THIS APPLICATION PACKET TO THE TOWN OF TRURO

3. Application for Adult Use Marijuana Establishments (RME) and Medical Marijuana Treatment Centers (MMTC) to the Town of Truro – Application Packet contains 3 sections:
   a. General Application
      i. Application Form
      ii. General Checklist
   b. Application for Site Plan Review from the Planning Board
      i. Site Plan Review Application Form
      ii. Required Plans & Other Information including Checklist
      iii. Criteria Review
      iv. Certified Abutters List
      v. Filing Fee

Once Site Plan Review has been approved (tentative – ZBA packet in process)

c. Application for Special Permit from the Zoning Board of Appeals (ZBA)
   i. Special Permit Application Form
   ii. Required Plans & Other Information
   iii. Certified Abutters List
   iv. Filing Fee

B. TRURO PROCESS AFTER RECEIVING PROVISIONAL LICENSE/CERTIFICATE

This process requires applicants receive approvals from both the Planning Board and the Zoning Board of Appeals (ZBA). The order is Planning Board first for Residential Site Plan Review and then ZBA for a Special Permit. This packet includes information and forms for both processes.

1. If the applicant is a Craft Marijuana Cooperative (CMC) the requirements are:
    a. An approved parcel-specific Site Plan for each parcel
        i. *§100.3* ELIGIBILITY – *The total number of parcels allowed to be utilized per Craft Marijuana Cultivator Cooperative licensee for Marijuana, and*
    b. One (1) Special Permit for the CMC

2. The following marijuana establishment specific items specified in 100.7 A, B, C and D must be included with this application in addition to the material required for Site Plan Review and Special Permit Applications:
    a. Security Plan *(need to identify process to maintain security of plans)*
    b. Resource Plan (Marijuana Cultivators and Marijuana Product Manufacturers)
    c. Traffic Study and Circulation Plan
    d. Copy of Provisional License or Provisional Certificate of Registration from the State of Massachusetts
    e. Executed Host Community Agreement
    f. Site Plan
    g. Elevations of any proposed new construction for indoor growing and/or processing
    h. Plan of any new signage
    i. Narrative describing management and general operation of the facility
    j. Fire Protection Plan (if applicable)
    k. Table showing use and square footage of all proposed buildings

Town of Truro

P.O. Box 2030, Truro, MA 02666

APPLICATION FOR MARIJUANA ESTABLISHMENT APPROVAL

To the Town Clerk, the Planning Board and the Zoning Board of Appeals of the Town of Truro, MA

Date _____

The undersigned hereby files an application for a:

- ☐ Recreational Marijuana Establishment (RME)
- ☐ Medical Marijuana Treatment Center (MMTC)

Is the applicant either a Marijuana Craft Cooperative (MCC) or member of an MCC? _____

---

1. General Information

Applicant's Name ___

Applicant's Legal Mailing Address _____

Applicant's Phone(s), Fax and Email _____

Applicant is one of the following: *(please check appropriate box)*

*****Written Permission of the owner is required for submittal of this application.

☐ Owner ☐ Operator***** ☐ Lessee ☐ Other*****

Owner's Name and Address _____

Physical Address of Parcel _____

Size of Parcel (in square feet) _____

---

2. Marijuana Craft Cooperative (MCC) Information (if applicable)

Name of MCC _____

MCC Member Information:

Name _____

Mailing Address _____

Physical Address of Marijuana Establishment _____

Size of Parcel (in square feet) _____

Name _____

Mailing Address _____

Physical Address of Marijuana Establishment _____

Size of Parcel (in square feet) _____

Name _____

Mailing Address _____

Physical Address of Marijuana Establishment _____

Size of Parcel (in square feet) _____

Name _____

Mailing Address _____

Physical Address of Marijuana Establishment _____

Size of Parcel (in square feet) _____

Name _____

Mailing Address _____

Physical Address of Marijuana Establishment _____

Size of Parcel (in square feet) _____

Signature(s)

_____	_____
Applicant(s)/Representative *Printed* Name(s)	Owner(s) *Printed* Name(s) or written permission
_____	_____
Applicant(s)/Representative *Signature(s)*	Owner(s) *Signature(s)* or written permission

100 - MARIJUANA ESTABLISHMENT GENERAL CHECKLIST

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Met	Not Met	Explanation, if needed
100.5 Applicability of Regulations				
A	The use of land for cultivation, production, processing, manufacturing, assembly, packaging, retail or wholesale sale, trade, distribution or dispensing of marijuana for commercial purposes is prohibited unless licensed by all applicable Massachusetts licensing authorities and permitted as an RME or MMTC under this section.			
B	The number of RMEs and MMTCs permitted in Truro shall be in accordance with the Use Table set out in §100.3, *supra.*			
C	Hours of operation for Recreational Marijuana Retailers and Medical Marijuana Treatment Centers shall not exceed the Alcoholic Beverages Control Commission (ABCC) maximum hours of operation for liquor licenses not to be drunk on premises pursuant to M.G.L c. 138 §15, but may be limited by conditions of the Special Permit.			
D	Marijuana Retailers shall be located in structures without residences.			

RME = Recreational Marijuana Establishments; MMTC = Medical Marijuana Treatment Centers

100 - MARIJUANA ESTABLISHMENT GENERAL CHECKLIST

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Included	Not Included	Explanation, if needed
100.7 Application Requirements				
A	Security Plan			
1	The applicant shall submit a copy of its security plan, approved by the Commission as part of the issuance of a Provisional License, to the Police and Fire Departments for their review and approval prior to the issuance of Site Plan Approval.			
2	The security plan shall be updated on an annual basis and any changes shall be reported to the Police and Fire Departments.			
3	The security plan shall meet all security requirements of 935 CMR 500.110.			
B	Resource Plan			
1	All Marijuana Cultivators, including but not limited to Craft Marijuana Cooperatives and Microbusinesses, MMTCCPs, and Marijuana Product Manufacturers shall submit a resource use plan to the Planning Board outlining planned practices for use of:			
	energy			
	water			
	waste disposal			
	and other common resources and to ensure there will be no undue damage to the natural environment.			
2	The Resource Plan, if applicable, shall include:			
	electrical system overview			
	proposed energy demand			
	proposed electrical demand off-sets			
	ventilation system and air quality			
	proposed water system			
	utility demand			
	The Planning Board may waive this requirement if it is determined that the scale and scope of the use does not require such review.			

RME = Recreational Marijuana Establishments; MMTC = Medical Marijuana Treatment Centers

100 - MARIJUANA ESTABLISHMENT GENERAL CHECKLIST

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Included	Not Included	Explanation, if needed
100.7 Application Requirements				
C	Traffic Study and Circulation Plan			
1	The applicant shall submit a traffic circulation plan for the site to ensure the safe movement of pedestrian and/or vehicular traffic on site.			
2	A traffic impact and access study shall be required for all Marijuana Retailers and MMTCDRs. The study shall be based on standard traffic engineering guidelines developed by the Massachusetts Environmental Protection Act (MEPA). The Planning Board may waive the requirement of a traffic impact study if, in the opinion of the Planning Board, a traffic impact study is not necessary to ensure safe movement of pedestrian or vehicular traffic on site.			
D	In addition to the requirements of §70.4C and §30.8 all Site Plan Review applications and Special Permit applications shall include the following:			
1	A copy of a Provisional License or Provisional Certificate of Registration from the State of Massachusetts as an RME under 935 CMR 500.00 or a MMTC under 935 CMR 501.00;			
2	An executed Host Community Agreement;			
3	A site plan showing existing conditions on the site and the boundaries of any proposed outdoor growing area;			
4	Elevations of any proposed new construction for indoor growing and/or processing;			
5	A plan of any new signage;			
6	A narrative describing the management and general operation of the facility;			
7	A security plan;			
8	A fire protection plan (if applicable);			
9	A table showing the use and square footage of all proposed buildings; and			
10	A completed Special Permit or Site Plan Review application form.			

RME = Recreational Marijuana Establishments; MMTC = Medical Marijuana Treatment Centers

100 - MARIJUANA ESTABLISHMENT GENERAL CHECKLIST

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Met	Not Met	Explanation, if needed
100.6 General Requirements				
A	No RME or MMTC shall be located within 500 feet, as measured from each lot line of the subject lot, of the following pre-existing uses: Public or private schools providing education in grades K-12.			
B	The 500-foot buffer distance under this section shall be measured in a straight line from the nearest point of the property line in question to the nearest point of the property line where the RME or MMTC will be located.			
C	Applicants for an RME or MMTC shall provide the security plan approved by the Commission to the Police Chief, Fire Chief, Health Agent and Building Commissioner prior to the granting of a Special Permit.			
D	An executed Host Community Agreement shall be required prior to the granting of a Special Permit and Site Plan Approval for an RME or MMTC.			
E	No odor from marijuana cultivation, processing, manufacturing or retail may be noxious or cause a nuisance or danger to public health or impair public comfort and convenience. Marijuana establishments shall incorporate odor control technology and safeguards to ensure that emissions do not violate Board of Health regulations adopted pursuant to M.G.L c. 111, §31C, including but not limited to those specified for odors.			
F	All business signage, marketing, advertising and branding shall be subject to the requirements promulgated by the Commission and the requirements of the Truro Zoning Bylaw and Sign Code. In the case of a conflict, the more restrictive requirement shall apply.			
G	The hours of operation of the RME and MMTC shall be set by the Zoning Board of Appeals as a condition of the Special Permit.			

RME = Recreational Marijuana Establishments; MMTC = Medical Marijuana Treatment Centers

100 - MARIJUANA ESTABLISHMENT GENERAL CHECKLIST

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Met	Not Met	Explanation, if needed
100.6 General Requirements				
H	No RME or MMTC shall be located inside a mobile vehicle such as a trailer, van, or truck, unless operating as a licensed Marijuana Transporter. Craft Marijuana Cultivator Cooperatives, Marijuana Cultivators, MMTCCPs and Microbusinesses shall be allowed to utilize movable structures, except that natural screening, or other approved screening, shall be required as a condition of Site Plan Review, as necessary, to render such structures less visible from public or private ways or abutting properties. The number of movable structures shall be limited to no more than 2 per parcel unless additional containers are approved by the Planning Board in connection with Site Plan Review.			
I	No RME or MMTC shall be located inside a building containing transient housing such as motels or hotels.			
J	To ensure compatibility with the residential character of Truro, the use of greenhouses, defined to have walls and roofs constructed predominantly of glass or other transparent or translucent materials, are to be encouraged in lieu of other types of enclosed buildings for marijuana cultivation. - The total aggregate floor area of all enclosed buildings used by an RME or MMTC within the Residential and NT6A Districts shall not exceed a floor area, as measured from the exterior faces of exterior walls, of 5,000 sq. ft. on a 2-acre lot, plus 500 sq. ft. for each additional contiguous acre of land, or minus 500 sq. ft. for each contiguous acre of land less than two acres, or as the case may be, where the square footage per acre specified above is pro-rated for a portion of an acre. Greenhouses and Gross Floor Area of any Dwelling Units shall be excluded from this floor area calculation. - Building lot coverage for marijuana cultivation, including greenhouses and other similar structures, in the Residential and NT6A Districts shall not exceed 25% of the parcel's total gross square footage.			

RME = Recreational Marijuana Establishments; MMTC = Medical Marijuana Treatment Centers

Town of Truro Planning Board

P.O. Box 2030, Truro, MA 02666

PROCEDURE FOR SUBMITTING SITE PLAN REVIEW APPLICATION FOR ADULT USE RECREATIONAL MARIJUANA ESTABLISHMENTS (RME) AND MEDICAL MARIJUANA TREATMENTS CENTERS (MMTC)

A completed application consisting of each of the requirements of §70 and §100 will be filed as follows:

- **fifteen (15) packets to be filed with the Town Clerk; AND**
- **a complete copy, including all plans and attachments, submitted electronically to the Town Planner at planner1@truro-ma.gov.**

The following information and requirements must be filed with all applications for Site Plan Review consistent with the Rules, Regulations and Fee Schedule of the Truro Planning Board.

☐ **1 – Official Application Form – Original and Fourteen (14) Copies**
Every application for action by the Board shall be made on an official form. Any communications purporting to be an application shall be treated as mere notice of intention until such time as it is made on an official application form accompanied by all requisite supporting data.

☐ **2 – Required Plan(s) and Other Information including Checklist (Fifteen (15) Copies)**
Every application and petition to the Board shall be accompanied by all the plans and other information required in the Zoning Bylaw. The application shall include each of the requirements of §70 and §100 as listed in the attached Checklist which is to be submitted as part of the official application. These items include:

- Copy of Provisional License or Provisional Certificate of Registration from the State of Massachusetts
- Executed Host Community Agreement
- Site Plan(s) as appropriate
- Elevations of any proposed new construction for indoor growing and/or processing
- Plan of any new signage
- Narrative describing management and general operation of the facility
- Security Plan
- Fire Protection Plan (if applicable)
- Table showing use and square footage of all proposed buildings

☐ **3 – Criteria Review**
Applicant will briefly state how they meet each of the review criteria in §70 and §100 using the format provided in this packet.

☐ **4 – Certified Abutters List – Original and Fourteen (14) Copies**
A Certified Abutters List shall be obtained by the Applicant from the Truro Assessors Office and filed as part of the complete application. A copy of the "Certified Abutters List Request Form" is included in this packet.

☐ **5 – Filing Fee**
All applications shall be filed with the Town Clerk and shall be accompanied by a check payable to the Town of Truro in the amount of **$250.00** for Site Plan Review. The filing fee is non-refundable.

Note: *Please familiarize yourself with Truro Zoning Bylaws including bylaws specifically addressing property in your Truro Zoning District. It may also be helpful to review other potentially applicable Town regulations such as Board of Health and Conservation Commission regulations and regulations of other jurisdictions as applicable such as The Cape Cod National Seashore or a homeowner's association.*

ONCE A COMPLETED APPLICATION HAS BEEN RECEIVED

- Town Planner will determine if an Application is complete. Upon determination an Application is complete, the Planning Board will then proceed to post notice of a public hearing in accordance with Section 11 of Chapter 40A of the General Laws of Massachusetts.

- Either you or your agent/representative shall appear before the Board at the scheduled hearing. If you need to reschedule, you must submit a request in writing for a continuance, using Town of Truro Continuance Request Form.

- Additional information may be submitted prior to the scheduled public hearing provided it is received no less than **ten (10) days** prior to the hearing so that it can be included in the packet for Board Members to read and review. Submit fifteen (15) paper copies **AND** an electronic copy to the Town Planner (at **planner1@truro-ma.gov**). Plans must be submitted to the Town Clerk for filing. Information received less than **ten (10) days** before the scheduled hearing may result in a continuance of the hearing. New material brought to the meeting, that has not previously been filed/submitted, will not be reviewed at that meeting.

Please do not include a copy of these instructions with the application

Town of Truro Planning Board

P.O. Box 2030, Truro, MA 02666

APPLICATION FOR MARIJUANA SITE PLAN REVIEW

To the Town Clerk and the Planning Board of the Town of Truro, MA Date _____

The undersigned hereby files an application with the Truro Planning Board for the following:

☐ ***Site Plan Review*** pursuant to §70 and §100 of the Truro Zoning Bylaw

---

General Information

Business Type: RME or MMTC _____

Is applicant a Marijuana Craft Cooperative (MCC)? _____ **If yes, a separate Site Plan Review packet must be submitted for each parcel**

Description of Property and Proposed Project _____

_____

_____

Property Address _____ Map(s) and Parcel(s) _____

Registry of Deeds title reference: Book _____, Page _____, or Certificate of Title Number _____ and Land Ct. Lot # _____ and Plan # _____

Applicant's Name _____

Applicant's Legal Mailing Address _____

Applicant's Phone(s), Fax and Email _____

Applicant is one of the following: *(please check appropriate box)*

*****Written Permission of the owner is required for submittal of this application.

☐ Owner ☐ Operator***** ☐ Lessee ☐ Other*****

Owner's Name and Address _____

Representative's Name and Address _____

Representative's Phone(s), Fax and Email _____

- The applicant is ***advised*** to consult with the Building Commissioner, Planning Department, Conservation Department, and/or Health Department prior to submitting this application.

Signature(s)

_____ _____

Applicant(s)/Representative *Printed* Name(s) Owner(s) *Printed* Name(s) or written permission

_____ _____

Applicant(s)/Representative *Signature(s)* Owner(s) *Signature(s)* or written permission

Your signature on this application authorizes the Members of the Planning Board and town staff to visit and enter upon the subject property

100 - REGULATION OF MARIJUANA REVIEW CHECKLIST - Applicant

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Included	Not Included	Explanation, if needed
70.4(C) Site Plan Procedures and Plan Requirements				
1a.	An original and 14 copies of the Application for Site Plan Review			
1b.	15 copies of the required plans and other required information including this Checklist			
1c.	Completed Criteria Review			
1d.	Certified copy of the abutters list obtained from the Truro Assessors Office			
1e.	Applicable filing fee			
	Site Plans			
2a.	Site Plans shall be prepared, stamped and signed by a Registered Land Surveyor and Professional Engineer			
2b.	Site Plans shall be prepared at a scale of one inch equals forty feet (1"=40') or larger			
3	Site Plan shall include the following:			
3a. 1	North Arrow and a locus plan containing sufficient information to locate the subject property, such as streets bounding or providing access to the property.			
3a. 2	Zoning Information: All applicable Zoning Bylaw information regarding the site's development, both existing and proposed conditions. This information shall be placed in a table format which must list all setbacks; percent of lot coverage, broken out between building, pavement, landscape coverage, etc.; number of buildings; total amount of square feet; and any other applicable zoning information necessary for the proper review of the site plan.			
	Existing:			
	All setbacks			
	Percent (%) of lot coverage broken out between building, pavement, landscape coverage, etc.;			
	Number of buildings			
	Total number of square feet			
	Any other applicable zoning information necessary for the proper review of the site plan			

100 - REGULATION OF MARIJUANA REVIEW CHECKLIST - Applicant

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Included	Not Included	Explanation, if needed
70.4(C) Site Plan Procedures and Plan Requirements				
	Proposed:			
	All setbacks			
	Percent (%) of lot coverage broken out between building, pavement, landscape coverage, etc.;			
	Number of buildings			
	Total number of square feet			
	Any other applicable zoning information necessary for the proper review of the site plan			
3a. 3	Assessor and Deed Information: The Truro Assessors Atlas Map(s) and Parcel(s) numbers and all plan and deed references.			
3a. 4	Graphic Scale			
3a. 5	Title Block - Including:			
	name and description of the project;			
	address of the property;			
	names of the record owner(s) and the applicant(s); and			
	date of the preparation of the plan(s) and subsequent revision dates			
3a. 6	Legend of All Symbols			
3a. 7	Property boundaries, dimensions and lot area			
3a. 8	Topography and grading plan			
3a. 9	Location, including setbacks of all existing and proposed buildings and additions			
3a. 10	Septic system location			
3a. 11	Location of (as applicable):			
	wetlands			
	the National Flood Insurance Program flood hazard elevation, and			
	Massachusetts Natural Heritage Endangered Species Act jurisdiction			
3a. 12	Driveway(s) and driveway opening(s)			
3a. 13	Existing and proposed lighting			
3a. 14	Existing landscape features both vegetative and structural			

100 - REGULATION OF MARIJUANA REVIEW CHECKLIST - Applicant

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Included	Not Included	Explanation, if needed
70.4(C) Site Plan Procedures and Plan Requirements				
3a. 15	Limit of work area (area to be disturbed during construction, including parking and storage of vehicles and equipment) and work staging area(s)			
	Architectural Plans			
3b.	Architectural plans with all dimensions at a scale of no less than 1/8" = 1'-0", including:			
	elevations			
	floor plans			
3c.	**Lighting** specification, including style and wattage(s)			
	N**eighborhood Context**:			
3d.	Photographs or other readily available data concerning the location and size of buildings on lots adjacent to or visible from the lot under consideration in order to provide a neighborhood context for the property under consideration			
3e.	**Re-vegetation/Landscaping plan**, including both vegetative and structural features			

100 - REGULATION OF MARIJUANA REVIEW CHECKLIST - Applicant

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Included	Not Included	Explanation, if needed
100.8 Additional Provisions Regarding Cultivation				
A	When indoor cultivation is proposed, existing buildings, barns, greenhouses, and containers shall be reused wherever possible. Any new construction that requires a building permit shall harmonize with nearby architectural styles to the greatest possible extent. The use of metal buildings or containers shall not be prohibited, however, reasonable natural screening, or other approved screening, may be required as a condition of the Special Permit or Site Plan Approval so as to render such structure less visible from adjacent public and private ways, and abutting properties.			
B	Security fencing, as required by the Commission, shall be as inconspicuous as possible and compatible with the surrounding neighborhood. In no case shall barbed wire topped fence or a similar style be permitted.			
C	All lighting shall comply with all Truro Bylaws and be shielded so as not to shed light onto adjacent properties. The Planning Board may require any artificial lighting system to employ appropriate components, including but not limited to LED components, equipped with deflectors in order to mitigate potential light pollution.			
D	The Planning Board shall include in its Site Plan Approval a mandatory condition of any cultivation activities, that sales, gifts or delivery of Marijuana or Marijuana products directly to the public shall be prohibited.			

100 - REGULATION OF MARIJUANA REVIEW CHECKLIST - Applicant

Address: _____ **Applicant Name:** _____ **Date:** _____.

No.	Requirement	Included	Not Included	Explanation, if needed
100.8 Additional Provisions Regarding Cultivation				
E	In the case of Marijuana Cultivators, Craft Marijuana Cooperatives, or MMTCCPs, located in districts other than the Residential District, the Special Permit application shall specify the amount of canopy proposed to be cultivated on each parcel utilized by the applicant, and a limit on the amount of cultivation canopy may be imposed as a condition of the Special Permit. Any material change in the amount of cultivation canopy at each parcel shall be reported to the Zoning Enforcement Officer, the Planning Board and the Zoning Board of Appeals. For the purposes of this section, the term "material" shall mean an increase in canopy utilization of greater than fifty percent (50%) in a calendar year. In the event such change in canopy, in the determination of the Zoning Board of Appeals constitutes a change in the intensity of use authorized under the terms of the Special Permit, the Zoning Board of Appeals may require a modification of the Special Permit and the applicant shall be required to obtain a modification of the Site Plan Approval.			

ADDRESSING THE REVIEW CRITERIA

§100.1 PURPOSE

The purpose of the marijuana bylaw is to provide for the regulation of Adult Use Recreational Marijuana Establishments ("RME") and Medical Marijuana Treatment Centers ("MMTC") in accordance with An Act To Ensure Safe Access to Marijuana, Chapter 55 of the Acts of 2017 (the "Act"), and all regulations which have or may be issued by the Cannabis Control Commission, including, but not limited to 935 CMR 500.00 and 935 CMR 501.00, in locations suitable for such uses, which will minimize adverse impacts of RMEs and MMTCs on adjacent properties, residential neighborhoods, schools and other sensitive locations by regulating the siting, design, placement and security of such uses.

Instructions: Please provide the Planning Board with a short explanation of how your application meets each of the review criteria of §70.4D, 100.6E and H, and §100.9 of the Truro Zoning Bylaw. If you require extra space for your answers, please attach the additional information to your application in no more than four (4) pages. This is to provide the Planning Board with an overview of your rationale prior to the meeting.

