

MEMORANDUM

TO: North Yarmouth Planning Board
Through Ben Scipione, Code Enforcement Officer

CC: Chris Byers, Principal, Branch Renewable Energy

From: Kate Burch, Planner, North Star Planning

RE: Boundary Line Solar – Site Plan Review meeting August 8, 2023

Date: August 1, 2023

Overview

The applicant, Boundary Line Solar, LLC (a subsidiary of Branch Renewable Energy, LLC) is proposing to develop an approximately 1 MW ground mounted solar array located on Doughty Road. It is listed as 0 Doughty Road, Tax Map 30, Lot 1. The property is in the Village Residential and Groundwater Protection Overlay zones. Approximately 10.7 acres of the 20.9 acre parcel will be disturbed. Impervious lot coverage will be 0.41 acres (the solar array is not considered impervious coverage.) The solar array will feature a single-axis tracker allowing the panels to move from east to west each day. The area under and around the solar panels will be revegetated with a native meadow mix.

The property is owned by the Yarmouth Water District. Boundary Line Solar LLC has a 30-year lease. The parcel was previously used as a sand and gravel pit. This land cannot be used for residential or commercial development.

The applicant has applied to Maine Department of Environmental Protection for a Stormwater Permit by Rule, and Solar Decommissioning permit as well as an Army Corps of Engineers Permit.

No concerns have been identified by Public Works, the Fire Marshall, or other town staff. Yarmouth Water District has reviewed the project and stated it does not pose a risk to groundwater. The project will follow best management practices to protect water quality.

This project was first brought to the Planning Board at a preapplication meeting on April 26, 2023. The project came before the Board as a site plan review on July 11, 2023. At that meeting, the Board voted the application complete and set a date for a site walk and public hearing. The Board also requested clarification from the applicant on the maintenance schedule and on how the project meets the noise requirements in the ordinance. The Board allowed public comment at the meeting, and concerns were expressed about wildlife habitat in the project area, as well as potential discrepancies in site details such as fencing. The site walk was held on July 23, 2023.

The applicant submitted a cover letter and additional materials on July 25, 2023. This included updated information on wetland treatment, fencing details, noise levels, and maintenance schedules. The fence surrounding the project area shall be a minimum of 7 feet high, raised 6 inches above the ground for wildlife passage. Noise levels are within the ordinance standards (see Attachment 15.) Errors in the previous submittal regarding post-construction inspection have been corrected, and the applicant confirms inspection of the transformer shall occur quarterly.

The applicant has withdrawn the waiver request of 10.3(c) that was relevant to two wetlands on the subject property, and notes the following instead:

- A low-value wetland (W-KV-04) in a former sand and gravel pit is proposed to be filled, and as part of the project has applied for a permit from the Army Corps of Engineers (ACE). This wetland fill is governed by the ACE permit. The ordinance buffer and setback standards apply to post-development wetlands. After the ACE permit is granted, no buffers or setbacks will be required. A condition is included that all federal, state, and local approvals (including the ACE permit) must be granted prior to the start of construction.
- The site plan also proposes to place solar equipment in the vicinity of the wetland labeled W-KV-05. According to 10.3.E.2, installing road crossings and required utilities are exempt from wetland buffering and setbacks. In the cover letter, the applicant states the overhead utility poles, racking, and underground wiring are required utilities and are thus exempt from buffering and setbacks. The planner has reviewed this statement and feels it is a well-reasoned approach to the ordinance standard. The proposed use is considered a utility use as per Table 7.1

Application Stage

The Board can vote on final approval for this project.

Applicant: Boundary Line Solar, LLC (c/o Branch Renewable Energy, LLC)

Owner: Yarmouth Water District

Location: 0 Doughty Road

Zoning: Village Residential and Groundwater Protection Overlay

Tax Map Number: Map 30 Lot 1

Existing Land Use: former gravel pit

Proposed Land Use: large-scale solar system (community solar array)

Acreage: approximately 20 acres

Waivers: none requested

Site Walk: A site walk for this project was held on July 23, 2023.

Public Hearing: A public hearing for this project will be held on August 8, 2023.