§70.4D – REVIEW CRITERIA

The Planning Board shall review Site Plans and their supporting information. It is the intent of Site Plan Review that all new construction shall be sited and implemented in a manner that is in keeping with the scale of other buildings and structures in its immediate vicinity in order to preserve the characteristics of existing neighborhoods. Such an evaluation shall be based on the following standards and criteria:

1. Relation of Buildings and Structures to the Environment. Proposed development relates to the existing terrain and lot and provides for solar and wind orientation which encourages energy conservation because:

   _____
   _____
   _____
   _____
   _____

2. Building Design and Landscaping. Proposed development is consistent with the prevailing character and scale of the buildings and structures in the neighborhood through the use of appropriate scale, massing, building materials, screening, lighting and other architectural techniques because:

   _____
   _____
   _____
   _____
   _____

3. Preservation of Landscape. The landscape will be preserved in its natural state insofar as practicable by minimizing any grade changes and removal of vegetation and soil because:

_____
_____
_____
_____
_____

4. Circulation. Curb cuts and driveways will be safe and convenient and will be consistent with Chapter I, Section 9 of the General Bylaws of the Town of Truro because:

_____
_____
_____
_____
_____

5. Lighting. Lighting will be consistent with Chapter IV, Section 6 of the General Bylaws of the Town of Truro. There will be protection of adjacent properties and the night sky from intrusive lighting because:

_____
_____
_____
_____
_____

§100.6 – GENERAL REQUIREMENTS (all in Checklist)

E. No odor from marijuana cultivation, processing, manufacturing or retail may be noxious or cause a nuisance or danger to public health or impair public comfort and convenience. Marijuana establishments shall incorporate odor control technology and safeguards to ensure that emissions do not violate Board of Health regulations adopted pursuant to M. G. L. c 111 §31C, including but not limited to those specific for odors. *Briefly explain how you are addressing this:*

_____
_____
_____
_____
_____
_____
_____

H. Craft Marijuana Cultivator Cooperatives, Marijuana Cultivators, MMTCCPs and Microbusinesses shall be allowed to utilize movable structures, except that natural screening, or other approved screening, shall be required as a condition of Site Plan Review, as necessary, to render such structures less visible from public or private ways or abutting parcels. *Briefly explain how you are addressing this:*

_____
_____
_____
_____
_____
_____
_____

§100.9 – SITE PLAN REVIEW AND SPECIAL PERMIT CRITERIA

A. In addition to the Site Plan Review under §70 et. seq., and the Special Permit criteria under §30.8 the Planning Board and Zoning Board of Appeals, respectively, shall conduct all Site Plan Review and Special Permit determinations on a case-by-case basis, taking into consideration:

1. The particular form of Marijuana activity proposed:

   _____
   _____
   _____
   _____
   _____

2. The site location (including proximity of abutters, schools, or sensitive natural habitat) or historic properties identified in the Town's inventory of historic resources:

   _____
   _____
   _____
   _____
   _____

3. The traditional uses of the site and their similarity to or difference from the proposed activities:

   _____
   _____
   _____
   _____
   _____

4. The intensity of the proposed activities, including impacts on neighbors and the environment:

_____
_____
_____
_____
_____

B. In addition to the Site Plan review criteria set forth in §70.4(D), the following shall additionally apply to the Planning Board's review of any RME and MMTC:

1. The proposal shall provide for the protection of abutting properties and the surrounding area from detrimental site characteristics and from adverse impact from excess noise, dust, smoke, or vibration higher than levels previously experienced from permitted uses:

_____
_____
_____
_____
_____

2. The proposal shall provide for structural and/or landscaped screening or buffers for storage areas, loading docks, dumpsters, rooftop or other exposed equipment, parking areas, utility buildings and similar features viewed from street frontages and residentially used or zoned premises:

_____
_____
_____
_____
_____

4

TOWN OF TRURO

ASSESSORS OFFICE
CERTIFIED ABUTTERS LIST
REQUEST FORM

APPLICATION FOR ADULT USE RECREATIONAL MARIJUANA ESTABLISHMENTS (RME) AND MEDICAL MARIJUANA TREATMENTS CENTERS (MMTC)

DATE: _____

NAME OF APPLICANT: _____

NAME OF AGENT (if any): _____

MAILING ADDRESS: _____

CONTACT: HOME/CELL _____ EMAIL _____

PROPERTY LOCATION: _____
(street address)

PROPERTY IDENTIFICATION NUMBER: MAP _____ PARCEL _____ EXT. _____
(*if condominium*)

ABUTTERS LIST NEEDED FOR:

_____ Application for Adult Use Recreational Marijuana Establishment (RME) and Medical Marijuana Treatment Centers (MMTC) Marijuana*****

*****Provide two (2) copies: one for Planning Board Site Review and one for ZBA Special Permit

FEE: $15.00 <u>per</u> checked item (*Fee must accompany the application unless other arrangements are made*)

<u>Note</u>: Per M.G.L., processing may take up to 10 calendar days. Please plan accordingly.

THIS SECTION FOR ASSESSORS OFFICE USE ONLY

Date request received by Assessors: _____ Date completed: _____

List completed by: _____ Date paid: _____ Cash/Check _____

<u>Abutters list for</u>: Abutters, owners of land directly opposite on any public or private street or way, and abutters to the abutters within 300 feet of the property line as well as any other property owners within 300 feet of the property line.

Scott Warner
North Truro, MA

October 29, 2020

Sent via email + Express Mail
TIME SENSITIVE MATTER

Regulatory Department at the Cape Cod Commission
P.O. Box 226
Barnstable, MA 02630

Re: Truro ZBA Request for Commission Review of Cloverleaf Project

Dear Colleagues:

Recently, members of Pond Village, a community of 150 households in Truro, have become deeply and increasingly concerned about the threat the proposed Cloverleaf project poses to the safety of our well water, to our own health and safety, and the well-being of the historic Pilgrim Pond located in our community. Our primary and urgent concerns, which we have expressed to the Truro Zoning Board of Appeals ("ZBA") in two letters[1] and many comments made by community residents at the last two ZBA meetings of Oct. 5 and 22, 2020, are twofold:

- First, **the sewage treatment system (the "I/A" system") as proposed poses a real threat to our health and safety**. It will release 2.8 million gallons of effluent per year downgradient into our community's groundwater with a stated "best case" nitrogen loading of 9 mg/L "at the property line" and 10mg/L at the site itself. This is twice what current science - and the Commission – recommend as an acceptable maximum contamination level.
- Second, **the "peer review" study obtained by Truro is inadequate and incomplete,** leaving our community with serious questions about the reliability and validity of the peer review process and conclusions, upon which the ZBA relies.

Our concerns are in part corroborated by a new report[2] prepared by an independent group, Docs for Truro Safe Water, which examined more than 60 years of extant scientific evaluations on the impact on human health of nitrogen loading and nitrate concentration in drinking and groundwater. The science is incontrovertible and the 60-year trend is consistent: **low levels of nitrates in groundwater have adverse effects on health and that nitrate levels above 5mg/L present unacceptable and life-threatening challenges to health including many forms of cancer, brain tumors in children, and birth defects., among many others. Excessive nitrates are a public and environmental health hazard.**

Our concerns are pressing and urgent because the ZBA is about to determine if final waivers for the project should be granted. If they are, our very serious concern is that our health and of future generations of Pond Villagers to come will be irremediably harmed.

---

[1] Attached as **Appendix A and B,** respectively.
[2] ***Private Wells and Truro Safe Water***, found at https://docstruro.org/

At the October 22 ZBA meeting,[3] the Board passed a resolution to request that the Cape Cod Commission review the proposed I/A wastewater treatment system for the Cloverleaf development, including a review of the proposed system itself and the associated operation management agreement, monitoring, and contingency plans, among other items. All of these are part of the "peer review" mentioned above as prepared by Horsley and Whitten for the Town.

Notably, the ZBA set a 20-day deadline for the Commission's report /response to their query based upon unspecified concerns for potential penalties to the Town and the developer**. We believe this time frame is unreasonable**, given the gravity of the matter, the time needed to digest the scientific review contained in the DOCS report cited above, and the detailed and extensive concerns and questions we have raised about the peer review process as well.

For us, this is a very serious matter of public health and safety; it is not opposition to affordable housing, which we unwaveringly support, including in the Pond Village area We believe safe water and affordable housing done in scale, are both important and mutually achievable, but only if the project's real impacts are ascertained based on current science, and if it operationalizes accordingly.

To help support your review, we attach the following materials that we have submitted to the ZBA:

- An October 5 letter from nearly 80 residents of Truro's Pond Village Community. This letter:
  - Makes 5 requests to the ZBA with respect to the pending health-related waivers associated with the applicant's current plans for 39 units of housing on the 3.9-acre Cloverleaf site.
  - Appends a summary of the history of recent well water testing in the Pond Village area, and the results of an initiative recently undertaken by the residents of Pond Village to have their well water tested, showing some of Pond Village properties already have high concentration of nitrates in their well water.
  - Appends the September 2020 report by the Docs for Truro Safe Water that compiles and synthesizes research related to the conditions and standards that affect potable water quality in Truro and in areas with similar geophysical and water use profiles in the Outer Cape area. We attach the **Executive Summary** and the **Conclusions** pages from that report in **Appendix C**.

- An October 19 letter from 120 residents of Truro's Pond Village community identified several as-yet unanswered questions about the proposed pilot wastewater treatment system, its monitoring and contingency plan, and the failure of the Town to provide a comprehensive, multidisciplinary peer review to consider all health-related impacts of the project. This letter also includes an Addendum entitled **Deficiencies of the Monitoring and Contingency Plans** that enumerates and raises a substantial list of unanswered questions about the extensive deficiencies in the applicant's plans for the wastewater treatment system. **We ask the Commission to fully consider each of the issues and questions raised in this Addendum.**

[3] Viewable at http://trurotv.truro-ma.gov/CablecastPublicSite/show/4609?channel=1

- Both of these letters were discussed at the ZBA meeting following submission (respectively, Oct 8 and 22, 2020) and many comments and questions were presented as well by residents.[4] Our concerns remain unabated and even more pressing now as we learn more about these risky plans.

In our view, the ZBA placed an unreasonably tight time limit on the Commission's ability to conduct the requested review in a manner that is both credible and responsive to the public, including us. **For the health and safety of our entire community, we ask that the Commission conduct a thorough, rigorous, and independent review of the proposed wastewater treatment system and plan and that it should take the time needed to do so.**

We also hope the Commission will recognize and call for **meaningful evaluation of the downgradient impacts from the additive effect of 2.8 million gallons of contaminated effluent discharged annually to the already compromised groundwater in the Pond Village** area and that it will call for full consideration of the effects of **additional nitrogen loading on the health of Pilgrim Pond**. Neither of these adverse effects were considered as part of the peer review or other processes to evaluate the project to date.

Finally, we hope that the Commission will **adhere to its own recommended standard for nitrate concentration and nitrogen loading in groundwater of 5 mg/L** in reviewing the Cloverleaf and **call for Truro to adopt this level before approving this project**.

We appreciate that the ZBA has a difficult task and that it referred important matters to your review based upon the grave and urgent concerns we have recently expressed. We now ask the Commission to use its considerable expertise to evaluate this project through the lens of science and in light of the threat it poses to our health and safety. Because we are uncertain if the ZBA request constitutes a "formal regulatory review," we send this both by email and in hard copy because of the limited time available if the Commission adheres to the ZBA timeline.

We look forward to discussing the attached materials and the issues we raise with Commission staff in a timely manner. Thank you for your consideration.

Respectfully,

Scott Warner
On behalf of engaged Pond Village residents

cc: Tim Paskarnis

Attachments [Appendices A to C]

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[4] Rough transcripts of the October 8 and October 22 ZBA meetings (viewable at http://trurotv.truro-ma.gov/CablecastPublicSite/show/4587?channel=1 and http://trurotv.truro-ma.gov/CablecastPublicSite/show/4609?channel=1) are available. These document comments made by both Horsley and Whitten and the applicant in response to questions posed by the ZBA and public commenters.

Zoning Board of Appeals
Town of Truro
Truro, MA 02666

Oct 5, 2020
via email

Dear Colleagues,

As the ZBA approaches a decision on granting waivers for density and water contamination standards for the Cloverleaf project, the undersigned residents of Pond Village/North Truro, a community of some 150 homes, are writing to express our concerns about the threat that nitrate contamination resulting from high density and insufficient wastewater treatment on the proposed site pose to our drinking and natural water quality and our health. We are also concerned about opaque financial disclosures and insufficient public scrutiny during related Cloverleaf negotiations. After individual emails and phone/video calls, we are writing collectively to ensure that our requests and concerns have been heard, acknowledged and given all due consideration.

Our requests to the ZBA are straightforward:

1. Review the DOCS report, ***Private Wells and Truro Safe Water***,[1] to understand that the science on drinking water safety since 1996 is incontrovertible and uniform at setting **5 mg/L or less as a safe limit for nitrate in drinking water**. No scientific evaluation relies upon a nitrate contamination standard above 5 mg/L.
2. **Defer granting any waivers** until and unless the developer can return with a plan, independently verified by modeling, that will achieve a 5 mg/L standard either by reductions in numbers of bedrooms or by expanded wastewater treatment systems or both;
3. **Refer these matters** to other appropriate Town bodies, including but not limited to the Board of Health, **before taking any decisions on waivers pending.** Given the impaired water quality already in existence in the Pond Village/North Truro area, we also believe the Town should conduct a **thorough and rigorous hydrogeology study of that area**, including analysis and modeling of nitrate contamination impacts to down gradient wells in this area in drought and in normal rainfall years. In the future, such studies should be required for any project proposing nitrate and/or nitrogen loading levels above 5 mg/L.
4. **Guarantee that the wastewater treatment system proposed is an effective solution to achieve 5 mg/L cap**. The proposed wastewater treatment system at Cloverleaf is not on the Mass DEP's list of accepted systems[2], and is a pilot, largely untested system.[3] Its margin of error is razor thin and there is no remediation possible if it fails. There will be no proof of its efficacy until it is installed and operational. As proposed, this system poses an unacceptable risk to the 150 families of Pond Village. Our health and safety depend on better than this; we hope the ZBA will require better than what has been provided.
5. **Require a pro forma review** including but not limited to ALL financial transactions and operational and regulatory relationships among the principal parties delivering the project, funding sources, business agreements and partnerships, long-term income projections and distribution agreements, title, sale and transfer conditions, and liabilities. The recent meeting of the Truro Housing Authority (Sep 10, 2020)[4] raises

[1] See Appendix B attached and can be found at https://docstruro.org/. Appendices are also attached for factual support.
[2] Approved Title 5 innovative/alternative technologies. https://www.mass.gov/guides/approved-title-5-innovativealternative-technologies#-general-use---secondary-treatment-units-
[3] See https://www.mass.gov/doc/biobarrier-mbr-wastewater-treatment-system-by-bio-microbics-inc-piloting-use-approval/download
[4] See http://trurotv.truro-ma.gov/CablecastPublicSite/show/4546?channel=1

pressing questions about whether the developer (CHR), management partners (CDP and others), and the Town have appropriate arms' length relationships and sufficient disclosures and controls to ensure that transparent action and appropriate taxpayer support are subject to proper public scrutiny.

We residents of Pond Village/North Truro are uniformly in favor of affordable housing in Truro including in the Pond Village area. In no way should the concerns we express about the potential negative impacts to water quality in the Pond Village area be construed as opposition to affordable housing. At the same time, we believe that safe drinking water in our community and throughout Truro is an equally important priority. **It is not "either/or" for us; it is "both/and."**

The Energy Committee has shown how Truro can accomplish affordable housing AND achieve a clean energy solution. The same must be accomplished for clean water. We have legitimate and serious scientifically supported concerns about the direct threats Cloverleaf poses to our drinking water, to our health and to public health and safety. We are equally concerned with what current Board of Health water contamination standards portend for other parts of Truro. We assert that clean water and affordable housing are mutually achievable, but the current plans fall far short and raise serious public health concerns that have not been explored, vetted, or disclosed.

A study commissioned by the Town and reported by Weston & Sampson in 2014 found that water quality in Pond Village is one of three areas of concern in Truro. Given that the Town has already recognized the precarious nature of drinking water quality in the Pond Village area, it seems imprudent at best to move forward absent further study with a project that has the serious potential to further degrade water quality in Pond Village.

.

Realizing that the Town is not yet taking our concerns seriously, we initiated our own water sampling project. Recent tests performed since August 2020 at nearly two dozen properties in the Pond Village/North Truro area show alarming rates of nitrate contamination at present and confirm past trends found by W&S and by WROC. These current results are aggregated in Appendix A. Any further nitrogen loading to the groundwater feeding our wells will exacerbate that degradation in water quality.

Furthermore, **Pilgrim Pond is a site of national historic significance** – "It was here that a group of 16 Pilgrims, led by Myles Standish and William Bradford, spent their second night on the shores of Cape Cod." Pilgrim Pond is not only an irreplaceable cultural asset for Truro, but one of national historic significance. The Cloverleaf project as proposed will almost certainly lead to increased nitrogen loading into the pond, further eutrophication, the potential for serious algal blooms, odor problems, and significant ecosystem disruptions and degradation to the detriment of the health and historic value of the community.

The proposed Cloverleaf Project has been a wake-up call for us about the potential impacts of development on Truro's water quality. Moving forward, we urge the Town of Truro to make water quality and its attendant health impacts a paramount issue in its decision-making processes. We are already deeply troubled and cannot accept the situation getting worse for us. Nor should the ZBA, whose remit is to ensure that nothing "detrimental to the neighborhood" is granted and whose authority and responsibility includes denying waivers to any project that jeopardizes public health and safety.

We appreciate your serious consideration of our concerns and requests for action.

Sincerely,

Members of the Pond Village Community
(Signatories on next page)

LIST OF POND VILLAGE SIGNATORIES

(Pond Village signatories only at time of submission to ZBA; more to be added, including residents of other areas in Truro)

Name	Street	Name	Street
Claire Aniello	Bay View Dr	Carolyn Hutchings	Sage Ridge Rd
Mauro Aniello	Bay View Dr	Gwen Kazlouskas-Noyes	Pond Rd
Harry Bogdos	Pond Rd	Scott Kazlouskas-Noyes	Pond Rd
Nancy Boyles	Bay View Rd	Hank Keenan	Highland Rd
Ronald Boyles	Bay View Rd	David Kirchner	Twine Field Rd
James Brown	Bay View Rd	Mary Ann Larkin	Pond Rd
Julie Brown	Bay View Rd	Julia Bergmark Lester	Pilgrims Path
Luther Bumps	Bay View Dr	Dan Maddalena	Merryfield Path
Lora Bumps	Bay View Dr	Jill Mays	Priest Rd
Barbara Cardinal	Pond Rd	Eric Mays	Priest Rd
Robert Cardinal	Pond Rd	Matthew McCue	Bay View Rd
Camille Cardinal	Twine Field Rd	Paula Passi McCue	Bay View Rd
Raymond Clark	Priest Rd	Jack McMahon	Professional Hts
Jil Clark	Bay View Rd	Marilyn Miller	Pond Rd
Sheila Coleman	Pond Rd	Brigid Moynahan	Priest Rd
Barbara Connolly	Bay View Rd	Chris Nagle	Pond Rd
William Connolly	Bay View Rd	Patric Pepper	Pond Rd
Steve Corkin	Merryfield Path	David Perry	Pond Rd
Janine Cote	Priest Rd	Louise Fournier Perry	Pond Rd
Bryan Cote	Priest Rd	Gigi Porges	Hughes Rd
Theresa Daigle	Bay View Dr	Janice Redman	Shore Rd
Glenna Descy	Bay View Dr	Jane Rudd	Priest Rd
Don Descy	Bay View Dr	Karen M. Ruymann	Bay View Dr
Damian DeWolf	Bay View Dr	Frederick W. Ruymann	Bay View Dr
Shelly DeWolf	Bay View Dr	Mallory A. Ruymann	Bay View Dr
Roger Dias	Pond Rd	Kathy Sharpless	Bay View Dr
Barry Donahoe	Paines Way	Gary Sharpless	Bay View Dr
Rob DuToit	Shore Rd	Ellynne Skove	Bay View Dr
Laura English	Pond Rd	Santina Smith	Bay View Dr
Andy English	Pond Rd	Frank Smith	Bay View Dr
Pamela Fichtner	Pilgrims Path	Barry Tendler	Pond Rd
Ronald Fichtner	Pilgrims Path	Suzanne Tendler	Pond Rd
Michael Gagne	Pond Rd	Scott Warner	Twine Field Rd
Kathy Gagne	Pond Rd	Lesley Weller	Bay View Dr
Jeanne Gaarder	Hughes Rd	Lynn Williamson	Priest Road
Eric Goss	Pond Rd	Lee Williamson	Priest Road
Amy Graves	Francis Rd	Barbara Wohlgemuth	Twine Field Rd
Elizabeth Hulick	Shore Rd	Diana Worthington	Pond Rd
Charles Hutchings	Sage Ridge Rd		

APPENDIX A

SUMMARY OF NEW RESULTS

Well Water Testing
Pond Village Area | N Truro MA
August 2020 to Present

BACKGROUND

- **Ongoing Water Testing Stops As the Cloverleaf Project Starts**

At the ZBA hearing of Dec 12, 2019 Truro residents learned that ongoing water testing - begun in 2007 and operating until 2016 - was no longer being conducted by the Town. This program ended about the same time that the original Cloverleaf project was approved by the voters.

At the next week's Board of Health meeting on Dec 17, 2019 concerns were discussed relative to ground water protection and storm/wastewater, yet it was also noted that

> "According to discussions at the Zoning Board of Appeals meeting, the next step is a peer review of the project by a private engineering company."

Throughout the early part of 2020 residents of Pond Village and other areas of Truro waited for assurances of Pond Village residents' water quality and safety. The peer review consulting firm was hired, and reports and presentations prepared. But as we read and listened to those reports, we realized that the focus remained almost exclusively on water contamination within the property lines of the 3.91-acre Cloverleaf site and not on impacts to abutters or the larger down gradient neighborhood.

- **Data Suggesting Pond Village is an Area of Concern Dismissed**

The Board of Health received a presentation from the former chair of the Water Resources Oversight Committee (WROC) in February 2020 that focused on the Pond Village water test results, where over 50 properties had been tested. The conclusion of the presentation was that Pond Village water quality was poor and presented an alarming baseline. However, the Board of Health at that time said it was "premature to make any conclusions… we're waiting for the peer review of the project."

Some ZBA members challenged the data from the WROC water studies, alleging they were "9 ½ years old" as if this data afforded no baseline value or impetus for the Town to refresh the data. Rather, Cloverleaf consultant review processes provided estimates of nitrogen loading in projected effluence – estimating 10 mg/L for effluence within the Cloverleaf parcel groundwater with 9 mg/L "at the property boundary" and near Rt 6, but that's where the analysis ended. It appeared that the impact of contaminated drinking water on the 150 family homes down gradient was no longer of concern, or at least was no longer the focus of inquiry by the Board of Health, the consultant review process or the ZBA.

The peer review provided an estimate of nitrogen loading at the up-gradient project site location. But without an insight into the baseline state of the water down gradient (in Pond Village) and the amount of additional nitrogen loading that would be expected to reach those down gradient wells, we continued to be unable to assess our health risks well into 2020.

- **Pond Villagers Request Time to Replace Town Water Testing with Their Own Water Testing**

Disturbed that our concerns about the very real threat to the health and safety of Pond Village were both dismissed and erroneously miscast as "anti-affordable housing," a number of Pond Village residents wrote in July 2020 to the ZBA saying:

> "Alarm bells that were quietly ringing in the background are now loudly peeling for our community. The more we have learned of this [Cloverleaf] proposal, the bylaw and health regulation waivers it requires, and the dangers of water contamination, the more concerns we began to have, primarily about the potential impact on the drinking water in our neighborhood and the threat that might pose to our health and safety, not to mention our equity.
>
> At this time, Pond Village property owners are conferring with one another, moving to get our well water tested, familiarizing ourselves with the issue of nitrogen/nitrates in drinking water and its consequences for health, and trying to understand why many experts say that even levels as low as 1 ppm[5] are a health threat in drinking water. We are trying to understand why the Cape Cod Commission recommends no more than 5 ppm, and the EPA accepts a standard of 10 ppm, while also saying that it doesn't apply to private wells (for which the risks seem greater)."

The Board of Health memo to the ZBA in its July 30 packet did present a sub-sample of data gathered between 2007 and 2016 as part of the Weston & Sampson study, but we read that it was inconsistent property-to-property or year-to-year, and that:

> "With the limited data that is available it is difficult to frame an accurate picture of the nitrate levels in this area."

Apparently after a wait of over six months, all that would be forthcoming was an inconclusive analysis of nitrate levels in the Pond Village area, with no new testing.

POND VILLAGERS DO THE TOWN'S JOB: CONDUCT NEW WATER TESTS

Realizing that the Town was not intending to alleviate some ZBA members' concerns about the perceived age and quality of the data, yet still acutely aware that current down gradient baseline data from Pond Village was also essential to understand the magnitude of the health risk to us, we proceeded with our own water testing program. Test kits were made available to all residents of Pond Village, beginning August 2020. Since then 27 residents sampled their water and had it tested for the level of nitrate.[6]

The results are tracked in a database and categorized into discrete levels of contamination in mg/L: >10, 10 to 5, 5 to 3, 3 to 2, 2 to 1, and <1. The results by frequency in each category are tabulated below.

Nitrate ppm	>10	10-5	5-3	3-2	2-1	<1	Total
# of Tests	**2**	**4**	**5**	**9**	**7**	**0**	27
% of Total	7%	15%	19%	33%	26%	0%	100%

Figure 1 - Water Test Summary (N=27, ongoing)

[5] The metrics "ppm" [parts per million] and mg/L [micrograms per liter] are interchangeable.

[6] Any test result with a nitrate level in excess of 5 mg/L was retested at an independent state-certified lab to ensure the integrity of the testing process. These 27 samples were collected using the same methodology and lab for comparability and reliability. Results collected using other methods and protocols are not included in this report. Collection continues and results will be reported in the future.

CURRENT WATER TESTS RESULTS AND ANALYSIS

Compared to benchmark thresholds, these results reveal a critical area where:

⇒ **7%** exceed **10 ppm**, EPA's Maximum Contamination Limit (unchanged since 1962)

⇒ **22%** exceed **5 ppm**, the Cape Cod Commission's guideline

⇒ **41%** exceed **3 ppm,** the level the EPA refers to water as "Contaminated" and the Truro BoH sends an alert to the owner about the elevated reading

⇒ **ALL samples exceed 1 ppm** - a clear signal of human waste in well water.