Suggested Motion: To approve the Boundary Line Solar site plan located on Map 30 Lot 1 based on the Findings of Fact and Conclusions in the Planner memo dated August 1, 2023 with the following conditions of approval:

1. This approval is conditioned on the applicant receiving all necessary federal, state, and local approvals prior to construction.
2. The project must follow conditions 1-10 in the Yarmouth Water District letter dated June 22, 2023.

Findings of Fact and Conclusions of Law for the North Yarmouth Planning Board

Site Plan Review - Findings of Fact:

1. Utilization of the Site
 - The approximately 10-acre community solar array will be constructed on a former sand and gravel pit and will limit disturbance and tree clearing as much as possible. Approximately 9.78 acres of tree clearing will be required. See "Limit of Disturbance" areas shown on Site Plan C-1.0 dated 6/1/23.
 - Lot coverage will be 0.41 acres or about 2%, which is under the maximum lot coverage of 30% in this zone.

- No streams, Wetlands of Special Significance, or vernal pools that meet Maine DEP criteria were identified within the project area.
- 5 wetlands were delineated within the project area. The project avoids impacts to 4 of the 5 wetlands on site.
- The project proposes 1,328 square feet of permanent wetland fill in one wetland, W-KV-04, a Low Value Wetland previously impacted by the gravel pit.
- Soils on site are suitable for the proposed development.
- In a letter dated June 22, 2023, the Yarmouth Water District says the project will not impact water quality. Yarmouth Water District has supplied a list of comments and conditions for project construction to protect groundwater (see Attachment 14.)

2. Utilities

- The project will connect to the CMP grid.
- Wiring will run underground until the point where it must connect to above ground poles on Doughty Road as per CMP engineering standards.
- Three-phase power will be extended from Greely Road at the project's expense.
- No other utilities will be needed.

3. Brook, Pond, Vernal Pool, and Wetland Buffers

- No streams, brooks, ponds, Wetlands of Special Significance, or vernal pools that meet Maine DEP criteria were identified within the project area.
- 5 wetlands were delineated within the project area.
- 2 are within the Limit of Disturbance area – a low-value wetland, W-KV-04, and a high-value wetland, W-KV-05. The project proposes 1,328 square feet of permanent wetland fill in W-KV-04, which will be governed by an Army Corps of Engineers permit.
- Overhead utility poles, solar panel racking, and underground wiring will be installed near wetland W-KV-05. Installation of utilities needed to access is exempt from wetland buffering requirements as per 10.3.E.2.
- The three wetlands outside the project area will be buffered by existing vegetation and as well a proposed double row of coniferous trees 4-6' tall, spaced 20' apart.

4. Building Standards

- Not applicable.

5. Impact on Community Facilities

- No negative impact on community facilities will result from this project.

6. Drive-Through Facilities

- No drive-through facilities are proposed.

7. Erosion and Sedimentation Control

- The project shall implement erosion and sedimentation control measures according to best practices set by Maine Department of Environmental Protection.
- Erosion and sedimentation control measures will be in place prior to ground disturbance and construction.
- Erosion and sedimentation control plans are included in Attachment 16.
- Erosion and sedimentation control plans have been submitted with the Stormwater Permit by Rule application to Maine DEP.

8. Emissions

- No emissions will result from the project.

9. Exterior Lighting

- There will be no exterior lighting or illuminated signage for the project.

10. Financial and Technical Capacity

- The applicant provided evidence of financial and technical capacity, including a letter from Gorham Savings Bank (see Attachment 7.)
- The applicant has applied to Maine Department of Environmental Protection for a Solar Decommissioning permit. An itemized decommissioning estimate is included (see Attachment 17.)

11. Floodplain Management

- The project is not located within a 100-year floodplain.

12. Hazardous, Special, and Radioactive Materials

- No hazardous, special, or radioactive materials will be used, stored, or disposed of for the project.

13. Historic and Archaeological Sites

- No historic or archaeological sites will be impacted, visually or otherwise, by the project (see Attachment 10.)

14. Landscaping, Buffers and Screening

- The solar array will be constructed in a forested area. Limits of Disturbance and tree clearing are shown on Site Plan C-1.0 dated 6/1/23.
- The applicant proposes tree plantings of 4'-6' tall coniferous trees on the east and southern boundaries of the Limits of Disturbance (see Site Plan C-1.0 dated 6/1/23) for additional screening.
- The area in and around the solar panels will be revegetated with a native seed mix. Any other disturbed areas will also be re-seeded with this mix.