The histogram chart below shows the frequency of test results measuring nitrate levels at varying ranges of milligrams per liter (mg/L), interchangeable with parts per million (ppm)

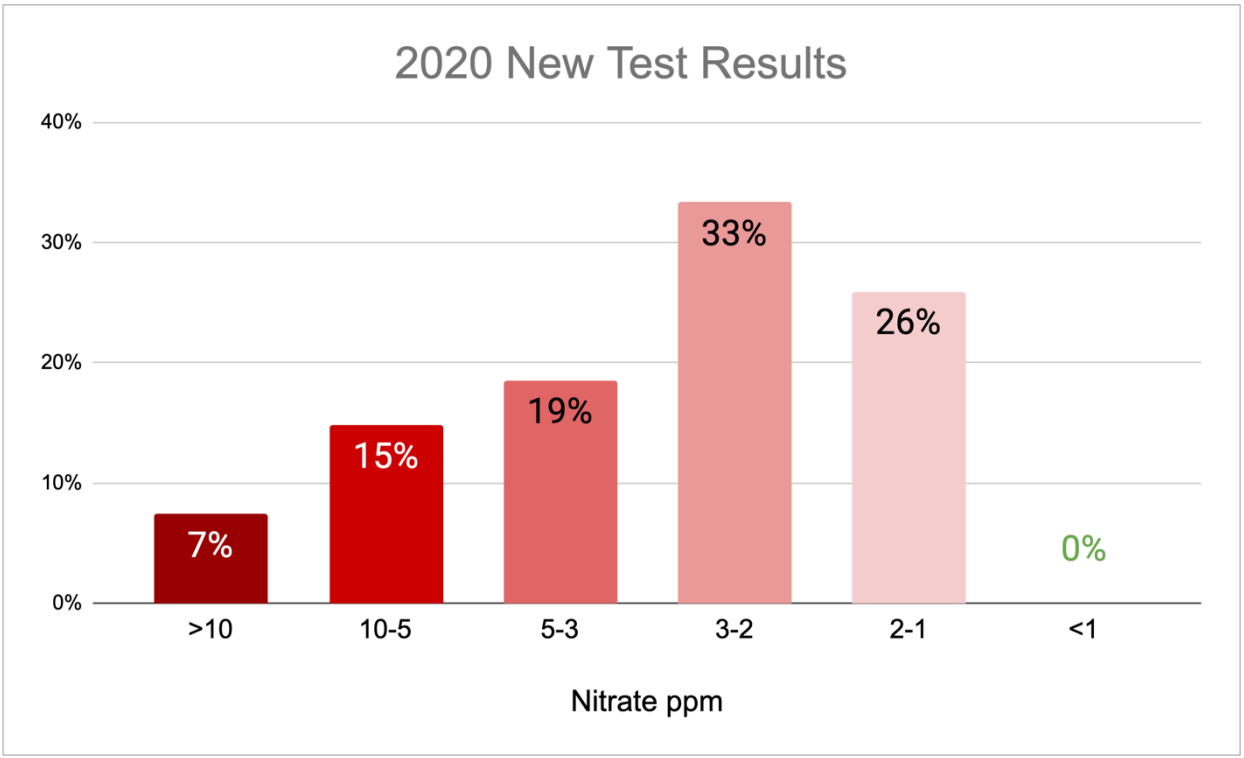


Figure 2
Pond Village Water Test Results - August 2020 to now
(N=27 samples, ongoing to be added)

Sample collection and testing will continue, and analysis of this data is being conducted by the residents and will be provided at a subsequent date.

APPENDIX B

Private Wells and Truro Safe Water

A Report by
Docs For Truro Safe Water
September 11, 2020

Full Report with Report Appendices

Executive Summary

This report compiles and synthesizes research related to the conditions and standards that affect potable water quality in Truro and in areas with similar geophysical and water use profiles in the Outer Cape area.[1] It does not analyze well water data and relies on extant reports to establish these levels.

In presenting the scientific evidence available we have relied upon three sources of data:

- Scientific data drawn from research reported in legitimate, peer-reviewed journals and publications
- Regulatory data where official agencies at various levels of government set regulations and, in many instances, maintain data related to same
- Consultative and Policy reports, usually prepared by experts, who may collect original data but who all interpret scientific and empirical evidence for policy- and decision-makers.

A lead indicator of water quality and water supply contamination is the levels of nitrates found in well water, the predominant source of domestic and commercial water in Truro. Drinking water contamination takes the form of nitrates and other organic wastewater compounds and chemicals that are mostly undetectable by taste and smell; nitrates are both easier and less costly to measure than other compounds and chemicals. Additionally, nitrates are found to be an "early detection" marker for other contaminants and serve as an effective warning sign of additional contaminants in drinking water supplies. Nitrate levels are measured in terms of milligrams per liter of water (mg/L) interchangeably with parts per million (ppm). This report uses "mg/L" but both metrics are referenced below.

Truro's Water Supply Sources

Most of Truro's drinking water comes from private wells drilled from the Cape Cod aquifer which consists of two "lenses" - or underground pools of ground water - that float between the ground and the saltwater beneath the aquifer. The Pamet River, flowing from Ballston Beach to Cape Cod Bay, divides the lens into the **Pamet Lens** to the north and the **Chequesset Lens** to the south.

Because the aquifer is fairly close to the surface in many parts of Truro and thus easily reachable by drilling, these groundwater lenses can and do provide potable water resources. Ponds throughout Truro provide a good indication of the top of the aquifer, which at its highest is about 5 feet above sea level and is generally about 200 feet deep.

Groundwater in the aquifer is mostly the result of rainfall that slowly filters down to the aquifer with every rain. Other contributors to groundwater include **runoff from hard surfaces such as roofs and paved areas** which contribute salts, petrochemicals and other solvents in the runoff; **on-ground open-air storage of toxic materials** such as asphalt, brick, concrete and pressure-treated wood; and **wastewater from septic tanks and cesspools and their overflow**, which "leach" into the soil and likewise filter into groundwater over time, contributing organic (human) and chemical waste mixed in residential and commercial effluence and wastewater. Cesspool leaching finds its way easily into the aquifer and at proportionately greater densities. It is estimated that 10% of Truro homes still have outdated cesspools or otherwise failed septic systems.

Standards and Regulations for Truro's Water Supply

Eighty-five percent (85%) of Truro's homes get their water from private wells. Yet private wells are not regulated by the Cape-wide, state or federal authorities, including the EPA. The Cape Cod Commission issues policy guidelines and recommendations, but the local Board of Health determines acceptable levels of drinking water contamination.

According to Truro's Board of Health, water quality in certain areas in the Town of Truro is degraded. Excessive nitrogen loading in our watersheds has been identified as a major cause of this degradation. The primary source of excess nitrogen is reported to be wastewater from on-site septic systems.

Although the federal EPA does not regulate private wells and Truro's largest supply of potable water is obtained through private wells, **Truro's Board of Health currently relies on the EPA standard of 10 mg/L for municipal water**

[1] The Outer Cape includes the towns of Provincetown, Truro, Wellfleet, and Eastham.

systems (not wells) as the safe upper limit of nitrates in drinking water. The EPA standard was adopted in 1962 based on a federal study of nitrates and other contaminants in reliance on data from 1951 to determine nitrate level contribution to methemoglobinemia ("blue baby syndrome"). This standard, unchanged since 1962, **cited10 mg/L as the threshold for blue baby syndrome; at no time has the EPA stated that this level is safe for private wells.**

Extensive research, most notably since 1996, **shows serious health consequences at levels of 5 mg/L - half the EPA's 10 mg/L - and less**. To illustrate but not exhaust the known impact, research associates levels of 5 mg/L with non-Hodgkins lymphoma, bladder and thyroid cancer, and birth defects, and some of these consequences are associated with nitrate levels as low as 0.9 to 3.87 mg/L; other cancers (e.g., colorectal cancer) have been found at and around a nitrate loading level of 1 mg/L. Many other serious health impacts have been identified in the research. The evolution in the scientific understanding of the adverse effects of nitrate contamination has significantly advanced since 1962, with notable changes **since 1996: the trend is clear that low levels of nitrates in groundwater have adverse effects on health and that nitrate levels above 5mg/L present unacceptable and multiple challenges to public health.**

In the intervening almost 60 years since the EPA adopted its 10 mg/L standard, numerous entities and studies, including by the University of Massachusetts, have recommended that standard be reduced to 5 mg/L. More recent research has looked at the long-term effect of nitrates and related contaminants and found significantly more risks to health. In the most recent decade, non-profit research firms including the *Environmental Work Group* and *Silent Spring Institute*, **have recommended nitrate standards be reduced to 1 mg/L**. Other than the EPA and those who adhere to its high tolerance level, **no longer do studies recommend levels as high as 10 mg/L.**

Truro's current Local Comprehensive Plan calls for continuing review by the Board of Health of nitrate concentration standards to ensure they adequately address potential groundwater pollution problems. As recently as 2014 and 2018, the Town of Truro hired the consulting firm of Weston & Sampson to study Truro's water and to understand the cumulative effects of nitrogen (nitrate) loading on groundwater quality. Sampling data obtained in 2010-2011 shows that 1181 samples were taken identifying 45 lots with nitrate concentrations above 5 mg/L and 2 lots revealing concentrations above 10 mg/L. In 2012-17 another 1400 samples were tested, generally corroborating earlier findings and trends. As a result, W&S identified parts of North Truro and the Pamet River basin as particular areas of concern. Their results, guidance on safety and mitigation, and recommendations are summarized later in this paper.

Other Effects of Excessive Nitrate Levels

Once drinking water is contaminated by excess levels of nitrates or other health-harming agents, **the remedies are costly and irreversible: to construct a public water supply system**, including large wells for supply, water filtration plants, water towers, underground water mains, and wastewater treatment facilities.

As expensive as a city-like water infrastructure is to build and maintain, and as much as it needs to be funded by significantly increased taxes, another economically devastating consequence is the **decrease in property values due to polluted drinking water.** Per the Cape Cod Commission, **a 1% increase in nitrogen is associated with a decrease in home prices of 0.6% on average.** In Truro's case, the total value of its homes is on the order of $2.3 billion. A mere 2% increase in nitrogen would then, according to this model, reduce home values by about $28 million. Allowing the **current Board of Health standard of 10 mg/L doubles the level science now establishes as a threshold for multiple health impacts: 5 mg/L**. The corresponding rise in allowable nitrate levels could have adverse economic impacts of considerable magnitude.

Conclusion

Since 1996, increasing evidence of harmful effects of nitrate concentrations on human health are found at ever lower levels; the arc of this trend has been consistent and irrefutable, finding significant health consequences at and below nitrate levels of 5 mg/L. Well below current EPA and Truro Board of Health standard of 10mg/L, these findings warrant consideration and possible revision to reset local standards consistently with current scientific evaluations for nitrate and nitrate loading levels at or under 5 mg/L as a pressing local matter. In addition, it is now evident that nitrates serve as a marker for human activity, the source of other harmful organic and chemical contaminants, many of which are not easily reducible and pose serious risks of cancer and other health problems to residents.

Abstract

This paper reviews and presents a compilation of 75 years of scientific research collected on private well water and its safety, primarily focused on evolving standards and new research on the health effects of nitrates in drinking water. It has been undertaken by *Docs for Truro Safe Water*[2] to present and highlight the scientific evidence available to residents and decision makers in the Town of Truro, MA who are concerned with drinking water safety in a variety of settings. To the extent that current standards rely on geo-specific and/or historic data, consideration has been given to circumstances particular to the Outer Cape, as well as to more recent research conducted and reported in the past two decades.

Introduction

Most of Truro's drinking water comes from private wells which are drilled down into the Cape Cod Aquifer in order to pump up groundwater, providing water for domestic use. Most importantly well water is the predominant source of drinking water, serving more that 85% of current residential properties in Truro. The majority of public-serving commercial entities also rely on well-water to serve their clients. Unlike other systems and appliances that can be maintained for optimum performance, private wells are passive, delivering whatever exists in the aquifer, regardless of how safe it is for human consumption. Thus, the quality of Truro's drinking water is largely dependent on the quality of its groundwater.

A primary and indicative contaminant in Truro's drinking and groundwater is nitrates. Currently, no explicit standards exist at federal, state or local levels to establish safe levels on nitrate contamination in well water. Federal standards apply to municipal water systems and environmentally sensitive areas and states and local governments have generally adopted these or developed regulations consistent with Federal standards. In the case of well water - passive systems that have none of the source protections (e.g., reservoir controls) or the supply protections (e.g., water treatment systems), the standards are not comparable.

In addition, the level of nitrate concentration considered to be safe in these public and natural systems is evolving – and decreasing – rapidly and most notably in the past 20 years based upon multiple scientific studies. Similarly, the variety and types of health conditions adversely impacted by low levels of nitrates in water is also expanding. This report attempts to look at evolving standards for safe nitrate concentrations and appropriate standards for safe well water in a rural community largely dependent upon this source of drinking water.

Truro's Water Supply Sources

The Cape Cod aquifer consists of two "lenses" - or underground pools of ground water - that float between the ground and the saltwater beneath the aquifer. The Pamet River, flowing from Ballston Beach to Cape Cod Bay, divides the lens

[2] ***Docs for Truro Safe Water*** is a group of medical and scientific professionals - all holding M.D. or Ph.D. degrees - who reside in Truro, MA and the Outer Cape region who bring their expertise and scientific perspective to the evaluation of data related to specific issues affecting the region. In this case, the focus is on local drinking water safety. Brief bios of affiliates can be found at **https://docstruro.org**.

into the **Pamet Lens** to the north and the **Chequesset Lens** to the south, as depicted below in **Figure 1** and in **Appendix A**.

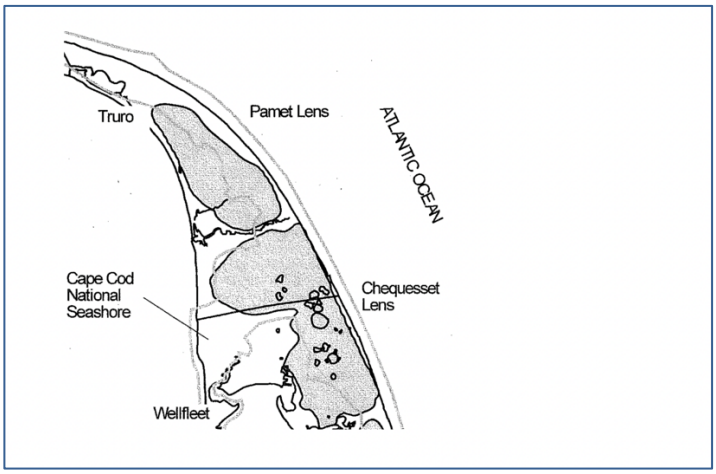


Figure 1: Aquifer Lenses in Truro, MA

Because the aquifer is fairly close to the surface in many parts of Truro and thus easily reachable by drilling, these groundwater lenses can and do provide potable water resources to the large majority of residents and businesses – as well as their visitors – throughout Truro. Ponds throughout Truro provide a good indication of the top of the aquifer, which at its highest is about 5 feet above sea level and is generally about 200 feet deep.

Groundwater in the aquifer is mostly the result of rainfall that slowly filters down to the aquifer with every rain. Other contributors to groundwater include:

- **Runoff from hard surfaces such as roofs and paved areas** which contribute salts, petrochemicals and other solvents in the runoff. This includes paved surfaces in roadways, driveways, sidewalks and all types of impermeable surfaces such as non-porous patios and decks
- **On-ground open-air storage of toxic materials** such as asphalt, brick, concrete, pressure-treated wood, aggregated construction debris, as well as any storage containers holding toxic materials (e.g., salts, petrochemicals, engine oils and other solvents) that leak or drip
- **Wastewater from septic tanks and cesspools and their overflow**, which "leach" into the soil and likewise filter into groundwater over time, contributing organic (human) and chemical waste mixed in residential and commercial effluence and wastewater. Cesspool leaching finds its way easily into the aquifer and at proportionately greater densities. It is estimated that 10% of Truro homes still have outdated cesspools.

Truro's water supply is plentiful on the one hand and fragile on the other, highly susceptible to the expanding use of toxic and environmentally sensitive chemicals introduced into the aquifer by human activity and products. In this respect nitrates pose a direct challenge to water quality and human health and serve as a barometer and catalyst for the presence of other contaminants that can also be harmful. According to the **Cape Cod Commission**:

> *The Cape Cod Aquifer is extremely susceptible to contamination from various land uses and activities.*
>
> *Nitrate, a major component of human wastewater, passes through septic systems virtually untreated and is introduced to the underlying groundwater.*

Nitrate can serve as an indicator of other wastewater contaminants, such as disease-causing organisms, solvents, cleaners, petroleum compounds, pharmaceuticals and personal care products and other emerging contaminants.

- *Water Quality Management Plan* (2015)

Access to clean water is first and foremost a public health issue, but it is also an economic and environmental issue as well. The US Geological Survey cautions us about the centrality of adequate water supply to our future well-being.

Population growth and increasing demands for water make the availability of that water, measured in terms of quantity and quality, even more essential to the long-term sustainability of our communities and ecosystems.

- National Water Quality Assessment Program (2010)

Standards and Regulations for Truro's Water Supply

All drinking water for Truro homes and businesses comes from the Cape Cod aquifer lenses located in whole or in part under the Town of Truro. The vast majority of these users rely on private wells for their water supply for home and business uses.

The EPA is often cited as the standard setter for water quality in public water systems and natural environments, but since its inception **the EPA has not regulated private wells. Federal authorities instruct well owners to be responsible for water quality in their own wells.**

Figure 2: Current EPA Message to Private Well Owners

EPA does not regulate private wells nor does it provide recommended criteria or standards for individual wells. EPA offers information regarding the importance of testing private wells and guidance on technologies that may be used to treat or remove any contaminants. Private well owners are responsible for the safety of their water.
https://www.epa.gov/sites/production/files/2018-02/documents/epa-ogwdw-private-wells-v4.pdf

While Federal authorities often establish thresholds on water safety for use by other levels of government, in the absence of EPA standards for private wells it is notable that **private wells are also not regulated by the Massachusetts Department of Environmental Protection (Mass DEP)**. The Commonwealth points to local Boards of Health to act as regulators, as stated on their Mass DEP website:

> *MassDEP does not regulate private wells. Your local board of health or health department regulates them….The local BOH is empowered to adopt a Private Well Regulation that establishes criteria for ...water quality.*
>
> *https://www.mass.gov/orgs/massachusetts-department-of-environmental/-protection*

The Truro Board of Health has expressed concern about degradation of drinking water quality in Truro:

> *Water quality in certain areas in the Town of Truro is degraded and excessive nitrogen loading in our watersheds has been identified as a major cause of this degradation. The primary source of excess nitrogen is wastewater from on-site septic systems.* - *Truro Board of Health Regulations*

Sources of Drinking Water Contaminants in Well Water

Contaminants in well water come primarily from septic systems. Those septic systems contain both **organic nitrogen (nitrates) from human waste as well as organic wastewater compounds (OWCs)** and may contain other toxins that are flushed or washed into septic systems or dropped on the ground to leach into groundwater. OWCs are ingredients and by-products of common agricultural, industrial, and household substances that can contaminate our groundwater through sources like hard surface runoff and septic systems, as noted above. **Appendix B** gives more examples, such as **solvents, disinfectants, detergent, and human drugs**. To a lesser degree, nitrates also come from the use of **fertilizer applied to plants, including animal waste**. An illustration of the Environmental Nitrogen Cycle is found in **Appendix C**.

In a residential community such as Truro, nitrates and OWCs both primarily originate from human activity. Because it is much simpler and less expensive to test for nitrate than it is to test for chemical compounds, actual OWC levels are less frequently reported - but that does not mean they are absent. To determine nitrate levels, water tests are available through the Barnstable County testing laboratory. An example test result is shown in **Appendix D**.

As regulators analyze water safety, a high correlation has been shown to exist between nitrate levels and OWC levels. This means that health risks exist at lower nitrate levels than previously understood, in part due to the co-presence of OWC contaminants. This is in part due to lower levels of tolerance for OWC contamination and to the cumulative effect of these in combination.

Researchers are also giving more attention to longer duration exposures at reduced levels of nitrate concentrations. Originally, pursuant to the EPA formulating its standards in the early 1960s, nitrate toxicity in infants was based on exposure of just a few months duration. High levels would be needed to show impact in a short time span. But exposure to a reduced nitrate level over several years, when that cumulative exposure also includes OWCs present as well, has been increasingly linked to health risks in humans of all ages. This exposure has been coined by Kevin Kuechler, former chair of Truro's Water Resource Oversight Committee, as the ***nitrogen footprint*** **which, like a carbon footprint, can benefit from substantial reduction in concentration and volume.**

"Safe" Levels of Contamination

A "safe level of contamination" is an oxymoron; contamination is never safe, but it is sometimes tolerable if contaminants have a negligible impact on human, animal or environmental health. In this respect, there is agreement about the sources of well water contamination. Consensus as to what levels of contaminants are safe in drinking water, and especially well water, is evolving. In recent years, research and scientific evidence has mounted that shows "safe" levels - that is, the level at which no known adverse consequences to health are triggered - are lower than originally understood.

The first known report of potential effects of nitrate poisoning in infants was made in 1945. In 1962, the EPA adopted a **standard of 10 mg/L originally as the threshold for blue baby syndrome** based on a federal study of nitrates and other contaminants in reliance on data from 1951 to determine nitrate level contribution to methemoglobinemia ("blue baby syndrome"). This standard, **unchanged since 1962, currently applies an MCL (maximum contamination level) of 10 mg/L for municipal water systems (not wells) as the safe upper limit of nitrates in drinking water; at no time has the EPA stated that this level is safe for private wells.**[3] Yet, in the face of growing and consistent research which indicate this standard may be too high, the EPA has begun to re-assess its recommendation. For example:

- In 2017, **the EPA** acknowledged (a) a growing body of literature indicating potential associations between nitrate/nitrite exposure and other serious noncancer health effects, and (b) epidemiological studies also suggesting an increased risk of cancer, the EPA began undertaking a reassessment of the health effects of nitrate and nitrite.

Based on their own independent research:

- **University of Massachusetts Dartmouth** recommends **a nitrate level no higher than 5 mg/L**. Its seminal study states, inter alia:

  Ingestion of drinking water with nitrate concentrations in excess of 10 mg/L may be fatal to infants. Concentrations in excess of 5 mg/L indicate a severe degradation of groundwater quality. In order to guard against nitrate concentrations reaching danger levels, if you have a nitrate concentration exceeding 5 mg/L in your well, you should monitor the nitrate for a trend of increasing concentrations.

  A potential cancer risk from nitrate in drinking water and food has been reported. The possibility exists that nitrate can form nitrosamine, which is known to cause cancer.

  Nitrate-nitrogen concentrations above 1.0 mg/L indicate potential land use impacts to water quality. You should try to identify the potential land use source that is causing the elevated levels in your drinking water. Drinking water with nitrate-nitrogen concentrations greater than 5.0 mg/L should not be used to prepare infant formula.

- The **Cape Cod Commission** recommends **a nitrate level no higher than 5 mg/L** Further to this, it has published some minimum guidelines as to level of discharge from septic systems to protect the aquifer in general and the private wells that pump from it. More follows below on the Commission's insights.

- The **Environmental Working Group,** a nationally recognized non-profit, non-partisan organization dedicated to protecting human health and the environment, **recommends a nitrate level "10 times lower" than EPA 10 mg/L, that is, 1 mg/L,** stating inter alia:

  Private drinking water wells in the vicinity of animal farms and intensively fertilized fields, or in locations where septic tanks are commonly used, can also have unsafe levels of nitrate.

  The federal limit of 10 milligrams per liter, or mg/L, equivalent to parts per million, for nitrate in drinking water was set in 1962 and has never been updated. This standard was developed to prevent acute cases of methemoglobinemia, known as blue baby syndrome, which can occur when an infant's excessive ingestion of nitrate leads to oxygen deprivation in the blood.

  Epidemiological research suggests that the federal nitrate limit does not sufficiently protect public health. Studies conducted in the U.S. and in other countries found greater incidence of colorectal, ovarian, thyroid, kidney and bladder cancers among people exposed to nitrate in drinking water. Researchers in Europe have found elevated risk of colorectal cancer associated with drinking water concentrations more than 10 times lower than the federal limit. Epidemiological studies also report that nitrate contamination of tap water can harm the developing fetus.

[3] At recent public meetings in Truro, it has been reported that the Board of Health currently relies on the EPA standard of 10 mg/L.

The federal legal limit for nitrate in drinking water fails to address the growing concerns about chronic, low-level exposure to nitrate and potential cancer risk.

- The **Silent Spring Institute**, a non-profit research institute, recommends **a nitrate level no higher than 1mg/L.** Silent Spring's mission is preventing cancer by reducing people's exposure to harmful chemicals. It is explicit and firm, inter alia, that based on the current EPA standard of 10 mg/L of nitrates in drinking water:

  Our results suggest that current regulations to protect domestic wells from pathogens in septic system discharges do not prevent OWCs [organic wastewater compounds] from reaching domestic wells.

  We found that nitrate concentrations of 1 mg/L NO3-N, which are tenfold higher than local background and tenfold lower than the US federal drinking water standard, were associated with wastewater impacts from OWCs. Since nitrate is a commonly measured drinking water contaminant, it is a useful screening tool for OWCs in domestic wells.

- **Cape Cod's** Area Wide Water Quality Management Plan Update, developed pursuant to Section 208 of the Clean Water Act, was certified by Governor Charlie Baker in June 2015 and approved by the U.S. Environmental Protection Agency on September 15, 2015. It states, inter alia:

  Cape Cod has a water problem. The saltwater border that has defined our peninsula is being poisoned by nitrogen. The rapid decrease in the water quality of Cape Cod's marine ecosystems is plain to see. The problem is nitrogen and the largest controllable source is the septic systems used every day.

  Nitrogen is impacting coastal water quality. About 80% of the nitrogen that enters Cape Cod's watersheds is from septic systems.

  The Cape Cod seasonal economy relies on the water that surrounds the region and the degraded water quality is negatively impacting important economic drivers including coastal property values.

- The **Cape Cod Regional Policy Plan** established a nitrogen loading concentration of 5 ppm (i.e., 5 mg/L) to ensure that nitrate levels in drinking water will not approach the 10 mg/L federal standard for public water supplies.

  Five-ppm Nitrogen Loading Standard: All development and redevelopment shall not exceed a 5-parts per million (ppm) nitrogen loading standard for impact on groundwater…

The Evolution of Safe Drinking Water Standards Over Time (1945 to now)

In order to understand how nitrate safety standards have evolved over the past 75 years, **Figure 3** depicts the main moments in time where "safe levels" of nitrates changed over time. This allows us to get a perspective on how long it has taken policy to catch up with science on water contamination and at the same time, to see how rapidly consensus and revised policy recommendations are being developed more recently. Starting with the first query in 1945 about "blue-baby syndrome" and the few small sample studies that followed on this topic in the 1950s to the early establishment of the EPA standard in 1962 that resulted, and on to more recent research focusing on various diseases resulting from well-water nitrates and other contaminants.

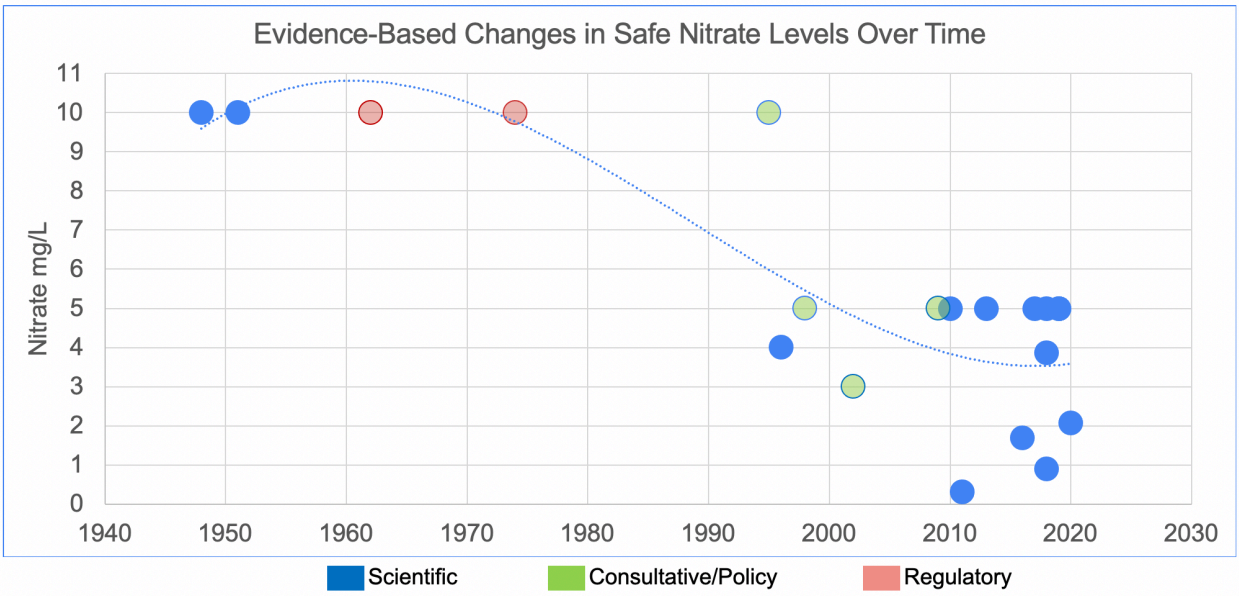


Figure 3: Evidence-Based Decreases in Safe Nitrate Levels (1945-2020)

Snapshot of Key Findings on Determinants of Health-Compromising Nitrate Levels Over Time

- 1945 (year 1)

  Dr. Hunter Comly of Iowa reported on two cases of a "previously unrecognized" condition that "may occur anywhere in rural areas where well-water is used in infant feeding." Dr. Comly suspected that the nitrates in the family's well-water were at fault.

- 1947-1950 (years 2-5)

  Journal of the American Water Works Association

  The first scientific reported study is conducted in 1947-49 by clinical and sanitary experts of 139 cases of methemoglobinemia ("blue baby syndrome") resulting from the consumption of well-water reported in Minnesota between January 1947 and September 1949 in infants under five months of age.

- 1951 (year 6)

  American Journal of Public Health and the Nation's Health

  "Water used in preparing infant's feeding formula should contain no more than 10 (possibly 20) ppm nitrate N."

- 1962 (year 17)

  The **U.S. Public Health Service** recommended a national nitrate standard of 10 ppm.

- 1974 (year 30)

  The **Safe Drinking Water Act (SDWA)** was passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The EPA endorsed a 10 mg/L (ppm) nitrate limit in public drinking water.

- 1996 (year 52)

  Epidemiology

  "Long term consumption of community water with average nitrate levels in the highest quartile (> or = 4 mg[4] per liter nitrate-nitrogen) was positively associated with health risk [citing non-Hodgkin's lymphoma]."

  "These findings indicate that long term exposure to elevated nitrate levels in drinking water may contribute to the risk of NHL [non-Hodgkin's lymphoma]."

- 1998 (year 54)

  Lower Cape Water Management Task Force

  "Descriptions of water quality are typically expressed by using an acceptable standard value. In this study, we report the number of wells that exceed 5 mg/L as a measure of water quality."

- 2002 (year 58)

  The Journal of Preventive Medicine

  "By mandating a safety factor of two, which would reduce the current MCL and HAL for nitrate to 5.0 mg/L NO3- N, and by promulgating a MCLG of 3.0 mg/L of NO3-N; the United States regulatory approach for nitrate in drinking water would become consistent with other European countries and would encourage the prudent public health strategy of limiting human nitrate exposure."

  Cape Cod Commission

  "This Regional Policy Plan continues to support the 5-ppm limit on nitrogen loading."

  "The maximum nitrogen loading standard for Potential Public Water Supply Areas shall be 1 ppm for development."

- 2005 (year 61)

  Truro Local Comprehensive Planning Committee

  "The Board of Health is asked to: Continually review the Board of Health nitrogen loading standards to ensure that such standards adequately address potential groundwater pollution problems."

- 2009 (year 65)

  Cape Cod Commission

  "Five-ppm Nitrogen Loading Standard: The maximum nitrogen loading standard for impact on groundwater shall be 5 ppm for development and redevelopment unless a cumulative impact analysis indicates a more stringent loading standard is necessary."

- 2010 (year 66)

  Epidemiology

  "We found an increased risk of thyroid cancer with higher average nitrate levels in public water supplies and with longer consumption of water exceeding 5 mg/L nitrate-N (for > or = 5 years at >5 mg/L."

[4] The symbols (> or =) and (≥) mean "greater than or equal to" the stated number. The symbol (< or =) and (≤) mean "less than or equal to" the stated number.

- 2013 (year 69)

  Environmental Health Perspectives

  "Women who had babies with NTDs [neural tube defects], limb deficiencies, and oral cleft defects were significantly more likely than control mothers to ingest >= 5 mg of nitrate per day from drinking water."

- 2017 (year 73)

  EPA – The Integrated Risk Information System (IRIS) Program

  "Since 1987, a growing body of literature indicates potential associations between nitrate/nitrite exposure and other non-cancer health effects."

- 2018 (year 74)

  International Journal of Cancer

  "We found statistically significant increased risks [of cancer] at drinking water levels above 3.87 mg/L."

  Environmental Health Perspectives

  "Mothers of babies with spina bifida were 2.0 times more likely to ingest ≥ 5 mg nitrate daily from drinking water."

  "During one month preconception through the first trimester, mothers of limb deficiency, cleft palate, and cleft lip cases were, respectively, 1.8, 1.9, and 1.8 times more likely than control mothers to ingest ≥ 5.42 mg of nitrate daily."

  International Journal of Public Health/MPDI

  "Risk of specific cancers and birth defects may be increased when nitrate is ingested under conditions that increase formation of N-nitroso compounds. We previously reviewed epidemiologic studies before 2005 of nitrate intake from drinking water and cancer, adverse reproductive outcomes and other health effects. Since that review, more than 30 epidemiologic studies have evaluated drinking water nitrate and these outcomes. The most common endpoints studied were colorectal cancer, bladder, and breast cancer (three studies each), and thyroid disease (four studies). Considering all studies, the strongest evidence for a relationship between drinking water nitrate ingestion and adverse health outcomes (besides methemoglobinemia) is for colorectal cancer, thyroid disease, and neural tube defects. Many studies observed increased risk with ingestion of water nitrate levels that were below regulatory limits."

  "Four of the five published studies of colorectal cancer found evidence of an increased risk of colorectal cancer or colon cancer associated with water nitrate levels that were mostly below the respective regulatory limits."

  "Four of the five studies of thyroid disease found evidence for an increased prevalence of subclinical hypothyroidism with higher ingestion of drinking water nitrate among children, pregnant women, or women only. Positive associations with drinking water nitrate were observed at nitrate concentrations close to or above the MCL (maximum contaminant level).[5]"

  "To date, five of six studies of neural tube defects showed increased risk with exposure to drinking water nitrate below the MCL. Thus, the evidence continues to accumulate that higher nitrate intake during the pregnancy is a risk factor for this group of birth defects."

[5] This same study reported "the maximum contaminant level (MCL) for nitrate in public drinking water supplies in the United States (U.S.) is 10 mg/L as nitrate-nitrogen (NO_3-N)."

- 2019 (year 75)

  Silent Spring Institute

  "…recent studies suggest exposure at levels as low as 5 ppm is also associated with several cancers and birth defects, raising the possibility that EPA's water standard is not sufficiently protective of health."

  Cape Cod Commission

  "The Cape Cod Commission has a long standing policy that aims to limit project site-wide nitrogen loading to a concentration of 5 mg/L or less in order to protect and preserve the drinking water quality of supply wells and areas that contribute to them: these areas include public drinking water supplies, private wells, and the sole source Cape Cod Aquifer in general. Included in the concentration limit are those controllable sources of nitrogen typically associated with development: wastewater, stormwater and turf fertilization."[6]

- 2020 (year 76)

  Epidemiology

  "Average drinking water nitrate concentration above the 95th percentile (>2.07 mg/L) compared with the lowest quartile (≤0.21 mg/L) was associated with bladder cancer."

While this survey of the scientific literature concerning key findings about nitrate concentrations over time is illustrative but not exhaustive, it is substantially representative of the extant research. This research shows that:

- From 1945-1996 the focus on one disease ("blue baby syndrome") without consideration of other conditions was associated with an MCL of 10 mg/L for nitrates in public water systems.
- From 1996 to today **the recommended MCL for nitrates has consistently been cited at or below 5 mg/L.**
- **Further, research confirms that nitrate levels below 5 mg/L are associated with an increasing number of health consequences.**
- These include numerous forms of cancer **- thyroid, bladder, colorectal, non-Hodgkins' lymphoma, and childhood brain tumors - as well as non-cancer health conditions, including birth defects.**

Figure 4 presents a brief summary in chart form of the evolution of the basis for changes in the recommended MCL (maximum contamination level) associated with serious cancer- and non-cancer-related health consequences in humans.[7] Key findings with some additional narrative are also presented here in the interest of clarity and brevity. Additional details and supportive citations are provided in **Appendix E**.

[6] Map contained in **Water Resources of Outer Cape Cod**, *Final Report of the Lower Cape Water Management Task Force,* May 1998, Figure 1

[7] Neither this survey of the scientific literature or this report addresses the adverse impact of nitrogen and OWCs, alone and in combination, on the health of flora, fauna or natural waters and related environmental conditions. That is beyond the scope of this report. However, that research is consistent with this report.

Timeline Summary | Level of Nitrates in Water and Serious Health Risks

Year	Nitrate	Reference Source	Type	Health Risk
1948	10	Minnesota Department of Health	S	methemoglobinemia
1951	10	Graham Walton, PhD	S	methemoglobinemia
1962	10	US Public Health Service	R	methemoglobinemia
1974	10	US Safe Water Drinking Act	R	methemoglobinemia
1995	10	US Environmental Protection Agency	C/P	methemoglobinemia
1996	4	Epidemiology/National Cancer Institute	S	non-Hodgkin's lymphoma
1998	5	Lower Cape Water Management Task Force	C/P	general
2002	3	The Journal of Preventive Medicine	C/P	Max Contam Limit Goal
2009	5	Cape Cod Commission Regional Policy Plan	C/P	Nitrogen loading standard
2010	5	Epidemiology	S	thyroid cancer
2011	0.31	Journal of Toxicology and Environmental Health	S	childhood brain tumors
2013	5	Environmental Health Perspectives	S	birth defects
2016	1.7	Spain and Italy	S	colorectal cancer
2017	5	Environmental Health Perspectives	S	bladder cancer
2018	3.87	International Journal of Cancer	S	colorectal cancer
2018	5	Environmental Health Perspectives	S	birth defects
2018	0.9	Denmark	S	colorectal cancer
2019	5	Silent Spring Institute	S	cancers and birth defects
2019	5	Environmental Research	S	colorectal cancer
2020	2.07	Epidemiology	S	bladder cancer

Scientific Consultative/Policy Regulatory

Figure 4: Timeline Summary of Changes in Nitrate Levels Associated with Serious Health Risks

Current Well Safety and Contamination Prevention in Truro

The safety of private well water in Truro depends on where you live. It also depends on well owners' personal vigilance, attention, and where needed, mitigation. As Weston & Sampson noted (see **Appendix F**), some neighborhoods, most notably **Pond Village and other areas in North Truro, have more contaminants in their drinking water than other areas**. Older "pre-Title V" neighborhoods, such as **the Pamet River Valley basin, are also of concern**. Other areas in Truro have lower levels on average but increasing human activity trends toward increasing nitrates wherever it occurs.

The **Truro Board of Health** controls nitrogen loading[8] by setting limits on the density of human activity by limiting development to one bedroom per 10,000 square feet of land up to the limits of total acreage (Section VI, Article 14 of the Board of Health Local Septic Regulations). See **Appendix G** for a summary of Truro's Board of Health regulations.

[8] Nitrogen loading is related to but different from nitrate concentration levels. Where nitrate levels can be assessed in drinking water directly, nitrogen loading is determined through multi-factor calculations. The load (aka, the flux) is the amount (or mass) that passes a given point in groundwater over a given period of time. In Truro, this is determined by gallons per day per bedroom per 10,000 sf for residential applications. More simply, it is the load per unit of drainage area. For a helpful link, see https://buzzardsbay.org/buzzards-bay-pollution/nitrogen-pollution/nitrogen-tools/bbpnitro-interactive/. **The Cape Cod Commission recommends 5mg/L as a safe nitrogen loading limit.**

The **Truro Housing Production Plan**, accepted by the Commonwealth's Department of Housing and Community Development, states:

> "... the town's resources for absorbing growth are extremely limited ...Truro has limited water and no sewer services, making denser development more costly and difficult. Consequently, residents must rely largely on wells and on-site septic systems. This raises concerns among residents about water supply and quality impacts of any development."

As seen in **Figure 5**, the EPA advises private well owners to monitor their own wells, ask questions, and understand mitigation options to protect the safety of their well water:

Figure 5: EPA Advisory to Self-Monitor Private Wells

The **Truro Water Resources Oversight Committee** (WROC) and the town's water consultant **Weston & Sampson** have provided information in this regard, and highlighted areas of concern. It is generally accepted that nitrate levels in excess of 1.0 ppm (i.e., 1 mg/L) are indicative of human activity. The more human activity and waste, the higher the nitrate level. **Figure 6** informs us that on average nitrate levels in Truro based upon voluntary sampling from 2007-2011 that the average nitrate concentration in Truro is 1 mg/L (ppm), while certain areas have levels $\geq$ 5 mg/L, generating designation as areas of concern with regard to drinking water safety.

As recently as 2014 and 2018, the Town of Truro hired the consulting firm of **Weston & Sampson** to study Truro's groundwater and to understand the cumulative effects of nitrogen (nitrate) loading on groundwater quality. Sampling data obtained in 2007-2011 shows that 1181 samples were taken identifying 45 lots with nitrate concentrations above 5 mg/L and 2 lots revealing concentrations above 10 mg/L. From 2012-2017 another 1400 samples were tested, generally corroborating earlier findings and trends. As a result, W&S **identified parts of North Truro and the Pamet River basin as particular areas of concern.** Local water sample tests provided voluntarily to the **Town's WROC and Board of Health** showed consistent results.

A summary of Weston & Sampson's two reports can be found in **Appendix G**.

Figure 7 shows where well monitoring took place in Phase 1 of the W&S study (2007-2011). Phase 2 (2012-2017) focused on identified areas of concern.

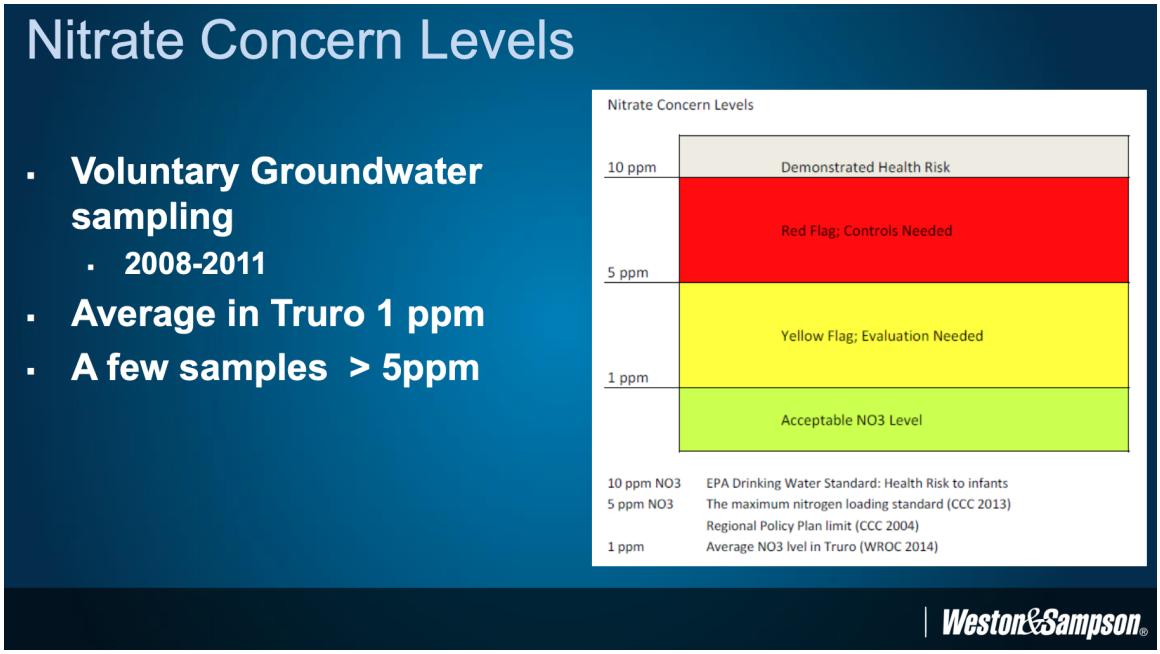


Figure 6: W&S Water Sampling Results and Impact 2008-2011

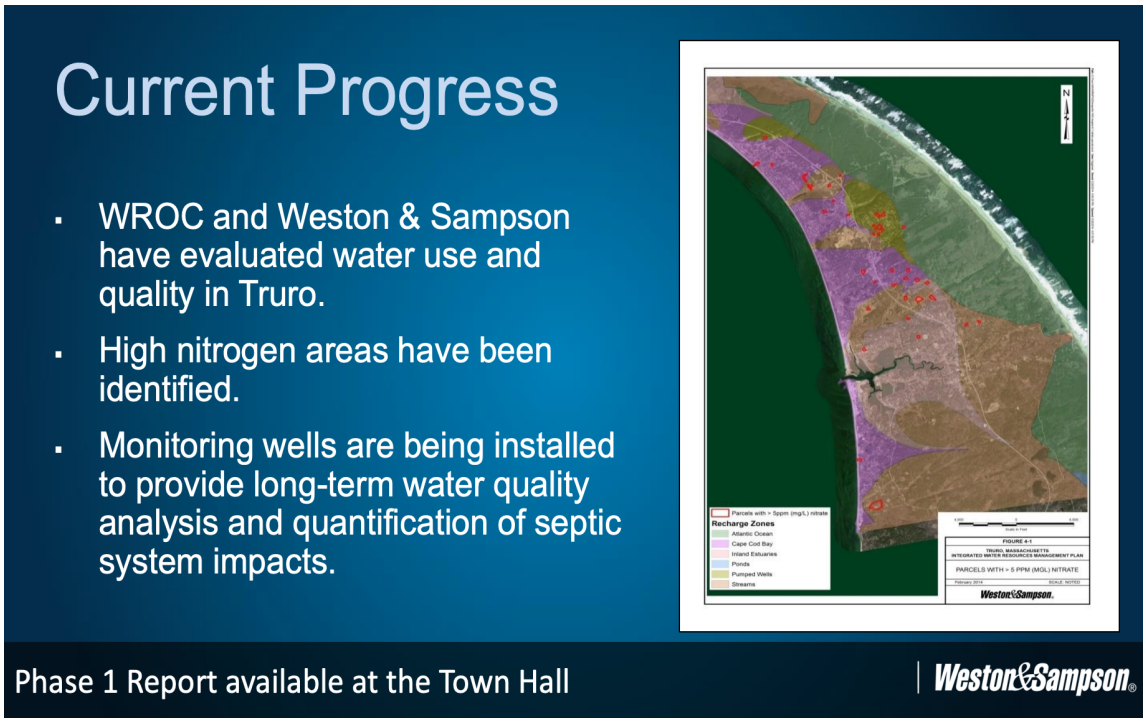


Figure 7: W&S Water Sampling Areas and Status 2008-2011

Other Effects of Excessive Nitrate Levels

- Property Values

Once drinking water is contaminated by excess levels of nitrates or other health-harming agents, the remedies are **costly and irreversible: to construct a public water supply system**, including large wells for supply, water filtration plants, water towers, underground water mains, and wastewater treatment facilities.

As expensive as a city-like water infrastructure is to build and maintain, and as much as it would be funded by significantly increased taxes, another economically devastating consequence is the **decrease in property values due to polluted drinking water.** Per the Cape Cod Commission, **a 1% increase in nitrogen is associated with a decrease in home prices of 0.6% on average.** In Truro's case, the total value of its homes is on the order of $2.3 billion. A mere 2% increase in nitrogen - below the rate of increase observed by the Inner Pamet Harbor monitoring project - would then reduce home values by about $28 million per year. Allowing the **current Board of Health standard of 10 mg/L doubles the level science now establishes as a threshold for multiple health impacts: 5 mg/L**. The corresponding rise in allowable nitrate levels could have adverse economic impacts of considerable magnitude.