15. Noise

- No noise levels in excess of the town standards will result from the project. The applicant submitted information on noise levels on inverters, transformers, and other electrical equipment (see Attachment 9 from the packet dated July 25, 2023.)

16. Sewage Disposal

- No sewage disposal is proposed as part of this project.

17. Signs

- A small informational placard will be installed near the entrance gate to list 24-hour emergency contact information, and trespassing and warning signs will be installed around the project fence. No other signage is proposed.

18. Soil Suitability

- Soils on site are suitable for the proposed development.

19. Solid Waste Disposal

- Solid waste will only be produced during the construction phase of the project.
- Solid waste will be hauled offsite by a licensed transporter.

20. Storage of Materials

- No outside storage areas will be included for the project.

21. Stormwater Control

- Per Maine DEP rules, the meadow conditions under and around the solar panels will serve as a self-treating stormwater buffer. The meadow will not be mowed more than twice per year.
- Stormwater analysis shows a reduction in runoff along the eastern property boundary and a slight increase towards the western property boundary and gravel pit. Soils are well-draining and no stormwater buildup is expected (see Attachment 16.)
- The applicant has submitted a Maine DEP Stormwater Permit By Rule application.

22. Water Supply

- The project will not require any water supply.
- The nearest fire hydrant is located about ½ mile away on Greely Road.

23. Water Quality

- In a letter dated June 22, 2023, the Yarmouth Water District says the project will not impact water quality. Yarmouth Water District has supplied a list of comments and conditions for project construction to protect groundwater (see Attachment 14.)
- The project will follow best management practices for groundwater protection.

24. Protection of Significant Wildlife Habitat

- No significant wildlife habitat or vernal pools that meet Maine DEP criteria are within the project area (see Attachment 10.)

25. Access Management and Vehicular Circulation

- The project will not produce vehicular traffic other than for construction and maintenance needs.
- The project will use an existing driveway off Doughty Road.
- The 16' wide gravel access road will include a turnaround adequate for emergency vehicles.

26. Pedestrian Ways and Bicycle Access

- No pedestrian or bicycle ways are being proposed for this project.

27. Off-Street Parking and Loading

- No off-street parking or loading will be included for the project.
- Inspection and maintenance vehicles will be able to park in the turnaround on the access road.

Conclusions of Law:

1. The development **will** reflect the natural capabilities of the site to support development.
2. Utilities serving developments in the Village Center District and Village Residential District **will** be installed underground.
3. The proposed development **will not** result in a negative impact to the environment or to the community facilities or services.
4. The development **will not** contribute emission of dust, ash, smoke or other particular matter.
5. ~~The proposed development **will/will not** have adequate exterior lighting to provide for its safe use during nighttime hours. **(N/A)**~~
6. The landscape **will** be preserved in its natural state, insofar as practicable, by minimizing tree and soil removal, retaining existing vegetation where desirable, and keeping any grade changes in character with the general appearance of neighboring areas.
7. The development **will** control noise levels such that it **will not** create a nuisance for neighboring properties.
8. ~~The size, location, design, color, texture, lighting and materials of all exterior signs **will/will not** detract from the design of proposed buildings and structures. **(N/A)**~~
9. ~~Exposed non-residential storage areas, exposed machinery, and areas used for storage **will/will not** have sufficient setbacks and screening. **(N/A)**~~
10. Adequate provisions **will** be made for the collection and disposal of all storm water that runs off proposed roads, parking areas, roofs and other surfaces.