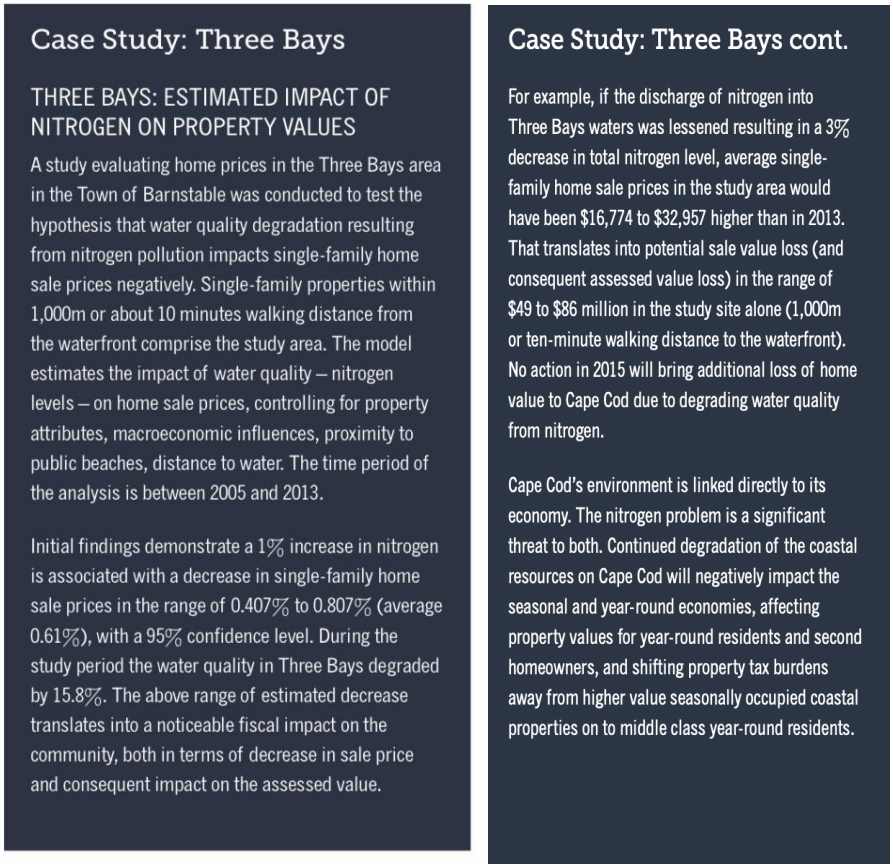


Figure 8: Case Study | Estimated Impact of Nitrates on Cape Cod Property Values

- **Commercial Safety Concerns**

The potential impact of contaminated water is not limited to residential property owners. Commercial operations, and especially those who serve the tourists and seasonal visitors who drive business success in Truro, must also rely on

safe groundwater supplies. Contamination comes from human activity. If there is increased human activity, of the same or expanded scale as we see now, then we will experience increased contaminants and safety and health of the tourist and seasonal clientele will accordingly be at risk. All of the potential effects on property values as well as the impact on consumer-serving business could proportionately affect Truro's limited retail and restaurant businesses that serve or rely on safe drinking water.

- **The Challenge of Density**

The Town of Truro has not consistently obtained, documented and published water quality test results over time to enable a trend to be determined in Truro. However, the **Center for Coastal Studies** has been monitoring the nitrogen levels at the Inner Pamet Harbor for over 10 years. The data is presently being analyzed by **Docs for Truro Safe Water** and a report is forthcoming. Preliminary results indicate an increasing nitrogen level over time, consistent with the increasing density of septic systems in Truro in general and in the Pamet watershed in particular. This is consistent with the Weston & Sampson study which concluded based on sampling that gradual increases would result absent well mitigation or more stringent regulation.

The more densely populated areas of Truro, including Pond Village, North Truro and the Pamet River basin in central Truro could experience an increase due to high density development up gradient. Other neighborhoods could experience increases due to added people and/or occupancy and deteriorating septic systems.

- **The Challenge of Mitigation**

There are at least three ways in which mitigation can pose challenges to property owners relying on well water for domestic or commercial consumer use:

- **Cesspool Replacement.** Truro is estimated to still have about 210 cesspools in operation. A cesspool is a pit lined with cement or stone. Cesspools lack the ability to filter waste and the sewage eventually contaminates the surrounding soil. For this reason, **cesspools are outdated and illegal**. However, when the Commonwealth enacted Title V in 1975, it mandated that cesspools be upgraded to septic systems upon the sale of the property. Since some properties have not sold or have been passed inter-generationally, these cesspools have in effect become "grandfathered" until a sale happens. In the meantime, these cesspools have been contributing a significant amount of contamination to the aquifer for the 45 years since Title V became law and will for the foreseeable future until some plan to upgrade them is formulated.
- **Nitrate reduction.** Once nitrates have entered groundwater, it is a difficult, uncertain and lengthy process to reduce nitrates concentrations and nitrogen loading. It is by far better to avoid the contamination if at all possible, avoiding the cost and health risks of attempted nitrate reduction efforts. Septic system improvements (e.g., cesspool replacement) through tax incentives, policy and regulations to limit nitrates in drinking water, building regulations that conform with adjusted lower limits, discouragement of residential lawns (and thus nitrogen) and other nitrate-reducing actions undertaken prophylactically are worth consideration.
- **Be proactive.** It is possible to take steps to prevent nitrate concentrations from reaching levels where health and safety are in danger. This requires personal vigilance and monitoring by individual well owners. But equally, it requires community planning, scientifically based decision-making, and regulations that reflect both of these.

A common solution for communities that neglect their private well water safety until it becomes too contaminated is to build expensive water treatment plant(s) and water department infrastructures, as mentioned above. We have expensive examples of this surrounding Truro in both Provincetown and Eastham. For example, Eastham faced the same issue over a decade ago, but failed to take sufficient measures early enough. (See **Appendix H** for a brief re-cap of Eastham's initial timeline.) That resulted in the necessity of replacing private wells with a town water system, at a projected cost of over $100 million.

Truro need not suffer this fate.

Conclusions

As more research has emerged from the first question in 1945 about nitrates in well water as a possible cause of "blue baby syndrome" to this day, the scientific evidence shows consistently and incontrovertibly that:

- The harmful effects of nitrate on human health are found at lower and lower levels of concentration.
- The trend of lower threshold levels has been consistent for more than 25 years, finding significant health consequences **at and below nitrate concentrations of 5 mg/L.**
- At levels below 5mg/L the list of cancer and non-cancer health conditions triggered by lower levels of nitrates expands continuously, to include, among other conditions, **non-Hodgkin's lymphoma, thyroid, bladder, colorectal and ovarian cancers, brain tumors in children, and multiple birth defects.**
- **Many experts and organizations domestically and internationally have called for the maximum contaminant level for nitrate to be set between 1 mg/L and 5 mg/L.**
- **Nitrate concentrations of 5 mg/L** are well below current EPA and Truro Board of Health standards.
- **Nitrate in private wells – serving 85% of Truro's households - is not regulated. In Truro, only the Board of Health has the authority to do so.**
- Nitrates combine with and catalyze action of OWCs (organic wastewater compounds) to induce adverse health effects **at lower levels of concentration and over longer periods of time**.
- Mitigation of excessive nitrate concentrations or nitrate loading is uncertain, expensive, and prolonged once it enters groundwater.
- With prior planning and sound regulation, the worst effects of water contamination can be avoided, as can the adverse effects associated with excess nitrates on human health, property values, the local economy and the surrounding natural environment.

Recommendations

It is clear that nitrate levels once thought to be safe in the 1960's – set at 10mg/L - are considered to be too high and are no longer viewed as safe by the great majority of scientific evaluations, and today's level of safety should reflect the evolution in science and science-based policy and regulation.

These extensive scientific evaluations propound that safe levels fall within the range of 1 to 5 mg/L.

Accordingly, as a pressing local matter this research warrants consideration and possible revision by the Truro Board of Health to reset local standards in conformity with current scientific evaluations for nitrate concentrations and nitrate loading at a level at or under 5 mg/L.

Addenda

Glossary

Appendices A-I

Addendum 1 - Glossary

Scientific Acronyms Used in This Report

BOD	biochemical oxygen demand
gal	gallons
L or l	liter; 1.06 quarts
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/L	milligrams per liter; a measure of concentration; the weight in milligrams of any specific substance or substances contained in one liter of solution
N2	Nitrogen gas naturally present in the atmosphere
NO3-N	Nitrate as Nitrogen
NO2	Nitrite
NH3	Ammonia
OWC	organic wastewater compound
pH	below 7.0 = acidic / above 7.0 = alkaline
ppm	parts per million
SF	square feet

Conversion Factors

mg/L to ppm =	1 (mg/L and ppm are equivalent at the density of water of 1 kg/L)
Liters to gal =	3.7854 liters to a gallon
SF per acre =	40,000 sf in a "builder's acre" (43,560 actual sf in one acre)

Constants

SF per parking space =	350 SF
Allowable Effluent / 1 bedroom per 10,000SF =	110 gals/day
Title V septic effluent concentration =	23.63 mg/L
Average household size in Truro =	2.03 people per house (per 2010 Truro Census data)

Symbols

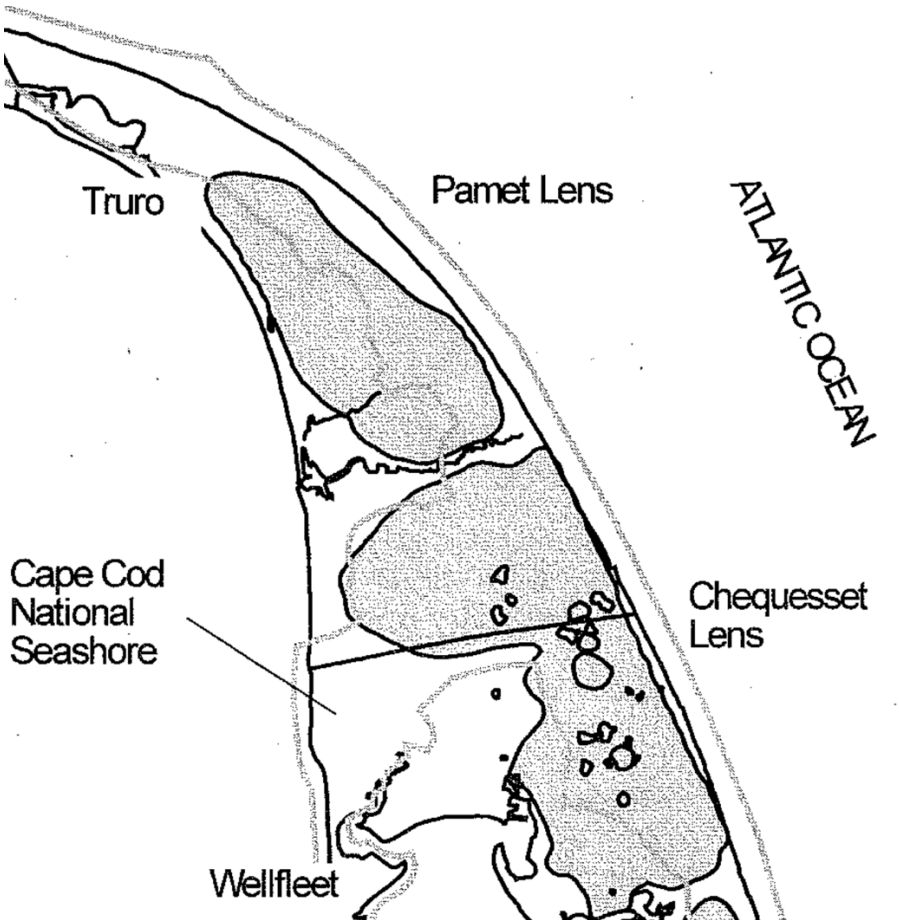
(>=) and (≥)	"greater than or equal to" the stated number
(<=) and (≤)	"less than or equal to" the stated number
~	"approximately"

Appendix A– Pamet Lens, Chequesset Lens, and Nitrate Levels from 1984-1995

Truro's groundwater, and thus well water, comes from the sections of the Cape Cod aquifer located under Truro known as the:

- **Pamet Lens** (north of the Pamet River) - The Pamet Lens exhibited a significant number of private wells which exceeded nitrate levels of 5 mg/L in the 1984 to 1994 timeframe.
- **Chequesset Lens** (south of the Pamet River)

These "lenses" are designated where ground water levels rise up to 5 feet above sea level. They float over sediments saturated with denser saltwater and have been studied extensively by the USGS, Cape Cod Commission, private consultants and municipal entities. The maps here are found in **Water Resources of Outer Cape Cod, Final Report of the Lower Cape Water Management Task Force, May 1998, Figures 1 and 6, respectively**



Appendix A – continued

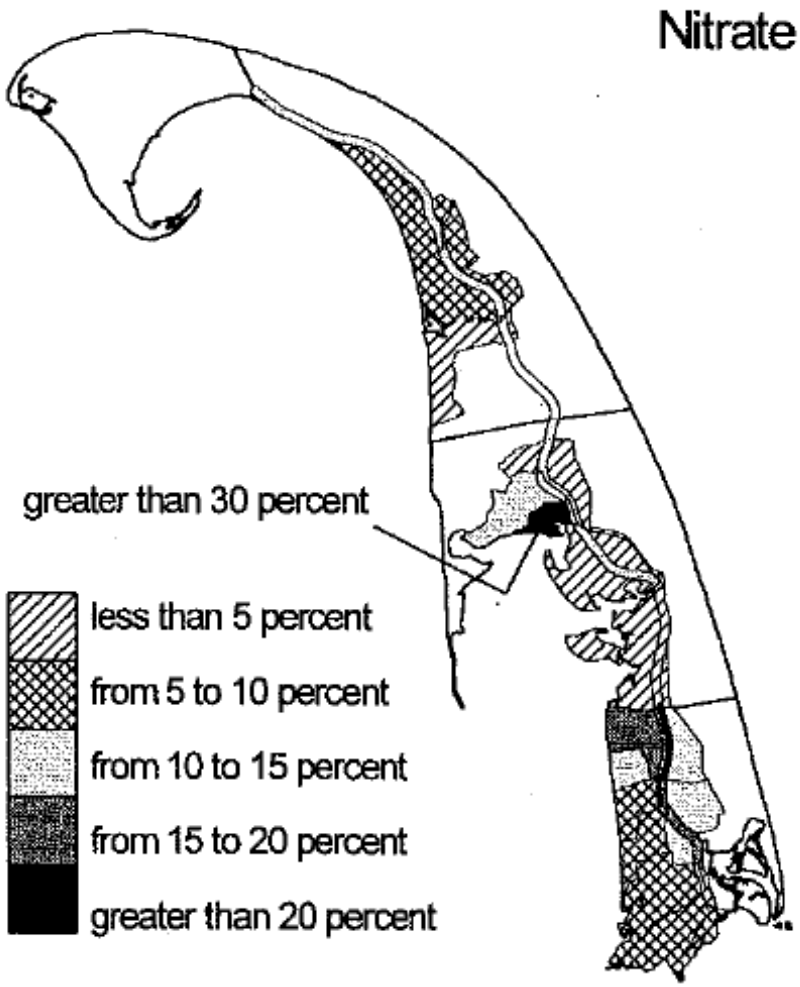


Figure 6. Percentage of private wells which exceeded nitrate levels of 5 mg/L from 1985 to 1994.

Appendix B – Organic Waste Compounds

What Are Organic Waste Compounds (OWCs)?

OWCs are ingredients and by-products of common agricultural, industrial, and household substances. For this study, 69 individual compounds were aggregated into 15 classes:

- Antioxidants
- Dyes/pigments
- Fire retardants
- Polycyclic aromatic hydrocarbons (PAHs)
- Plasticizers
- Fuels
- Solvents
- Herbicides
- Insecticides
- Antimicrobial disinfectants
- Detergent metabolites
- Flavors and fragrances
- Human drugs (nonprescription)
- Sterols
- Miscellaneous

OWCs enter the environment in many ways, including runoff from urban and agricultural areas, industrial discharges into the air or water, leaching into the groundwater from unlined landfills, discharges from wastewater-treatment plants, combined sewer overflows, leaking septic systems, and leaking municipal sanitary and storm sewer systems.

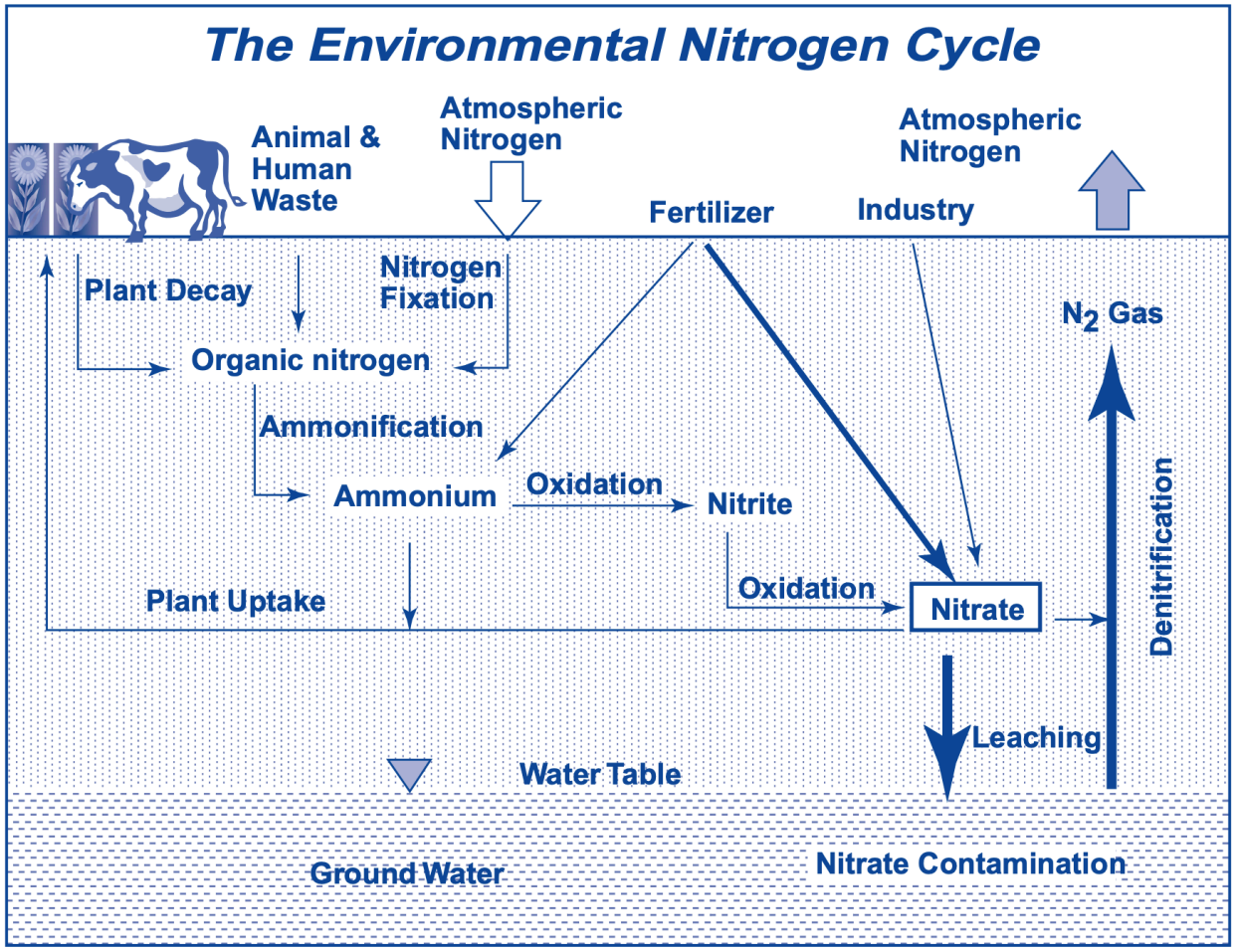
Many of these compounds are toxic at elevated concentrations and (or) are known to have endocrine-disrupting potential. Even low concentrations can impact aquatic organisms because exposure is often chronic, spanning entire life cycles and multiple generations. Furthermore, OWCs often occur as mixtures of multiple compounds, which can strengthen their effects.

https://pubs.usgs.gov/fs/2015/3056/fs20153056.pdf

OWCs are present in wastewater. They were not studied at the time when the original Safe Water Drinking Act was enacted in 1974, 46 years ago.

Appendix C – The Environmental Nitrogen Cycle

The graphic below illustrates the flow of nitrogen into and out of the ground water table.



Appendix D - Sample Water Testing Results Report

The **Barnstable County Health Laboratory** conducts drinking water analysis from samples collected and sent to them.

Below is a result from a randomly collected well-water sample from Pond Road in North Truro, analyzed in 2019. The nitrate level is outlined in red, having a very high nitrate level of 4.7 mg/L. The pH of 6.1 indicates acidic water, and the sodium level of 58 is also high.

CERTIFICATE OF ANALYSIS

Barnstable County Health Laboratory (M-MA009)

Recipient: [redacted]
[redacted] Pond Road
North Truro, MA 02652

Order No.: G19114801
Report Dated: 07/29/2019
Submitter: [redacted]
Description: rtn - [redacted] Pond Road

Laboratory ID#: 19114801-01
Sample #:
Collection Address: [redacted] Pond Road, North Truro, MA 02652
Sample Location:

Matrix: Water - Drinking Water
Sampled: 07/11/2019 By: Customer
Received: 07/11/2019 11:37 By: SamirB
Turn Around: Standard

Routine

ITEM	RESULT	UNITS	RL	MCL	METHOD #	ANALYST	TESTED	TIME
Nitrate as Nitrogen	4.7	mg/L	0.10	10	EPA 300.0	CL	07/11/2019	14:03
Copper	0.12	mg/L	0.10	1.3	EPA 200.8	CL	07/12/2019	13:09
Iron	0.13	mg/L	0.10	0.3	EPA 200.8	CL	07/12/2019	13:09
pH	6.1	PH AT 25C	NA	6.5-8.5	SM 4500-H-B	CL	07/11/2019	14:23
Sodium	58	mg/L	2.5	20	EPA 200.8	CL	07/12/2019	13:09
Total Coliform	Absent	P/A	0	0	SM 9223B	RG	07/11/2019	16:26
Conductance	410	umohs/cm	2.0		EPA 120.1	DCB	07/11/2019	14:23

Sodium level is above the maximum contaminant level. Those on a low sodium diet may wish to consult a physician.

Attached please find the laboratory certified parameter list.

Approved By: [signature]
(Lab Manager) 30JUL19

Appendix E – Timeline of Research on Water Safety | Additional Details

This appendix summarizes the evolution over time of research into drinking water safety. The science has evolved considerably over the last 75 years since the end of World War II. It shows a period of accepting a 10 mg/L nitrate standard from 1962 (based on results from the 15 years prior) until today.

After the year 2000, studies began to appear questioning the appropriateness of the standard, especially as it relates to carcinogens and cancer. By 2010, more studies appear and confirm the relationship of nitrates and cancer and other illnesses. Some studies argue for a reduction in the standard to 5 mg/L or below. The last five years have seen an accelerating number of studies supporting similar conclusions.

1945

Dr. Hunter Comly of Iowa reported on two cases of a "previously unrecognized" condition that "may occur anywhere in rural areas where well-water is used in infant feeding." Dr. Comly suspected that the nitrates in the family's well-water were at fault. Before publishing his report, Dr. Comly collected from colleagues' anecdotal accounts of 17 more cases, including one that had resulted in death. It appeared to him that "the condition was not rare."

https://dartmed.dartmouth.edu/summer00/html/what_makes_my_baby_blue.shtml
https://jamanetwork.com/journals/jama/article-abstract/275699

1947-1950

Methemoglobinemia and Minnesota well supplies
Journal of the American Water Works Association

A study is conducted in 1947-49 by clinical and sanitary experts of 139 cases of methaemoglobinaemia, due to the consumption of well-water, reported in Minnesota between January 1947, and September 1949, in infants under five months of age.

Based on the study, in 1950 the Journal of the American Water Works Association publishes a journal article Methemoglobinemia and Minnesota well supplies, reporting on the association of this condition with a high nitrate content of water.

https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/3841331

1951

Survey of literature relating to infant methemoglobinemia due to nitrate-contaminated water - G. Walton
American Journal of Public Health and the Nation's Health

The literature on methemoglobinemia in new-born infants due to ingestion of high-nitrate water is reviewed, the historical background leading to Comly's hypothesis is presented, and medical aspects, including cause, susceptibility, physiol. effects, diagnosis, and treatment, are briefly covered. Water used in preparing the infant's feeding formula should contain not more than 10 or possibly 20 ppm nitrate N.

https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/3002705

1962

The U.S. Public Health Service recommended a national nitrate standard of 10 ppm.

1970

President Richard Nixon decided in July of 1970 to create a single agency to deal with environmental issues, and the EPA was born.

1974

The Safe Drinking Water Act (SDWA) was passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The EPA endorsed the 10 ppm nitrate limit to protect against "blue-baby syndrome."

https://www.epa.gov/sites/production/files/2015-04/documents/epa816f04030.pdf

1995

The SDWA also authorized the EPA to seek the expertise of the National Research Council (NRC) to identify the health effects of specific contaminants. A 1995 NRC document, ***Nitrate and Nitrite in Drinking Water***, was then the most recent of the required periodic reviews and again upheld the 10 ppm nitrate limit, based on no other data or research being available since 1951.