11. Developments **will** be designed to protect and conserve important wildlife habitat to the greatest extent feasible.
12. The layout of the site **will** provide for the safe movement of passenger, service, and emergency vehicles throughout the site.
- ~~13. The site plan **will/will not** provide for a system of pedestrian ways within the development appropriate to the type and scale of development. **(N/A)**~~
- ~~14. Parking areas **will/will not** be constructed to protect the natural environment and visual character of the community, improve pedestrian safety and accessibility, and promote the quality of life in developed areas. **(N/A)**~~

July 25, 2023

Ben Scipione
Code Enforcement Officer
Town of North Yarmouth
10 Village Square
North Yarmouth, ME 04097

**Re: Updated Site Plan Review and Conditional Use Application Materials
Boundary Line Solar Project**

Dear Ben,

After receiving feedback during the Planning Board meeting on July 11, 2023, we are submitting a few revised attachments/modifications to the Site Plan Review application for the Boundary Line Solar Project:

- Attachment 1: General Description
- Attachment 9: Wetlands
- Attachment 3: Site Plans (Standard Details)
- Attachment 15: Noise
- Attachment 11: Spill Prevention, Control, & Countermeasures Plan

General Description, Wetlands, and Withdrawal of Waiver Requests

The Project is withdrawing the request for a waiver related to wetland fill due to recent clarification from the town's attorney (Natalie Burns) in an email sent on July 18, 2023 related to wetland fill. Burns stated that if the Project has applied for an Army Corps of Engineers Permit and is not required to obtain a permit from the Maine Department of Environmental Protection due to the proposed fill amounting to less than 4,300 SF, then the Planning Board cannot regulate the fill proposed in the wetland. The Project requests that any approvals issued by the Planning Board would be conditioned upon receipt of the approved Army Corps of Engineers permits as it relates to this topic discussed above.

Additionally, the Project is no longer requesting a waiver for the solar equipment that is proposed near the high-value wetland within the limit of disturbance. § 10.3.B.1 indicates that,

"Vegetative buffers shall be located between all disturbed areas of a development and streams, ponds, vernal pools and high value wetlands."

However, § 10.3.E.2 outlines exemptions to buffering standards for high-value wetlands by stating that,

"Road crossings, bridges, culverts, and the installation of utilities needed to access property on the other side of wetlands and bodies of water;".

The overhead utility poles and underground wiring underneath the solar panels required for the site to operate which are proposed near the high-value wetland (W-KV-05) meet the exemption criteria listed in § 10.3.E.2. The overhead utility poles and underground wiring in and around the solar panel racking are



“utilities” that are needed to operate the property. Therefore, the requirement of any buffering or setback standards related to this high-value wetland is not applicable and does not require a request for a waiver to construct equipment any distance from this high-value wetland.

Further details have been added to “Attachment 1: General Description”, and “Attachment 9: Wetlands” and these revised sections are attached to this submittal packet.

Standard Details

The height of the fence depicted in the previously submitted Standard Details plan did not match the proposed height of the fence in the rest of the Site Plan Review Application. The correct proposed height of the fence is a minimum of 7-feet tall including a 6-inch gap on the bottom of the fence. Therefore, the height of the fence shall be at minimum 7 feet, 6 inches total. An updated copy of the Standard Details showing this change is attached in this submittal packet under Attachment 3: Site Plans..

Noise

The Project has conducted a more comprehensive analysis of the sound pressure measurements of the sound emitted from the solar equipment measured at property lines. Additionally, per the Planning Board Chair’s request, any simultaneous sounds emitted from various equipment has been studied and added to the chart in as seen in the attached “Attachment 9: Noise”. The Project falls well below the required sound pressure limits defined in the Land Use Ordinance even when all pieces of equipment are operating simultaneously.

Spill Prevention, Control, & Countermeasures Plan

The Project has modified post-construction inspection responsibilities related to the inspection of the transformer from monthly to quarterly. This was an error in the previous submittal, and this issue has been brought up to standards that still allow for appropriate inspection frequency of the transformer. Additionally, the previously submitted SPCC plan listed the county as Piscataquis County, but that has been corrected to be Cumberland County.

Thank you for your help in better understanding these requirements, and please let me know if you have any questions of comments regarding these submitted materials.

Sincerely,

A handwritten signature in black ink, appearing to read "CB", is written over a light blue horizontal line.