> "When EPA evaluated the toxicity of nitrate and nitrite for the purpose of establishing drinking-water criteria, it did not assign a weight-of-evidence classification for their carcinogenic potential (EPA 1990a). EPA concluded that there are no convincing data to suggest that nitrate or nitrite is associated with any adverse effect other than methemoglobinemia, and it identified a no-observed-adverse-effect level (NOAEL) for nitrate of 10 mg of nitrate nitrogen per liter (1.6 mg/kg-day) on the basis of epidemiologic studies (Walton 1951). That value is equivalent to nitrate at 44 mg/L. To obtain a reference dose (RfD) from the NOAEL, an uncertainty factor of 1 was used because the NOAEL was derived from studies in humans of the most sensitive subpopulation. For nitrite, EPA assumed that the conversion rate of nitrate to nitrite by gastrointestinal tract bacteria in infants is about 10%, from which an RfD of 1 mg of nitrite nitrogen per liter (0.16 mg/kg-day) was calculated. That value is equivalent to nitrite at 3.3 mg/L. The MCLGs for nitrate and nitrite are based on these RfDs: nitrate nitrogen at 10 mg/L and nitrite nitrogen at 1 mg/L (EPA 1991)."
>
> "Available data are inadequate to support an association between nitrate and nitrite exposure from drinking water and any noncancer effects except for methemoglobinemia in infants."
>
> "The subcommittee concludes that EPA's current MCLGs and MCLs of nitrate at 44 mg/L (nitrate nitrogen at 10 mg/L) and nitrite at 3.3 mg/L (nitrite nitrogen at 1 mg/L) are adequate to protect human health."
>
> https://pubmed.ncbi.nlm.nih.gov/25101396/

1996

Drinking water nitrate and the risk of non-Hodgkin's lymphoma - Mary H. Ward et al
Epidemiology

> Long term consumption of community water with average nitrate levels in the highest quartile (> or = 4 mg per liter nitrate-nitrogen) was positively associated with risk.
>
> These findings indicate that long term exposure to elevated nitrate levels in drinking water may contribute to the risk of NHL [non-Hodgkin's lymphoma].
>
> https://pubmed.ncbi.nlm.nih.gov/8862975/

1998

Water Resources of Outer Cape Cod
Lower Cape Water Management Task Force

From 1985 to 1994, 3 of every 4 wells did not exceed nitrate levels of 1.4 mg/L in Truro.

Descriptions of water quality are typically expressed by using an acceptable standard value. In this study, we report the number of wells that exceed 5 mg/L as a measure of water quality… movement from sparse to dense development is accompanied by increasing variation of sampled nitrate levels and a general decrease in water quality. The importance of this trend is that it challenges the misconception that degrading water quality touches only a small minority of wells that already have "higher" nitrate levels. In fact, increasing development density is shown to affect the entire range of private wells on the Outer Cape.

A private well water quality monitoring program should be established in order to track water quality conditions into the future.

The absence of central wastewater treatment has meant that all households and businesses on the Outer Cape rely on onsite septic systems to dispose of their wastewater. Other than removing solids and reducing dissolved solids, conventional onsite systems do little to remove many other contaminants of household sewage.

The gradual accumulation of nitrate in groundwater as it flows towards coastal discharge areas and municipal wells has both environmental and public health implications on Cape Cod.

https://sp.barnstablecounty.org/ccc/public/Documents/Provincetown%20Harbor/1998%20Water%20Resources%20of%20Outer%20Cape%20Cod.pdf

2002

Nitrate Toxicity and Drinking Water Standards: A Review - B.C. Kross
The Journal of Preventive Medicine

"The current US EPA maximum contaminant level (MCL) for public drinking water supplies and the health advisory level (HAL) for other private water supplies is 10 mg/L, expressed as NO3-N. Unlike other drinking water standards, the nitrate standard has no safety factor, which typically is about a 10-fold safety factor to account for differences in human susceptibility. Guidance, action, or advisory levels for nitrate in drinking water are lower in several countries, including Germany (4.4 mg/L), South Africa (4.4 mg/L), and Denmark (5.6 mg/L). Clearly health and regulatory officials in other countries believe that the current WHO and USA drinking water standard for nitrate is not adequate."

"The regulatory authorities should establish a safety factor of two, which would reduce the current MCL and HAL for nitrate to 5.0 mg/L NO3-N. This regulatory mandate would encourage a prudent public health strategy of limiting human nitrate exposure."

"The current nitrate standard established in 1987 is based on a literature review of 278 cases of methemoglobinemia reported in the United States between 1945 and 1950. The study reported that none of these cases occurred when nitrate concentrations in drinking water were below 10 mg/L (18). Unlike other drinking water standards, the nitrate standard has no safety factor, which typically is about a 10-fold safety factor to account for differences in human susceptibility."

"By mandating a safety factor of two, which would reduce the current MCL and HAL for nitrate to 5.0 mg/L NO3-N, and by promulgating a MCLG of 3.0 mg/L of NO3-N; the United States regulatory approach for nitrate in drinking water would become consistent with other European countries and would encourage the prudent public health strategy of limiting human nitrate exposure."

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.490.9053&rep=rep1&type=pdf

2005

2005 Truro Local Comprehensive Plan
Truro Local Comprehensive Planning Committee

Truro's greatest treasure is the rural character it has preserved.

The pressures for change are relentless, however -- and likely to accelerate. How can we balance economic growth with the need to protect limited resources?

This local comprehensive plan suggests a response to those questions. Developed over almost a year, representing the thought and work of scores of town citizens, employees, and officials…

Land Use. Town policies codified into the zoning bylaws are Truro's most effective planning tool.

Water Resources. The critical issues involving the Outer Cape's limited water resources were brought dramatically into the public eye by the 2004 agreement between Truro and Provincetown over how to share the water pumped from the Pamet Lens.

Board of Health is asked to: Continually review the Board of Health nitrogen loading standards to ensure that such standards adequately address potential groundwater pollution problems.

2009

Cape Cod Regional Policy Plan
Cape Cod Commission

Five-ppm Nitrogen Loading Standard: The maximum nitrogen loading standard for impact on groundwater shall be 5 ppm for development and redevelopment unless a cumulative impact analysis indicates a more stringent loading standard is necessary.

https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/RPP/030411RPP_forweb.pdf

2010

Nitrate intake and the risk of thyroid cancer and thyroid disease – Mary H. Ward et al
Epidemiology

"We found an increased risk of thyroid cancer with higher average nitrate levels in public water supplies and with longer consumption of water exceeding 5 mg/L nitrate-N (for >or=5 years at >5 mg/L."

https://pubmed.ncbi.nlm.nih.gov/20335813/

2012

Cape Cod Environmental Summit Consensus Statement
Association for the Protection of Cape Cod

On September 27, 2012 representatives from thirty-six Cape Cod-based 501(c)3 nonprofit environmental organizations gathered to discuss and agree upon a set of core principles related to wastewater and nutrient loading of Cape Cod's waters.

Excess nutrients from wastewater and other sources are contributing to the decline of water quality.

Nutrient loading of Cape Cod's groundwater, ponds, and coastal waters caused by human activity and waste is the region's number one environmental priority. Immediate action on the part of government, business, and every citizen across Cape Cod is necessary.

Delay will add to the environmental damage, the cost of remediation and the cost of necessary infrastructure.

Long-term management of nutrients/wastewater requires an integrated approach. Integrated approach is "a holistic approach to water resources management that takes into account land use practices, open space preservation, growth management, zoning, stormwater management, drinking water protection, wastewater management, and water quality enhancement."

It is necessary to use appropriate zoning, natural resource protection regulations, and land use regulations to protect our water resources and facilitate the goal of no net increase above each watershed's TMDL for nutrients.

Sound land use planning, including zoning, can be used to manage growth, facilitate growth in areas with adequate infrastructure and control the generation of nutrients/wastewater.

https://apcc.org/wp-content/uploads/2020/05/Consensus-Statement-final-ratified.pdf

2013

Prenatal nitrate intake from drinking water and selected birth defects in offspring of participants in the national birth defects prevention study
Environmental Health Perspectives

"Women who had babies with NTDs [neural tube defects], limb deficiencies, and oral cleft defects were significantly more likely than control mothers to ingest >= 5 mg of nitrate per day from drinking water."

https://pubmed.ncbi.nlm.nih.gov/23771435/#:~:text=Higher%20water%20nitrate%20intake%20did,nitrosatable%20drugs%20and%20birth%20defects.

2017

Nitrate from Drinking Water and Diet and Bladder Cancer Among Postmenopausal Women in Iowa
Environmental Health Perspectives

"We found significant associations among those exposed ≥ 4 years to drinking water with > 5 mg/L NO3-N. "

"Long-term ingestion of elevated nitrate in drinking water was associated with an increased risk of bladder cancer among postmenopausal women."

https://pubmed.ncbi.nlm.nih.gov/27258851/

EPA

"The Integrated Risk Information System (IRIS) Program is undertaking a reassessment of the health effects of nitrate and nitrite."

The IRIS Program previously evaluated the oral health effects of nitrate and nitrite; oral reference doses (RfDs) for nitrite and nitrate2 were posted to the IRIS database in 1987 and 1991, respectively. EPA based these RfDs on surveys of clinical cases of methemoglobinemia in infants associated with ingestion of nitrate-containing drinking water conducted in the early 1950s (Walton, 1951; Bosch et al., 1950). Since 1987, a growing body of literature indicates potential associations between nitrate/nitrite exposure and other noncancer health effects. Some epidemiological studies also suggest an increased risk of cancer, especially gastric cancer, associated with dietary nitrite exposure (ATSDR, 2017). Cancer risk associated with nitrate or nitrite exposure is complicated by the fact that, under conditions of concurrent exposure to amines or amides or low levels of antioxidants, endogenous nitrosation can occur, leading to the formation of carcinogenic nitroso compounds (ATSDR, 2017; IARC, 2010). IARC (2010) concluded that ingested nitrate or nitrite under conditions that result in endogenous nitrosation is probably carcinogenic to humans.

https://yosemite.epa.gov/sab/sabproduct.nsf/8AF41B299F1C342C852581980075D17D/$File/Nitrate-Nitrite_IAP_draft_plan+9.8.17.pdf

2018

Nitrate in drinking water and colorectal cancer risk: A nationwide population-based cohort study.
International Journal of Cancer

"We found statistically significant increased risks at drinking water levels above 3.87 mg/L."

https://onlinelibrary.wiley.com/doi/full/10.1002/ijc.31306

Prenatal nitrate intake from drinking water and selected birth defects in offspring of participants in the national birth defects prevention study
Environmental Health Perspectives

"Mothers of babies with spina bifida were 2.0 times more likely (95% CI: 1.3, 3.2) to ingest ≥ 5 mg nitrate daily from drinking water."

"During 1 month preconception through the first trimester, mothers of limb deficiency, cleft palate, and cleft lip cases were, respectively, 1.8 (95% CI: 1.1, 3.1), 1.9 (95% CI: 1.2, 3.1), and 1.8 (95% CI: 1.1, 3.1) times more likely than control mothers to ingest ≥ 5.42 mg of nitrate daily."

https://ehp.niehs.nih.gov/doi/10.1289/ehp.1206249

Drinking Water Nitrate and Human Health: An Updated Review – Mary H. Ward et al
Int J Environ Res Public Health

"Risk of specific cancers and birth defects may be increased when nitrate is ingested under conditions that increase formation of N-nitroso compounds. We previously reviewed epidemiologic studies before 2005 of nitrate intake from drinking water and cancer, adverse reproductive outcomes and other health effects. Since that review, more than 30 epidemiologic studies have evaluated drinking water nitrate and these outcomes. The most common endpoints studied were colorectal cancer, bladder, and breast cancer (three studies each), and thyroid disease (four studies). Considering all studies, the strongest evidence for a relationship between drinking water nitrate ingestion and adverse health outcomes (besides methemoglobinemia) is for colorectal cancer, thyroid disease, and neural tube defects. Many studies observed increased risk with ingestion of water nitrate levels that were below regulatory limits."

"Four of the five published studies of colorectal cancer found evidence of an increased risk of colorectal cancer or colon cancer associated with water nitrate levels that were mostly below the respective regulatory limits."

"Four of the five studies of thyroid disease found evidence for an increased prevalence of subclinical hypothyroidism with higher ingestion of drinking water nitrate among children, pregnant women, or women only [37,144,145,160]. Positive associations with drinking water nitrate were observed at nitrate concentrations close to or above the MCL."

"To date, five of six studies of neural tube defects showed increased risk with exposure to drinking water nitrate below the MCL. Thus, the evidence continues to accumulate that higher nitrate intake during the pregnancy is a risk factor for this group of birth defects."

"Estimating exposure for private well users is important because it allows assessment of risk over a greater range of nitrate exposures compared to studies focusing solely on populations using PWS [public water supplies]. Future health studies should focus on these populations, many of which may have been exposed to elevated nitrate in drinking water from early childhood into adulthood. A major challenge in conducting studies in these regions is the high prevalence of private well use with limited nitrate measurement data for exposure assessment. Recent efforts to model nitrate concentrations in private wells have shown that it is feasible to develop predictive models where sufficient measurement data are available."

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6068531/

2019

Millions of Americans Exposed to Elevated Nitrate Levels In Drinking Water
Silent Spring Institute

> "Currently, EPA's drinking water standard for nitrate is 10 ppm. That level is set in order to protect infants from a potentially fatal condition known as "blue baby syndrome," a decrease in the ability of blood to carry oxygen around the body. However, recent studies suggest exposure at levels as low as 5 ppm is also associated with several cancers and birth defects, raising the possibility that EPA's water standard is not sufficiently protective of health."
>
> https://silentspring.org/news/millions-americans-exposed-elevated-nitrate-levels-drinking-water

Exposure-based assessment and economic valuation of adverse birth outcomes and cancer risk due to nitrate in United States drinking water - Alexis Temkin et al
Environmental Research

> "Our data suggest that exposure to nitrate in drinking water could account for 1–8% of total colorectal cancer cases, which translates into 1233–10,379 cancer cases annually. Of these cases, 12–24% are due to nitrate exposure for private well users, especially for people whose well water has 5 mg/L or more nitrate."
>
> "The latest research has produced strengthened epidemiological evidence for the risk of colorectal cancer at nitrate levels below the regulatory standard of 10 mg/L of nitrate as nitrogen."
>
> https://reader.elsevier.com/reader/sd/pii/S001393511930218X?token=E6DB567D0A18C237359A21B313EF0AE2DE0F45986F253723721 7E221968B84D7AE9B0C022F545E65E4E6C59C8947CFCD

Nitrate in U.S tap water may cause more than 12,500 cancers a year
Environmental Working Group

> In 2018, a nationwide study in Denmark found a significant increase in colorectal cancer risk at nitrate levels above 0.9 ppm. And in 2016, a study conducted in Spain and Italy found an increase in colorectal cancer risk at approximately 1.7 ppm of nitrate. A long-running epidemiological research program based in Iowa has reported an association of nitrate in drinking water and increased risk of colorectal, ovarian, thyroid, and bladder cancers.
>
> https://www.ewg.org/research/nitrate-us-tap-water-may-cause-more-12500-cancers-year/

2020

Ingested Nitrate and Nitrite and Bladder Cancer in Northern New England - Kathryn Hughes Barry et al
Epidemiology

> "Average drinking water nitrate concentration above the 95th percentile (>2.07 mg/L) compared with the lowest quartile (≤ 0.21 mg/L) was associated with bladder cancer."
>
> "Our results suggest the importance of both drinking water and dietary nitrate sources as risk factors for bladder cancer."
>
> https://pubmed.ncbi.nlm.nih.gov/31577632/

New Hampshire Department of Environmental Services

> "EPA has not established an MCL [Maximum Contamination Limit] for a man-made contaminant since 1995."
>
> https://ebcne.org/wp-content/uploads/2020/03/Presentations-Emerging-Contaminants-Seminar-The-Life-Cycle-of-PFAS.pdf

Appendix F – Weston & Sampson Reports | Phases 1 and 2 | Relevant Excerpts

This appendix summarizes key findings in the reports by the Town of Truro's water consultant, Weston & Sampson (W&S), an employee-owned interdisciplinary design, engineering, and environmental services firm in Massachusetts with over 100 years of experience. https://www.westonandsampson.com/about-us/

The Truro **Integrated Water Resources Management Plan (IWRMP)** was prepared and delivered in two phases: Phase I in 2014, and Phase II in 2018. The report is summarized below by including selections from the text of the report at the pages indicated.

- **Truro Weston & Sampson Phase I Report - October 2014**

  https://www.truro-ma.gov/sites/g/files/vyhlif3936/f/u286/truro_phase_i_iwrmp.pdf

  by page:

1-1
Truro, like many Cape Cod communities is seeking to understand both current and potential future impacts to water resources and undertake a sensible and cost-effective approach to management. Maintaining the rural characteristics and natural beauty of Truro is of primary importance. Managing impacts due to summer population increases while not placing undue burden on year round residence is also important. While economic cycles may cause changes in the rate of development, future increases in population, tourist visits, and ageing infrastructure will most likely have increased water demand, additional wastewater management needs and increasing impervious cover dictating stormwater infrastructure improvements

One of the Outer Cape's greatest assets is the groundwater lenses that are capable of providing potable water resources.

1-4
The IWRMP was initiated to understand the cumulative effects of nutrient loading on groundwater quality and surface water resources.

1-5
Based on multiple working sessions with the Truro Water Resources Oversight Committee a rational approach to incremental change and methods to address data gaps was developed. The overarching goal of sustainable water resource stewardship for Truro is well served by the committee and their commitment to a long-term plan.

3-1 Stormwater
Ensuring that precipitation enters the ground where it falls (direct infiltration) is a critical component of improving stormwater management. The largest inhibitor of direct infiltration is impervious surfaces and therefore, the most important factor in minimizing the amount of stormwater is by reducing impervious surfaces or treating stormwater from impervious surfaces. The amount of existing impervious surface varies by community, but all communities must work diligently to minimize the amount of newly constructed impervious surface, and even reduce that already existing, through proper regulation of growth and development. This is particularly true for critical recharge zones within Truro. Recharge zones based on ground water flow patterns are shown in Figure 3-2. Essentially, Truro can be divided into nineteen (19) zones effecting wells, rivers, lakes or direct discharge to the ocean.

3-2
"Point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

3-7 Sampling
Although nitrogen concentrations can be modeled, empirical ground water sampling data is often used to compare

(Appendix F – p 2)

and contrast predicted concentrations from the model. Nitrogen sampling data from domestic wells was compared and plotted against modeled concentrations. Lots revealing > 5ppm (mg/l) of nitrogen are shown on Figure 3-2.

Sampling data suggests that over the sample period (2007-2009) over 1181 lots have been sampled with 45 showing concentrations above 5 ppm and 2 lots revealing concentrations above 10 ppm. Concentrations above 5 represent action levels for public drinking water supplies while concentrations above 10 exceed safe drinking water standards. Although, individual sample results require verification through sampling, the results suggest a variety of actions and management approaches are warranted.

A nitrogen loading rate of 13.5 pounds/acre/year was used for pavement loading and 6.76 pounds/acre/year was used for roof loading.

A nitrogen loading rate (0.45 pounds/acre/year) was applied to each recharge zone to calculate annual nitrogen loading for vegetative cover.

In lawn areas a loading rate of 1.08 pounds/5000sf/year was applied to each recharge zone to calculate annual nitrogen loading from the addition of fertilizers applied to lawn areas.

A nitrogen loading rate of 9.73 pounds/acre/year was used for open area loading.

3-9
The amount of open land and impervious area results in a total load of 13,065 lbs/year, or almost 37% of Truro's total annual nitrogen load for this analysis. [implies total annual nitrogen load ~ 35,000 lbs/yr]

3-12
The Town of Truro does not have a separate Stormwater Bylaw and associated Stormwater Regulations. In order to improve stormwater issues within Town, a public outreach program should be developed to make the population aware of the issue.

3-16
Figure 3-2, Map: Areas of Nitrate >5 ppm

3-18
Locally, the Board of Health rules and regulations govern subsurface disposal systems and the discharge of wastewater. Systems above a capacity of 10,000 GPD are required to obtain a Ground Water Discharge Permit (BRP WS-79, 85) and apply treatment technologies that limit the impacts to receptors and generally maintain groundwater quality at less than 10 ppb of Nitrogen (measured as Nitrate) at a property boundary. Although some inconsistency exists with these criteria and the drinking water action level of 5 ppb, most large systems in recent years have been achieving discharge concentrations between 4 and 7 ppb.

4-2

The initiation of a water quality sampling program in 2007 was a progressive move by concerned citizens. The program was designed to sample one-third of the private wells in Truro in every calendar year. The program is voluntary and response is neither mandatory nor punitive. Sample results above the safe drinking water level of 10mg/L (ppm) are asked to retest immediately. Sampling efforts have met with a high rate of response which has helped to establish baseline data throughout the town.

Sample bottles were directly distributed to 889 residences in 2007. Ten (10) sample results indicated concentrations between 5 and 10 ppm. No sample results revealed concentrations above 10 ppm.

No discernible pattern or clustering of the results between 5 and 10 ppm could be suggested. Instead results appeared scattered or random over the subject population.

4-5
Further work is necessary in densely developed areas and within the general locale of elevated concentrations.

(Appendix F – p 3)

4-6
Figure 4-1, Map: Areas with >5 ppm Nitrate

4-8
Figure 4-3, Map: Areas of Critical Interest

5-4
A loading rate of 26.23 mg/L of nitrogen was used for residential septic systems for the entire Town. This loading rate is consistent with current MassDEP assumptions for working septic systems. Additionally, this loading rate is consistent with values used in the Massachusetts Estuaries Program and ongoing studies for Cape Cod.

6-2
The time frame was restricted to a 10-year build-out analysis for nutrient loading purposes. The 10-year time frame was essentially chosen due to the relatively recent data sets available from the 2010 census and its comparison to 1990 and 2000 data. The analysis included nutrient loading using nitrogen as a key essential component of the challenges faced by most Cape Cod communities.

6-3
Table 1. Nitrogen Loading Summary (10-Year Build-Out)

6-6
110 gallons per day per bedroom was the assumed wastewater flow. This loading rate of 23.63 mg/L for wastewater flow is comparable to the loading rate used by the Buzzards Bay National Estuaries Program nitrogen loading studies.

6-9
The existing nutrient loading rate from residential use was then calculated using the nitrogen loading rate of 5.95 pounds per person per year, which is the loading rate per person used in the Buzzards Bay Project's Nitrogen Loading Model.

6-11
Developable parcels map. Shows large parcels in Pond Village/N Truro

7-1
The sampling data and nutrient loading models indicate that excessive water quality impacts or risks to human health and ecology are not evident. Instead, sampling programs indicate that further detailed evaluations in areas with elevated nitrate sampling results should help ascertain whether land use practices, septic system conditions, or simply well construction and hydrogeologic conditions have resulted in localized impacts to groundwater quality. In essence, Truro is fortunate in that the need to create extended municipal infrastructure is not necessary.

W&S Appendix C | Parcels with Septic Systems on Recharge Boundary Line

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End of **Weston & Sampson Phase I Report** excerpts

Truro Weston & Sampson Phase II Report excerpts follow below

(Appendix F – p 4)

- **Truro Weston & Sampson Phase II Report - February 2018**

  https://www.dropbox.com/s/8if11a9uhfu1xl6/IWRMP_FINAL_REPORT_8.16.19.pdf?dl=0

IWRMP 8/16/2019

> "…development shall generally meet a 5 parts per million nitrate/nitrogen loading standard for impact on groundwater, but may increase to 10 parts per million nitrate/nitrogen where it can be demonstrated to the permitting authority that such increase will cause no significant adverse impact on wetlands, water bodies, public or private drinking water supply wells and potential water supply wells."

[by page]
1
2005-2010 Local Comprehensive Plan, Ch. 3 Water Resources, Page 38 et al

2
2005-2010 Local Comprehensive Plan, Ch. 3 Water Resources Page 42 et al
https://septic.barnstablecountyhealth.org/
https://www.masstc.org/

3-7
Area 1 includes the intersection of Highland Road and Route 6 and the vicinity of the Pond Road commercial district, and including approximately 128 residences. This area has a significant amount of impervious surface. In addition, DOH records indicate replacement of 4 cesspools with Title 5 compliant systems since 2004. Village Pond is downgradient of this area.

3-9
...current Title 5 compliant systems are assumed to result in effluent containing 26.25 mg/L (ppm) NO3 while I/A systems may reduce loading to 13 to 19 mg/L.

3-9
MassDEP has approved I/A and enhanced I/A septic systems that are expected to achieve 19 and 13 mg/L, respectively in treated effluent. Other I/A system may be installed for nitrogen reduction, but the system must go through an approval process at the local level.

Barnstable County records indicate that 6 I/A systems have been installed in Truro.

3-11
The Town should establish one or more monitoring wells in the Pamet River drainage, Pond Road commercial district, Old Rt.6/Sylvan Lane area and South Highland road area. Monitoring wells in these areas should be monitored twice a year in spring and fall.

Reference to Local Comprehensive Plan 2005

page 41: In Fresh Water Recharge Areas surrounding ponds, when developments generate over 2,000 gallons per day of sewage effluent, Developments of Regional Impact may be required to delineate the groundwater recharge areas to potentially affected fresh water ponds in order to identify and mitigate adverse effects.
https://www.capecodcommission.org/our-work/developments-of-regional-impact

page 42: In Unimpaired Areas, (areas where groundwater may have been degraded by point and non-point sources of pollution, including but not limited to areas with unsewered residential developments where lots, on average, are less

(Appendix F – p 5)

than 20,000 sq ft; landfills, septage and wastewater treatment plant discharge sites; high density commercial and industrial areas and those down gradient areas where the groundwater may have been degraded by these sources) development shall generally meet a 5 parts per million nitrate/nitrogen loading standard for impact on groundwater, but may increase to 10 parts per million nitrate/nitrogen where it can be demonstrated to the permitting authority that such increase will cause no significant adverse impact on wetlands, water bodies, public or private drinking water supply wells and potential water supply wells.

42-12. In Unimpaired Areas, where existing development exceeds the 10 parts per million nitrogen loading standard, redevelopment of that property shall not increase existing levels of nitrogen loading.

page 44: The certification, development and use of appropriate new innovative technologies designed to improve wastewater treatment by reducing nutrient loading is encouraged, although such technologies shall not be the basis upon which to increase building density or change uses from those defined by the Town Zoning By-Law.

page 45: Public & Private Wastewater Treatment Facilities: Truro will not actively encourage the use of these systems except in cases where groundwater quality is significantly deteriorated, the public health is threatened and public water supplies are not available, or where the use of such a system might advance a larger community goal identified in this Plan. In most such cases, private funding of such systems will be preferred. Under no circumstances will these systems alone be the basis upon which building densities are increased or land uses changed from those allowed in Truro's Zoning By-Law.

page 58: All forms of shellfishing have been experiencing unsatisfactory levels of productivity for many years. The brood stock for all species has fallen below the level where natural production of a bountiful annual harvest can be anticipated.

page 87: Truro's economy today depends almost completely on summer visitors and second homeowners. Almost 70% of its area is National Seashore, which, together with its beaches, is the primary attraction of what is perhaps the Cape's last rural town.

page 110: The Pamet Lens will reach output capacity by about 2020.

Appendix G - Truro's Board of Health Regulations | Summary on Nitrogen Loads

Article 3
Truro's Board of Health regulations, Article 3, applies to facilities with on-site sewage disposal systems located in the Town of Truro with a septic design flow greater than 600 gallons per day (gpd).

They must achieve/produce no greater than 19 mg/L total nitrogen concentration in the effluent by using the secondary treatment achieved with an approved innovative/alternative (I/A) septic system.

These systems shall be tested and reported on a quarterly basis.

Any application for a system proposing the use of I/A technology shall be submitted to the Truro Board of Health which shall hold a public hearing to consider its approval.

All applications shall include a copy of the Massachusetts Department of Environmental Protection approval letter appropriate to the I/A technology being used and the level of approval (i.e., General Use, Provisional Use, Remedial Use, Piloting Use, or site-specific Pilot Approval). All applications for Pilot Approval shall include all performance data from all piloting sites where the I/A technology has been similarly configured and utilized.

Article 14
Nitrogen Loading Limitations. The Truro Board of Health hereby requires that all properties within the Town of Truro meet the loading restrictions set forth in 310 CMR 15.214 and contain at least ten thousand (10,000) square feet of Buildable Upland (as defined in Article 1 hereunder) for every 110 gallons per day of design flow and that all systems designed to serve said facilities meet the same restrictions and requirements contained in Title 5 as the "Nitrogen Sensitive Areas" defined in 310 CMR 15.215 irrespective of whether the properties are located within "Nitrogen Sensitive Areas" as so defined.

In other words:

Each bedroom in a residential property in Truro is assumed to have two (2) human occupants who produce nitrogen-based waste. Each bedroom is assumed to contribute 110 gallons per day (gpd) on average. That nitrogen load must be spread over enough land so as not to create a "point load" which poses an added danger to the aquifer.

The Truro Board of Health has long required 10,000 square feet of land (or approx. ¼ acre) per bedroom. The more bedrooms, the more waste, and so the more land is needed to spread the nitrogen load. By limiting the nitrogen load per acre, Truro's aquifer is not subjected to high nitrogen loads from any one parcel, and the consequences down gradient of such a load are mitigated for abutters and neighbors in the down gradient area.

Four bedrooms would require almost 1 acre, 25 bedrooms would require about 5.7 acres, 70 bedrooms would require about 15.9 acres, and 100 bedrooms would require about 22.8 acres to meet Truro's nitrogen load requirements.

Appendix H – Eastham's Struggle with Water Safety

This Appendix compiles some findings and timeline about how the Town of Eastham has dealt with the increasing elevation of nitrogen load in groundwater. This has been a more than decade long journey for the town, from dealing with increasing nitrogen levels to eventually acknowledging the need for a town-wide public water system.

March 2013

After weeks of presentations about the need for town water, selectmen unveiled the price tag per household for a $114.8 million public water system that will be proposed at town meeting.

The cost — for the median priced home in Eastham — will be $17,875 over a 29-year payment schedule, which includes inflation. Depending on the bond payments, the cost will vary from about $300 a year to $966 at the top payment year. The annual cost averages out to $616 a year, or $52 a month, for the median home valued at $400,000, according to the town's presentation Tuesday night.

All homeowners, regardless of whether they hook up to the system, would pay for the town water with their annual tax bill.

https://www.capecodtimes.com/article/20130327/NEWS/303270322#:~:text=After%20weeks%20of%20presentations%20about,be%20proposed%20at%20town%20meeting.

April 2017

Eastham's waterworks continue to progress. Overall construction for Phase 1 is 92-percent complete and that portion of the work is $2.4 million under its eventual $45.8-million budget (including phase 2).

While the listed cost of Phase 1 alone is $28 million that doesn't include three decades of interest at a 2.4 percent rate. Nor did it include $2.1 million in loan forgiveness to Eastham from Massachusetts and a $400,000 grant from the U.S. Department of Agriculture to support the project.

https://eastham.wickedlocal.com/news/20170415/260-connected-to-eastham-water---next-17-million-to-be-spent

August 2020

Phase 2 of the program is currently underway and is anticipated to be completed by 2023. Construction consists of five phases, A through E, to expand water service and fire protection to secondary roadways and neighborhoods Town-wide. Phase 2A is under construction and includes three separate contracts to complete over 20 miles of water mains and associated water services and fire hydrants. Phase 2B, which includes additional water main construction, a water supply wellfield and control building, and a water storage tank, is currently scheduled to be online in late 2020.

https://www.envpartners.com/project/new-municipal-water-system-development/

Appendix I - Citations in Text and Additional Resources Organized by Source

EPA

https://www.epa.gov/privatewells

https://www3.epa.gov/region1/eco/drinkwater/private_well_owners.html

https://yosemite.epa.gov/sab/sabproduct.nsf/8AF41B299F1C342C852581980075D17D/$File/Nitrate-Nitrite_IAP_draft_plan+9.8.17.pdf

The IRIS [Integrated Risk Information System] Program previously evaluated the oral health effects of nitrate and nitrite; oral reference doses (RfDs) for nitrite and nitrate2 were posted to the IRIS database in 1987 and 1991, respectively. EPA based these RfDs on surveys of clinical cases of methemoglobinemia in infants associated with ingestion of nitrate-containing drinking water conducted in the early 1950s (Walton, 1951; Bosch et al., 1950). Since 1987, a growing body of literature indicates potential associations between nitrate/nitrite exposure and other noncancer health effects. Some epidemiological studies also suggest an increased risk of cancer, especially gastric cancer, associated with dietary nitrite exposure (ATSDR, 2017). Cancer risk associated with nitrate or nitrite exposure is complicated by the fact that, under conditions of concurrent exposure to amines or amides or low levels of antioxidants, endogenous nitrosation can occur, leading to the formation of carcinogenic nitroso compounds (ATSDR, 2017; IARC, 2010). IARC (2010) concluded that ingested nitrate or nitrite under conditions that result in endogenous nitrosation is probably carcinogenic to humans.

https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0078_summary.pdf

Primary research cited above by EPA

https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/3841331

https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/3002705

US Geological Survey

https://pubs.usgs.gov/sir/2012/5001/pdf/sir2012-5001_report_508.pdf

http://www.state.in.us/idem/cleanwater/files/gw_source_water_workshop_usgs_nitrates.pdf

Population growth and increasing demands for water make the availability of that water, measured in terms of quantity and quality, even more essential to the long-term sustainability of our communities and ecosystems.

Scientific Investigations Report 2010-5100

Examination of the 1.640-ft-radius area around a well can provide a broad characterization of local land use affecting the well, but it may not adequately characterize the land use in the entire capture area of the well, which may also affect the quality of the water in the well.

http://www.state.in.us/idem/cleanwater/files/gw_source_water_workshop_usgs_nitrates.pdf

Commonwealth of Massachusetts

https://www.mass.gov/private-wells

https://www.mass.gov/service-details/private-well-guidelines

https://www.mass.gov/service-details/faqs-private-wells

https://www.mass.gov/service-details/protect-your-family-a-guide-to-water-quality-testing-for-private-wells

https://www.mass.gov/regulations/310-CMR-1500-septic-systems-title-5

https://www.mass.gov/doc/310-cmr-15000-title-5-of-the-state-environmental-code/download

https://www.mass.gov/doc/private-well-guidelines/download

https://www.mass.gov/service-details/chapter-40-b-housing-production-plan

https://www.mass.gov/files/documents/2016/07/vt/truro.pdf

Cape Cod Commission

https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/RPP/RPPrev2003illustrated.pdf

https://www.capecodcommission.org/our-work/208

https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/208/208%20Final/Cape_Cod_Area_Wide_Water_Quality_Management_Plan_Update_June_15_2015_Summary.pdf

https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/208/208%20Final/Cape_Cod_Area_Wide_Water_Quality_Management_Plan_Update_June_15_2015.pdf

Barnstable County

https://www.barnstablecountyhealth.org/resources/publications/compendium-of-information-on-alternative-onsite-septic-system-technology/basics-of-wastewater-treatment#:~:text=The%20amount%20of%20oxygen%20required,biochemical%20oxygen%20demand%20or%20BOD.&text=Some%20BOD%20is%20removed%20in,flows%20to%20the%20leaching%20field.

University of Massachusetts

https://ag.umass.edu/cafe/fact-sheets/nitrate-nitrite-in-private-drinking-water-wells

https://ag.umass.edu/sites/ag.umass.edu/files/fact-sheets/pdf/nitrate.pdf

https://ag.umass.edu/cafe/fact-sheets/well-water

Truro Board of Health

https://www.truro-ma.gov/board-of-health
https://www.truro-ma.gov/sites/g/files/vyhlif3936/f/uploads/board_of_health_regulations_rev_eff_2-2020.pdf

Truro Water Resources Oversight Committee

https://www.truro-ma.gov/sites/g/files/vyhlif3936/f/u286/wastewater_in_truro_august_13_2015.pdf

Environmental Work Group

https://www.ewg.org/tapwater/

https://www.ewg.org/tapwater/reviewed-nitrate.php#:~:text=According%20to%20the%20findings%20of,%2Done%2Dmillion%20cancer%20risk.

Environmental Working Group | Drinking Water Standards:

https://cdn3.ewg.org/sites/default/files/u352/EWG_TWDBStandards-Chart_PP01.pdf

Exposure-based assessment and economic valuation of adverse birth outcomes and cancer risk due to nitrate in United States drinking water

https://reader.elsevier.com/reader/sd/pii/S001393511930218X?token=E6DB567D0A18C237359A21B313EF0AE2DE0F45986F2537237217E221968B84D7AE9B0C022F545E65E4E6C59C8947CFCD

Silent Spring Institute

https://silentspring.org/our-science

https://www.youtube.com/watch?v=MV5Oc5Ml6-Y&feature=youtu.be

In general, shallower wells pull younger groundwater more recently in contact with the atmosphere (Plummer and Friedman, 1999) with shorter flow paths that allow less time for sorption and biodegradation processes. Shallower wells have previously been found to show the greatest impact from septic systems and other pollution sources.

https://www.sciencedirect.com/science/article/pii/S0048969715312353

Our results suggest that current regulations to protect domestic wells from pathogens in septic system discharges do not prevent OWCs from reaching domestic wells.

We found that nitrate concentrations of 1 mg/L NO3-N, which are tenfold higher than local background and tenfold lower than the US federal drinking water standard, were associated with wastewater impacts from OWCs. Since nitrate is a commonly measured drinking water contaminant, it is a useful screening tool for OWCs in domestic wells

https://privatewells.silentspring.org/faq

https://www.mendeley.com/catalogue/309b4ce1-901e-3985-a68a-6924f9713888/

Association for the Protection of Cape Cod (APCC)

A large portion (roughly 80 percent) of the excess nitrogen in our coastal waters comes from on-site septic systems. Title 5 septic systems were designed to remove bacteria and viruses, but not nutrients like nitrogen or phosphorous.

https://apcc.org/our-work/advocacy/water-quality/

New Hampshire Department of Environmental Services

"EPA has not established an MCL [Maximum Contamination Limit] for a manmade contaminant since 1995. EPA issued a preliminary regulatory determination for perchlorate in October 2008 – still no MCL."

https://ebcne.org/wp-content/uploads/2020/03/Presentations-Emerging-Contaminants-Seminar-The-Life-Cycle-of-PFAS.pdf

Interstate Technology and Regulatory Council (ITRC)

Per- and polyfluoroalkyl substances (PFAS) are a very large family of thousands of chemicals that vary widely in their chemical and physical properties, as well as their potential risks to human health and the environment.

PFAS have only recently come to the attention of investigators and the public in large part due to the fact that until the early 2000s analytical methods to detect low levels of PFAS in the environment were available only in a few select research institutions. It was not until the early 2010s that these methods became widely available and had detection limits in water low enough to be commensurate with levels of potential human health effects. Toxicological studies have raised concerns regarding the bio-accumulative nature and potential health concerns of some PFAS. As a result, our understanding of PFAS and the risks they may pose is rapidly evolving.

https://pfas-1.itrcweb.org/

https://pfas-1.itrcweb.org/wp-content/uploads/2020/04/ITRC_PFAS_TechReg_April2020.pdf

https://www.youtube.com/watch?v=Zm1C3vjvre8&feature=youtu.be

MassDEP 310 CMR: DEPARTMENT OF ENVIRONMENTAL PROTECTION

15.214: Nitrogen Loading Limitations (1) No system serving new construction in Nitrogen Sensitive Areas designated in 310 CMR 15.215 shall be designed to receive or shall receive more than 440 gallons of design flow per day per acre except as set forth at 310 CMR 15.216 (aggregate flows) or 15.217 (enhanced nitrogen removal).

Comments and Questions?

Comments and questions on this publication can be emailed to docsTruro@gmail.com

Zoning Board of Appeals
Town of Truro
Truro, MA 02666

Oct 19, 2020
via email

Dear Colleagues,

The residents of Pond Village, both as signatories to the prior letter and as participants/observers of the last ZBA meeting, thank you for the opportunity to express our concerns. We found it informative and hope the ZBA members learned from us as well. Yet important questions remain, and new concerns have arisen as a result of that discussion.

Our primary concern is safe water for our home use and for historic Pilgrim Pond. **The health and safety of 150 families in Pond Village is as important as the housing needs of 39 families** newly slated for the Cloverleaf. The Town apparently intends to guarantee the safety of drinking water for the occupants of the proposed Cloverleaf site but not for the residents of our community.

If the proposed sewage treatment system for the Cloverleaf Project is approved, **2.8 million gallons of contaminated water will be discharged each year into our down-gradient groundwater, into our wells and into our taps**. This is equivalent to the volume of 330 in-ground swimming pools[1] filled with contaminated water being dumped every year into our groundwater. Seen this way, close and careful attention to the public health impacts of the Cloverleaf project are not a distraction, but rather should be front and center. They must be thoroughly explored before the ZBA makes any additional decisions on waivers.

- **Public health and safety must come first.** This is not only a practical matter, but one of the primary responsibilities of the ZBA. In evaluating the myriad and extensive waivers associated with the Cloverleaf Project, the ZBA must consider, as clearly stated by the Town's Attorney, the **need to protect the health and safety** of the occupants of the proposed housing and of the residents of the Town.[2] We know, for the reasons set forth below, that our health and safety will be in jeopardy if Cloverleaf's sewage treatment plant is approved as proposed. Deceptive efforts have been made in front of the ZBA to re-cast the limited data presented to make it seem as if the pilot system will reliably achieve safe levels of nitrogen loading and nitrate levels down-gradient. They will not.
- **The proposed sewage treatment plant is untested and places us at serious risk.** The proposed sewage treatment plant and plan is designed around an unproven pilot system and therefore fails to afford adequate protections to ensure public health and safety of our community. According to MassDEP, pilot systems are "intended to provide field-testing and a technical demonstration to determine if a particular alternative technology can or cannot function effectively."[3] To achieve even *provisional use* status,[4] a minimum of 50 systems of the model type

[1] Based on each pool being 12' x 24'-foot swimming pools of average 5-foot depth.
[2] Furthermore, as we understand it, the ZBA consideration of the public health implications of the proposed project is particularly critical in 40B applications such as this, under which the ZBA functions as a "one-stop shop" (per Town Council) for the applicant. In such applications, the ZBA considers waivers of regulations usually heard by other boards (e.g., the BoH).
[3] Technology is only approved when the Department has determined, based on relevant technical data, that the proposed alternative is likely to be capable of a level of environmental protection at least equivalent to that of a system designed in accordance with 310 CMR 15.100 through 15.293." (https://www.mass.gov/guides/approved-title-5-innovativealternative-technologies#-piloting-use-
[4] According to MassDEP, the *provisional use* designation is intended "to evaluate, under actual field conditions, alternative systems that appear technically capable of providing levels of protection at least equivalent to those of a standard on-site

proposed by the developer must be installed and evaluated at various locations for at least three years. The applicant has provided evidence of only a few such systems in operation. **If approved, we can only conclude that the ZBA considers the Pond Village community to be a guinea pig for this wastewater experiment.**

- **The monitoring and contingency plans presented by the applicant are incomplete and inadequate to protect our health and safety.** Many questions remain unanswered that the ZBA must consider before proceeding. At least two representatives of the project acknowledged on October 8 that this untested nature of this system will create unanticipated, potentially adverse outcomes. For example, Mr. Nelson suggested that the sewage discharge will have impacts on Pond Village wells and contamination levels that are difficult to know. That alone is deeply concerning. In addition, Mr. O'Reilly acknowledged that the untested equipment might fail and be "replaced" with some other equipment, also unknown. Questions about system reliability also arise because the proposed operational life of systems of this nature are short compared to the 99-year life of the project. Critical factors such as mean- and worst-case times to failure, to respond and then to repair; discharge control; and even parts availability cannot be established with confidence in face of likely system failure at some point. These are just a few of the serious, unaddressed concerns outlined in Addendum 1.

- **The "peer review" process is insufficient.** The Town has characterized Horsley and Whitten's study as a "peer review." In our view, this is misleading. The process the Town has followed falls far short of any standards or guidance for peer review we can find,[5] particularly when the pressing issue is the need to consider safe water and our public health. A meaningful peer review includes project review by a panel of multiple experts with credentials in all relevant aspects of a project. Instead of pursuing a process of this nature, the Town-commissioned review was performed by one engineering firm only and focused almost exclusively on engineering up the hill at the project site rather than on safe water down in the Village. A more comprehensive multidisciplinary peer review process—with experts in public health, drinking water safety, health economics, environmental sampling and monitoring, and ecology—is essential to garner confidence in this complex process and merit consideration for ZBA approval.

- **The ZBA must apply current science in this process.** Two weeks ago, we provided the ZBA with an expert peer-reviewed analysis of the severe adverse impacts on human health of well water contaminated above 3 to 5 mg/L. We also demonstrated that a large percentage of our wells, for historical reasons described below, can sustain no additional such contamination without posing documented health risks for Pond Village residents. If the ZBA finds the science we presented convincing, then it cannot seriously consider permitting the excessive volume of sewage discharge planned by the applicant. If the ZBA does not respect the science, we ask that it explain why it does not and provide properly peer-reviewed evidence to the contrary. Absent any response from the ZBA in this regard, we can only conclude that ZBA members have not had the opportunity to read this expert peer-reviewed report in order to understand the unquestionable harm this project will cause for us and its implications for Truro overall.

- **Pond Village's current nitrate levels are a product of history, not irresponsibility. We cannot let the situation get worse.** The Pond Village area was the site where the Pilgrims found fresh water upon arriving in America 400 years ago. In the 18th and 19th centuries, a community grew up around Pilgrim Pond with the closely spaced homes and smaller lots characteristic of historic villages of this period. (See Addendum 2.) Today, Pilgrim Pond is suffering from nitrates and other contaminants caused by many factors, and many of our wells are also showing this stress. Some have suggested that we have not maintained our septic systems and that cesspools in the neighborhood are a significant cause for the baseline nitrate levels that our tests have revealed; however, only about 3% of houses in Pond Village have cesspools, compared to the Health Department's estimate of 8% town-wide. There is no evidence that Pond Villagers neglect their wells, either. Whatever causes current conditions—be it historical

disposal system. *Provisional Use Approval* typically occurs after a technology has been piloted successfully or has been proved satisfactory past performance over at least two years of general usage in one or more states outside Massachusetts."

[5] For example, see the Peer Review Handbook (4th Edition) developed by the U.S. EPA's Science and Technology Policy Council.

density or low elevations downgradient in a watershed below a state highway interchange—the Cloverleaf project will superimpose new density upon historic density. ZBA approval of density waivers can only worsen our water quality, and consequently, the health and safety of Pond Village residents. This is unacceptable to us, and it should be unacceptable to the ZBA.

- **Other initiatives underway should inform the ZBA before it makes any decision to grant additional waivers to the Cloverleaf.** As the ZBA learned during its October 8 meeting, the BoH is currently seeking the advice of experts in revisiting its health regulations with respect to private well water safety. More specifically, with respect to Pond Village, Ms. Beebe also informed the ZBA the BoH was undertaking a four-step plan to better understand the water quality issues in Pond Village. We urge the ZBA to make no decisions with respect to health regulations until they can be fully informed of the results of these efforts once completed. Similarly, the well thought out, thoroughly vetted, and carefully balanced provisions set forth in the Town's existing Zoning Bylaws and regulations must apply to this project rather than ad-hoc, extensively waivered conditions.

- **Safe water and affordable housing are a false choice.** We reiterate without any ambiguity that the residents of Pond Village are uniformly in favor of affordable housing in Truro, including in the Pond Village area. We supported the vote approving Truro's acquisition of the Cloverleaf parcel, which expressly stated the intention to build 12 to 16 units on it, as originally proposed. The need is real, and our response is unwaveringly supportive. As we said in our prior letter**, we believe that safe water and affordable housing are not "either/or" but "both/and."**

We understand the complexity of the task in front of the ZBA and we are grateful for your diligence. The project that you are being asked to evaluate is more akin to city planning than to zoning review. The sheer volume of zoning and health regulations and by-laws that you are being asked to waive is a daunting task indeed.

Because this is a "40B" application, the ZBA has the unequivocal responsibility to consider and protect our public health. Many Pond Villagers are convinced that neither adequate time or expertise have been given to ensure our health is considered during this process and protected as a result of this process. **Yet it must become the greatest concern of all, given the number of Truro residents at risk.** The sheer magnitude of the health risks from the Cloverleaf that are at stake in Pond Village compels us to speak up.

In conclusion, for the reasons stated above and previously, we respectfully ask the ZBA to:

- **Address the issues raised** in our first letter that remain unaddressed, that is items 2 to 5 in whole or part.
- **Defer or deny granting any additional waivers** to the Cloverleaf project unless and until:
    - **The BoH concludes a thorough public process on new standards** for nitrate concentration in drinking water and for nitrogen loading in groundwater consistent with current science evaluations of health effects, that is, at or under 5 mg/L.
    - **The developer produces a new plan for ZBA approval**, verified by independent peer review of the planned modeling, that will achieve a 5 mg/L standard of both discharge and well water, either by reductions in numbers of bedrooms or by expanded wastewater treatment systems or a combination of both, with proven systems and documented backup systems.

Thank you for your continued consideration.