Chris Byers
Principal
Branch Renewable Energy
207-653-9864
cbyers@branchrenewables.com



BRANCH
RENEWABLE ENERGY

Attachment 1: General Description

Attachment 1: General Description

Project Summary

Boundary Line Solar, LLC, a subsidiary of Branch Renewable Energy, LLC (Branch), is proposing to develop the Boundary Line Solar Project (Project), a ground-mounted solar energy generation facility. The Project's limit of disturbance (LOD)—including all clearing, infrastructure, and equipment—will occupy a total of approximately 10.7 acres in North Yarmouth. The Project will provide approximately 1 megawatt (MW AC) of renewable power to the local electrical grid by interconnecting to the distribution poles Doughty Road.

The Project features a racking type called a single-axis tracker, which allows the solar panels to move from east to west each day as the sun moves across the sky, maximizing the solar energy potential of the site. Single-axis trackers afford an approximately 15% increase in solar energy production compared to a fixed-tilt racking assembly. The renewable energy generated from this Project will benefit Maine ratepayers and contribute to the State's long-term renewable energy production goals.

The Project parcel was chosen due to its previously disturbed nature; the presence of existing infrastructure, such as three-phase power lines; the willingness of the landowner; and the existing capacity at the Elm Street substation. The Project is capable of producing clean renewable electricity for more than 30 years, requiring no fuel and producing no emissions during operation.

In addition to the North Yarmouth Site Plan Review Permit, the Project is applying for a Stormwater Permit by Rule (PBR) and a Solar Decommissioning permit with the Maine Department of Environmental Protection (MDEP), along with a US Army Corps of Engineers (USACE) Self-Verification Notification. The Project team has already submitted these state and federal permit applications, and copies of the applications can be found in **Attachments 16, 17, and 18**. Once received, copies of all approvals will be provided to the Town of North Yarmouth.

Once construction is complete, the Project will operate autonomously with 24/7/365 remote monitoring. For safety reasons, the Project will not be accessible to the public. Occasional site visits from Project personnel will be necessary for routine maintenance (e.g., mowing) and periodic inspections of equipment and stormwater management controls. Such visits are not expected to occur more often than once per quarter.

Project Location

The Project is proposed to be located at 0 Doughty Road, on Lot 30 of Tax Sheet 1 in North Yarmouth. This parcel is in the Village Residential district, and is within the Groundwater Protection Overlay (GPO) District. The parcel is owned by the Yarmouth Water District (YWD).

More details, including existing buildings, roads, and setbacks, as well as proposed structures and clearing, can be found in the Site Plans included in **Attachment 2**. Additionally, **Attachment 3** includes the following maps:

- Project Location Map (Aerial)
- Project Location Map (Topographic)
- Town Tax Map
- 500-foot Abutters Map
- Town Zoning Map
- Groundwater Overlay Protection Map
- Sand and Gravel Aquifers Map
- Natural Resources Map
- Wetland Impact Map
- FEMA 100-year Flood Map
- High Value Plant and Wildlife Habitat Map
- Boundary Survey
- Site Plan with 2500 Day Well Protection Area

Dimensional Requirements

The total lot coverage proposed is 0.41 acres of the 20.9-acre parcel (~2%), and is below the maximum of 30% coverage. The total lot coverage, as defined by the ordinance includes all impervious areas such as the access road and equipment pad. The solar panels are not considered impervious by the MDEP and the area under the array will remain vegetated. The LOD is outside of the 20-foot front setback and 10-foot side and rear setbacks, as seen in the Site Plan in **Attachment 2**. With the exception of power poles, no structure will be taller than 35 feet; the height of the solar panels is proposed to be 10-14 feet. The Project parcel has approximately 800 feet of street frontage, and is above the minimum 100 feet required within the Village Residential District.

Abutters

A map of abutting properties within 500 feet of the Project parcel is provided in **Attachment 3**, along with a list of those property owners and addresses in **Attachment 4**. The Project team has notified the listed abutting property owners by certified mail more than 14 days prior to the Planning Board meeting at which this application is to be considered. A copy of the notification and evidence of certified mailing is provided in **Attachment 4**.

Title, Right, or Interest

The Project parcel is owned by the Yarmouth Water District. Boundary Line Solar, LLC has acquired an option to lease the parcel for up to 30 years. This option agreement is included in **Attachment 5**. There are no known restrictions or easements on the property that the Project team is aware of that will conflict with the proposed Project. While a comprehensive boundary survey has been completed by BH2M, a title search is currently underway.