Sincerely,

Members of the Pond Village Community
(Signatories follow)

LIST OF POND VILLAGE SIGNATORIES

Name	Street
Vicki Abrahamson	Twine Field Rd
Terry Abrahamson	Twine Field Rd
Claire Aniello	Bay View Dr
Mauro Aniello	Bay View Dr
Nancy Bean	Shore Road
Patricia Bellinger	Pond Road
Harry Bogdos	Pond Rd
Nancy Boyles	Bay View Rd
Ronald Boyles	Bay View Rd
Elisabeth Bradfield	Professional Heights Rd.
James Brown	Bay View Rd
Julie Brown	Bay View Rd
Will Bullard	Pond Rd
Luther Bumps	Bay View Dr
Lora Bumps	Bay View Dr
Barbara Cardinal	Pond Rd
Robert Cardinal	Pond Rd
Camille Cardinal	Twine Field Rd
JanIs Christensen	Twine Field Rd
Richard Christensen	Twine Field Rd
Raymond Clarke	Priest Rd
Jil Clark	Bay View Rd
Sophia-Grace Clark	Bay View Rd
Sheila Coleman	Pond Rd
Carolyn Collins	Highland Rd
Barbara Connolly	Bay View Rd
William Connoly	Bay View Rd
Steve Corkin	Merryfield Path
Barbara Coughlin	Pilgrims Path
Robert Coughlin	Pilgrims Path
Janine Cote*	Priest Rd
Bryan Cote*	Priest Rd
Theresa Daigle	Bay View Dr
Tom DeFranco	Pond Village Rd
Francine DeFranco	Pond Village Rd
Glenna Descy*	Bay View Drive
Don Descy*	Bay View Drive

POND VILLAGE SIGNATORIES (con't)

Damian DeWolf	Bay View Dr
Shelly DeWolf	Bay View Dr
Barry Donahoe	Paines Way
Denise Donohoe	Paines Way
Rob DuToit	Shore Rd
Ellen English	Pond Rd
Laura English	Pond Rd
Andy English	Pond Rd
Sam English	Pond Rd
Pamela Fichtner	Pilgrims Path
Ronald Fichtner	Pilgrims Path
Michael Gagne	Pond Rd
Kathy Gagne	Pond Rd
Jeanne Gaarder*	Hughes Rd
Joe Gareau	Pond Village Ave
Pauline Gareau	Pond Village Ave
Jim Gillman	Bay Village Rd
Sandy Gillman	Bay Village Rd
Nita Giordano	Twine Field Rd
Alan Giordano	Twine Field Rd
Jeff Goldenberg	Pilgrim Pond Road
Eric Goss	Pond Rd
Amy Graves	Francis Rd
Marne Hodgins	Pond Road
Tony Hodgins	Pond Road
Elizabeth Hulick	Shore Rd
Charles Hutchings	Sage Ridge Rd
Carolyn Hutchings	Sage Ridge Rd
Eric Johnson	Twine Field Rd
Gwen Kazlouskas-Noyes*	Pond Rd
Scott Kazlouskas-Noyes*	Pond Rd
Hank Keenan	Highland Rd
Mindy Kingston	Pilgrim Pond Road
David Kirchner	Twine Field Rd
Deborah Kmetz	Professional Heights Rd.
Mary Ann Larkin	Pond Rd
Mary Ellen Laughlin	South Highland Rd
William F Laughlin	South Highland Rd
Gail Lebowitz	Pond Village Ave.
Julia Bergmark Lester	Pilgrims Path
Dan Maddalena	Merryfield Path

POND VILLAGE SIGNATORIES (con't)

Jill Mays*	Priest Rd
Eric Mays*	Priest Rd
Matthew McCue	Bay View Rd
Paula Passi McCue	Bay View Rd
Jack McMahon	Professional Hts
Laureen McVay,	Amber Way
Brigid Moynahan	Priest Rd
Chris Nagle	Pond Rd
Christina O"Brien	Shore Road
Patric Pepper	Pond Rd
David Perry	Pond Rd
Louise Fournier Perry	Pond Rd
Gigi Porges*	Hughes Rd
Janice Redman	Shore Rd
James Rudd	Priest Road
Jane Rudd	Priest Rd
Karen M. Ruymann	Bay View Dr
Frederick W. Ruymann	Bay View Dr
Mallory A. Ruymann	Bay View Dr
Lisa Sette	Professional Heights Rd.
Kathy Sharpless	Bay View Path
Gary Sharpless	Bay View Path
Jake Sharpless	Bay View Path
Ellynne Skove	Bay View Dr
Santina Smith	Bay View Dr
Frank Smith	Bay View Dr
Barry Tendler	Pond Rd
Suzanne Tendler	Pond Rd
Scott Warner	Twine Field Rd
Lesley Weller*	Bay View Dr
Lynn Williamson	Priest Road
Lee Williamson	Priest Road
Barbara Wolhgemuth*	Twine Field Rd
Diana Worthington	Pond Rd
Peter Burgess	Friendship Way
Karen Feldman	Turnbuckle Way

*Signatories to Oct 5 submission to ZBA. Unavailable at time of submission. Confirmation pending. Additional signatories will continue post-submission.

ADDENDUM 1

Deficiencies of the Monitoring and Contingency Plans

A range of deficiencies in the plans for ensuring safe and effective operation of the sewage treatment plant ("I/A" and backup systems) proposed for the Cloverleaf project have been identified and are explored more fully below.

1. If we understand Mr. O'Reilly, **after an exceedance, and if repairs are made, a resample will be taken within 30 days.** If monitoring were to become quarterly, that would also mean a problem could go undetected for up to another 90 days. Why allow 30 to 120 days of high-nitrogen content water at 8,000 gallons per day, namely 240,000 to 960,000 gallons, to discharge into Truro's aquifer?

2. Horsley and Whitten's March 3 report entitled *Peer Review/Cloverleaf Parcel* states:

   > "If the Board agrees to the waiver with the use of an appropriate treatment system, then it should be conditioned on requirements for regular monitoring of the treated effluent, monitoring of groundwater on the southeastern property boundary, and the development of a contingency plan that describes how the property owner will address issues with the performance of the system if effluent standards aren't met in the future."

   In what way are the details of the applicant's monitoring and repair plan as discussed on October 8 binding at this point? The applicant stated that such details would be part of MassDEP's and the BoH's permits for the pilot treatment system. If the ZBA were to even consider the requested waivers, at minimum, such requirements should first be made legally binding. Since the BoH has never permitted a system of this scale, it is imperative that independent and transparent expertise be brought into the process to inform the BoH in this phase of the permitting process. The same holds true for BoH oversight of the system, given the health risks involved.

3. According to Mr. O'Reilly, "The type of unit we're specifying – the treatment processes are interchangeable so if they do get damaged, get clogged over time, which might be a possibility, they would be changed." What if the manufacturer discontinues the model, no longer produces the parts needed, or if the manufacturer, for some reason, ceases operation as a business entity altogether? The manufacturer is a privately held, 25-person manufacturing firm located in Lexana, Kansas. **Has any due diligence been performed on the manufacturer to ascertain its financial viability or maintenance and support records? This is doubly concerning since this is a pilot system which may not be further developed or supported.**

4. If there are **failures of the sewage treatment plant for whatever reason, the time to repair depends on the availability of trained service technicians and spare parts**. These are most likely not in existence on Cape Cod, which adds an additional delay to the repair cycle. Assuming a malfunction of the treatment plant, there is not sufficient holding tank capacity to handle the volume of sewage that can accumulate during a delay of any significant duration. Will there be a standby agreement with a local licensed wastewater tank pumping company that has the capacity to pump and remove off-site 8,000 gallons per day of high-nitrate

concentration sewage? Will the contents of the numerous pump trucks required each day be dumped someplace in Truro, or elsewhere above the aquifer?

5. **The development of a contingency plan must be part of the application process**, and not left for future consideration. The reliability of the contingency plan must be evaluated now in order to assess the health risks attendant to its operation, should it be needed. Should that contingency plan ever need to be implemented, and should it turn out to be insufficient to protect the health of the residents in Pond Village below, it could, as the ZBA noted earlier, "have the potential to be quite detrimental to the neighborhood." And then later on to be responsible for a health "disaster."

6. What is the **estimated nitrogen concentration of the discharge from the backup leaching facility**? If that concentration exceeds 10 mg/L, will the volume be reduced to compensate for the increased concentration in the discharge?

7. In addition to design information about reserve locations, there are practical considerations of actually implementing a contingency plan.

    a. **What plans are in place to implement the contingency plan in a timely manner?**

    b. **What would be the lead time to implement the contingency plan?** How many days would elapse between when it is declared necessary to when the sewage could be re-routed to a fully operational and compliant backup facility? What construction on-site would be required to do so? For example, is there a large enough dose tank in place to accommodate any timed dose delivery of 8,000 gallons per day of wastewater to the leaching facility?

8. **With respect to reserve locations**, Horsley and Whitten's March 6 peer review report also states :

    "The applicant should provide additional design information to confirm that these [reserve] locations can function as reserve areas and meet all Title 5 requirements for construction of a leaching facility in an area that has a significant change in topography. The applicant should also document that the proposed effluent pumps will function properly in the event the reserve areas must be utilized."

    Have these requirements been satisfied? Are the reserve areas for the backup system adequate?

9. **With respect to grading and construction requirements,** on July 6 in follow-up to the March 6 statement above, Horsley and Whitten states:

    "The applicant shows the proposed reserve areas on the revised plans that include the use of a drip dispersal technology… It should be noted that the drip dispersal technology requires different components (pumps, hydraulic units, etc.) than a traditional pressure dosed system so there will be a different configuration of components should this be required. Additionally, although the drip tubing can be installed along trees, the tubing must be installed in zones of similar elevation and significant grading may be required for this to be constructed."

    How significant is the grading required, and does that construction or the result of the construction pose any other requirements, including but not limited to additional waivers required? Is it possible to support plantings required by the BoH on the reserve leaching area should it become operational at some time?

10. **With respect to influence (water intake into the system)**, according to the manufacturer, sewage treatment results assume there is sufficient alkalinity in the influent wastewater for nitrification and there are no issues with pH, temperature, or toxicity. What is the plan to maintain these parameters within manufacturer's tolerance, and what are the implications should they not be maintained, especially to groundwater discharge concentrations?

11. No matter what the cause, **if discharge exceeds a concentration of 10 mg/L, how long will it take the owner to detect such an exceedance, and then to notify the Health Department and Board of Health?** How long will it then take to implement corrections? Is there a service level agreement in place to guarantee time to repair, which is especially important given the serious health consequences that could ensue from such a discharge?

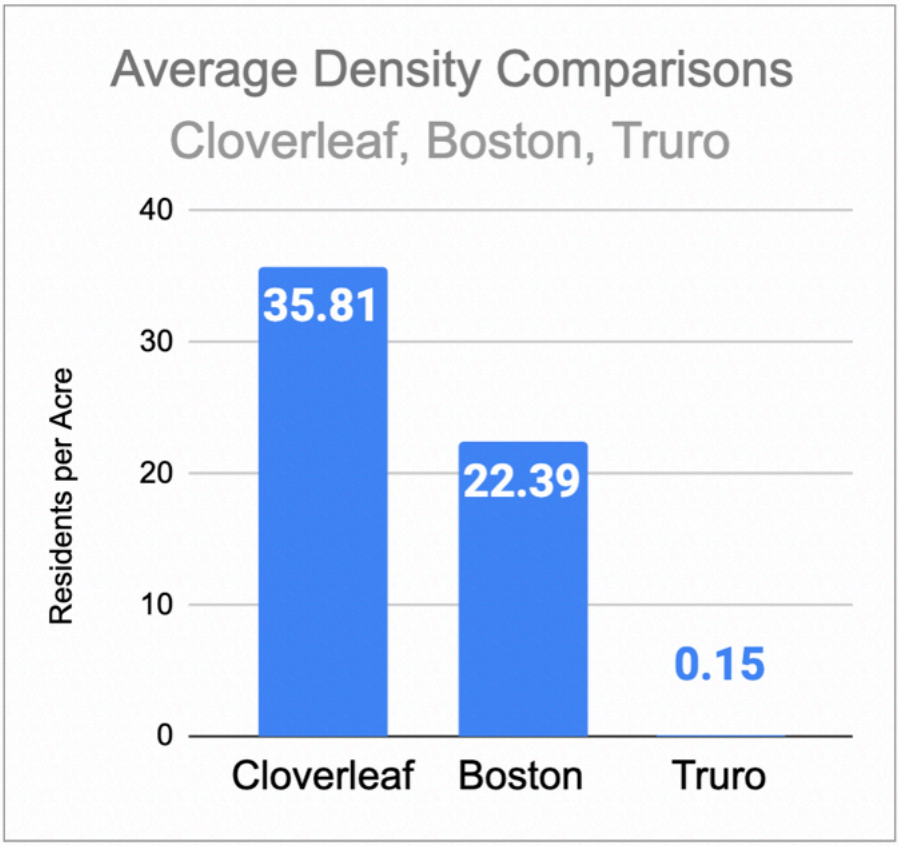
12. What are the **credentials of the Certified Wastewater Operator** and do they have documented experience operating a sewage treatment plant with the components specified in the applicant's plan?

13. **With respect to monitoring of the down-gradient groundwater**, it is paramount to guaranteeing the health of the many residents in the watershed including Pond Village. Recent and past test results of private well's in the area show that existing levels of contamination leave no room for additional nitrogen loading. In fact, 20 wells were tested more than once during the town's 10-year testing program, a program which was halted in 2016, the same year the project in question was approved by the voters for 12 to 16 units. That testing revealed that a statistically significant **90% of the wells so tested exhibited an increasing trend in nitrate contamination**. Had that testing program not been discontinued by the Town, for whatever reason, an additional 4 years of data would now be available to further establish this trend, and increase the sample size. **Given the health risks at stake, and in light of the report by Weston & Sampson only two years earlier that established the Pond Village area as one of concern for nitrogen loading, it is disconcerting that the Town apparently ignored the obvious need for continued data collection and monitoring**.

14. This upward trend in contamination levels, observed up to 2016, most likely due to up-gradient nitrogen loading, could very well be due to increased growth in vehicular traffic on the state highway and the cloverleaf on/off ramp interchange that is just up-gradient from these residents' private wells. If that is indeed the case, then **any margin of health safety that exists today, if at all, for the residents' wells could very possibly erode with time as such growth trend continues.**

15. The Town decided to create a dense project up-gradient from the Pond Village area of concern, and Town management, subsequent to voter approval for 12 to 16 units, tripled the size of the project to 40 units. Such a decision, without consulting the voters, **increased the density of the project to greater than the density of the City of Boston** (see Figure 1 below) -- without any continued monitoring or data collection whatsoever. **This ill-conceived approach to monitoring of a critical area in the planning phase of this project speaks strongly to our concerns about the monitoring that will be performed post-construction, without which the magnitude of the inevitable impact on our health and safety cannot be ascertained**.

Figure 1



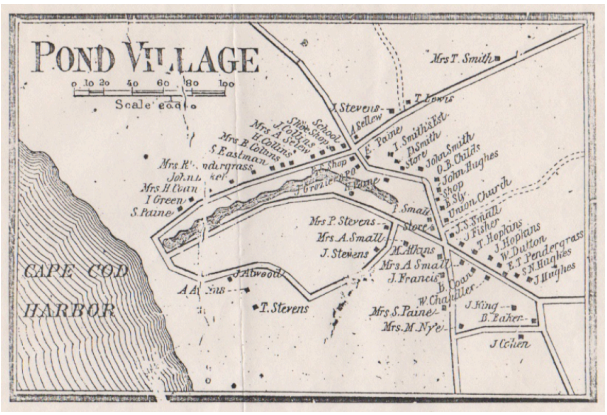
	Cloverleaf	Boston	Truro
Acres per Sq Mile		640	640
Residents per Sq Mile		14327.68	99.1
Acres	3.91		
Residents	140		
Residents/Acre	**35.81**	**22.39**	**0.15**

Residents assume 2 per bedroom; 70 bedrooms;
per HUD Keating Memo 1991
https://en.wikipedia.org/wiki/Boston
https://en.wikipedia.org/wiki/Truro,_Massachusetts

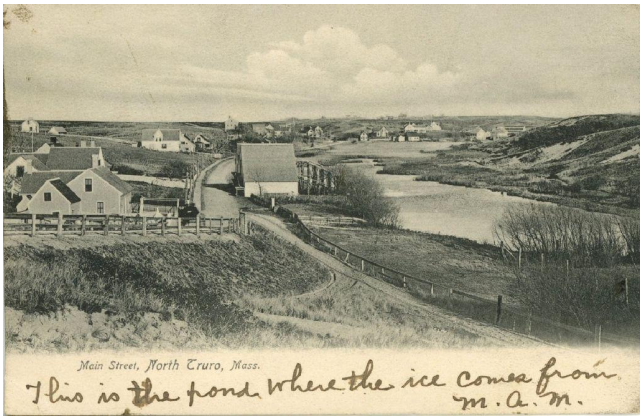
ADDENDUM 2

Pond Village Historical Images

Pilgrim Pond Plaque - 1920

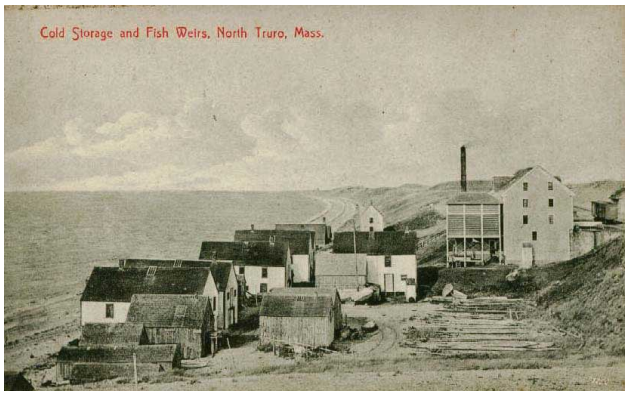


1858 Map



Main St, N Truro

Train Station, N Truro



Fish Weirs

Cottages at N Truro

DOCS FOR TRURO
SAFE WATER

Report on
Private Wells and Truro Safe Water

Executive Summary

This report compiles and synthesizes research related to the conditions and standards that affect potable water quality in Truro and in areas with similar geophysical and water use profiles in the Outer Cape area.[1] It does not analyze well water data and relies on extant reports to establish these levels.

In presenting the scientific evidence available we have relied upon three sources of data:

- Scientific data drawn from research reported in legitimate, peer-reviewed journals and publications
- Regulatory data where official agencies at various levels of government set regulations and, in many instances, maintain data related to same
- Consultative and Policy reports, usually prepared by experts, who may collect original data but who all interpret scientific and empirical evidence for policy- and decision-makers.

A lead indicator of water quality and water supply contamination is the levels of nitrate found in well water, the predominant source of domestic and commercial water in Truro. Drinking water contamination takes the form of nitrates and other organic wastewater compounds and chemicals that are mostly undetectable by taste and smell; nitrates are both easier and less costly to measure than other compounds and chemicals. Additionally, nitrates are found to be an "early detection" marker for other contaminants and serve as an effective warning sign of additional contaminants in drinking water supplies. Nitrate levels are measured in terms of milligrams per liter of water (mg/L) interchangeably with parts per million (ppm). This report uses "mg/L" but both metrics are referenced below.

Truro's Water Supply Sources

Most of Truro's drinking water comes from private wells drilled from the aquifer beneath us. In Truro, the aquifer consists of two "lenses" - or underground pools of fresh ground water - that float above the salt water below. The Pamet River, flowing from Ballston Beach to Cape Cod Bay, divides the lens into the **Pamet Lens** to the north and the **Chequesset Lens** to the south.

Because the aquifer is fairly close to the surface in many parts of Truro and thus easily reachable by drilling, these groundwater lenses can and do provide potable water resources. Ponds throughout Truro provide a good indication of the top of the aquifer, which at its highest is about 5 feet above sea level and is generally about 200 feet deep.

Groundwater in the aquifer is mostly the result of rainfall that slowly filters down to the aquifer with every rain. Other contributors to groundwater include **runoff from hard surfaces such as roofs and paved areas** which contribute salts, petrochemicals and other solvents in the runoff; **on-ground open-air storage of toxic materials** such as asphalt, brick, concrete and pressure-treated wood; and **wastewater from septic tanks and cesspools and their overflow**, which "leach" into the soil and likewise filter into groundwater over time, contributing organic (human) and chemical waste mixed in residential and commercial effluence and wastewater. Cesspool leaching finds its way easily into the aquifer and at proportionately greater densities. It is estimated that 10% of Truro homes still have outdated cesspools or otherwise failed septic systems.

Standards and Regulations for Truro's Water Supply

Eighty-five percent (85%) of Truro's homes get their water from private wells. Yet private wells are not regulated by the Cape-wide, state or federal authorities, including the EPA. The Cape Cod Commission issues policy guidelines and recommendations, but **the local Board of Health determines acceptable levels of drinking water contamination**.

According to Truro's Board of Health, water quality in certain areas in the Town of Truro is degraded. Excessive nitrogen loading in our watersheds has been identified as a major cause of this degradation. The primary source of excess nitrogen is reported to be wastewater from on-site septic systems.

Although the federal EPA does not regulate private wells and Truro's largest supply of potable water is obtained through private wells, **Truro's Board of Health currently relies on the EPA standard of 10 mg/L** <u>**for municipal water**</u>

[1] The Outer Cape includes the towns of Provincetown, Truro, Wellfleet, and Eastham.

systems (not wells) as the safe upper limit of nitrates in drinking water. The EPA standard was adopted in 1962 based on a federal study of nitrates and other contaminants in reliance on data from 1951 to determine nitrate level contribution to methemoglobinemia ("blue baby syndrome"). This standard, unchanged since 1962, **cited10 mg/L as the threshold for blue baby syndrome; at no time has the EPA stated that this level is safe for private wells.**

Extensive research, most notably since 1996, **shows serious health consequences at levels of 5 mg/L - half the EPA's 10 mg/L - and less**. To illustrate but not exhaust the known impact, research associates levels of 5 mg/L with non-Hodgkins lymphoma, bladder and thyroid cancer, and birth defects, and some of these consequences are associated with nitrate levels as low as 0.9 to 3.87 mg/L; other cancers (e.g., colorectal cancer) have been found at and around a nitrate loading level of 1 mg/L. Many other serious health impacts have been identified in the research. The evolution in the scientific understanding of the adverse effects of nitrate contamination has significantly advanced since 1962, with notable changes **since 1996: the trend is clear that low levels of nitrates in groundwater have adverse effects on health and that nitrate levels above 5mg/L present unacceptable and multiple challenges to public health.**

In the intervening almost 60 years since the EPA adopted its 10 mg/L standard, numerous entities and studies, including by the University of Massachusetts, have recommended that standard be reduced to 5 mg/L. More recent research has looked at the long-term effect of nitrates and related contaminants and found significantly more risks to health. In the most recent decade, non-profit research firms including the *Environmental Work Group* and *Silent Spring Institute*, **have recommended nitrate standards be reduced to 1 mg/L.** Other than the EPA and those who adhere to its high tolerance level, **no longer do studies recommend levels as high as 10 mg/L.**

Truro's current Local Comprehensive Plan calls for continuing review by the Board of Health of nitrate concentration standards to ensure they adequately address potential groundwater pollution problems. As recently as 2014 and 2018, the Town of Truro hired the consulting firm of Weston & Sampson to study Truro's water and to understand the cumulative effects of nitrogen (nitrate) loading on groundwater quality. Sampling data obtained in 2007-2011 shows that 1181 samples were taken identifying 45 lots with nitrate concentrations above 5 mg/L and 2 lots revealing concentrations above 10 mg/L. In 2012-17 another 1400 samples were tested, generally corroborating earlier findings and trends. As a result, W&S identified parts of North Truro and the Pamet River basin as particular areas of concern. Their results, guidance on safety and mitigation, and recommendations are summarized later in this paper.

Other Effects of Excessive Nitrate Levels

Once drinking water is contaminated by excess levels of nitrates or other health-harming agents, **the remedies are costly and irreversible: to construct a public water supply system**, including large wells for supply, water filtration plants, water towers, underground water mains, and wastewater treatment facilities.

As expensive as a city-like water infrastructure is to build and maintain, and as much as it needs to be funded by significantly increased taxes, another economically devastating consequence is the **decrease in property values due to polluted drinking water.** Per the Cape Cod Commission, **a 1% increase in nitrogen is associated with a decrease in home prices of 0.6% on average.** In Truro's case, the total value of its homes is on the order of $2.3 billion. A mere 2% increase in nitrogen would then, according to this model, reduce home values by about $28 million. Allowing the **current Board of Health standard of 10 mg/L doubles the level science now establishes as a threshold for multiple health impacts: 5 mg/L**. The corresponding rise in allowable nitrate levels could have adverse economic impacts of considerable magnitude.

Conclusion

As more research is conducted, increasing evidence of harmful effects of nitrate concentrations on human health are found at lower and lower levels of concentration; the arc of lower threshold levels has been consistent for more than 25 years, finding significant health consequences at and below nitrate concentrations of 5 mg/L. As this is well below current EPA and Truro Board of Health standards, this research warrants consideration and possible revision as a pressing local matter. In addition, it is becoming more evident that nitrates serve as a marker for human activity, and human activity is the source of other harmful organic and chemical contaminants. Many of these contaminants are not easily filtered out even in public water supplies and pose a risk of cancer and other health problems to residents.