Utility Notification

An application for interconnection was submitted to Central Maine Power (CMP) on 3/29/23. The application was deemed complete and a substation queue position was assigned to the Project on 4/10/23. The Notification of Completion from CMP is included in **Attachment 6**. The Project is awaiting its system impact study results and expects to enter into an Interconnection Agreement with CMP in Q3 2023.

Technical and Financial Capacity

The Project team is based in North Yarmouth and includes established leaders from the Maine solar energy industry. The team has decades of combined experience in natural resources protection, solar energy development, environmental permitting, stormwater engineering, and construction oversight. More information about the Project team is included in **Attachments 7**.

The estimated cost to construct the Project is \$2.5 million. Boundary Line Solar, LLC has obtained a letter of financial capability from Gorham Savings Bank affirming its confidence in the ability of the Project and Branch Renewable Energy to construct the Project. The letter is included in **Attachment 7**.

Existing Site Conditions

The Project parcel is predominantly forested, but has previously been significantly disturbed. A portion of the Project parcel is a former sand and gravel pit, and the parcel is bisected by a CMP transmission line. Given the historical use of a portion of the Project parcel as a sand and gravel pit, Halfway Rock Development Partners, LLC (HRDP) reviewed the site and determined that site is exempt from licensing under the current Maine rules

for Excavations for Borrow, Clay, Topsoil, or Silt. For more information, see the regulatory review letter prepared by HRDP included in **Attachment 19**. The surrounding area includes agriculture and low-density residential development. There are no other structures within the parcel, and no structures are proposed within the LOD.

Natural Resources

The Project parcel is predominantly characterized by forested uplands and a former sand and gravel pit, and overlies sand and gravel aquifers of moderate to good groundwater yield (see the Aquifer Map in **Attachment 3**). No naturally occurring vernal pools were identified during an on-site natural resources survey. The survey did delineate four small scrub-shrub and forested wetlands, as well as an emergent wetland within the Project survey area (see the Natural Resources Map in **Attachment 3**).

No Wetlands of Special Significance (WOSS) were identified within the Project survey area, as defined by MDEP in 06-096 CMR 310 (rules governing “Wetlands and Waterbodies Protection”). No streams were identified within the parcel. For more information about natural resources within the Project area, see the Natural Resources Report in **Attachment 8**.

Two wetlands were identified within the proposed Project LOD. One wetland is considered a high-value wetland (W-KV-05), and the other is considered a low-value wetland (W-KV-04) per § 10.3 of the *Town of North Yarmouth Land Use Ordinance*. The Project is only proposing impacts to the low-value wetland, which is referred to as W-KV-04. See **Attachment 9** for a discussion of the wetland functions and values, and the proposed Project impacts.

Soils

Soil map units within the Project parcel were identified through the Natural Resources Conservation Service (NRCS) Web Soil Survey for Cumberland County. Three soil types underlie the majority of the proposed LOD: Gravel Pits, Nicholville very fine sandy loam, and Hinckley loamy sand. These soils are not hydric, and range from moderately well drained to excessively drained. Slopes within the LOD range mostly from 3 to 8 percent, outside of the former sand and gravel pit. Soils on site are generally suitable for the proposed development. More details are available in the full NRCS report, which is included in the Natural Resources Report in **Attachment 8**.

Protected Species and Sensitive Habitats

The Maine Natural Areas Program (MNAP) and the Maine Department of Inland Fisheries and Wildlife (MDIFW) were contacted regarding the presence of any rare, threatened, or endangered botanical species, or any other protected communities or habitats within the Project parcel. MNAP’s review and response, included in **Attachment 10**, found no rare botanical species documented within the Project area. MDIFW responded that it has not mapped any Essential Habitats that would be directly affected by the Project, nor any Significant Wildlife Habitats such as significant vernal pools or waterfowl habitats. MDIFW’s response is included in **Attachment 10**.

Historic Structures

No known historic structures exist on the Project property. The National Register of Historic Places does not identify any sites that would be impacted, visually or otherwise, by the Project. The nearest listed structure is the Captain Reuben Merrill House in Yarmouth, approximately 2 miles from the Project site.

An inquiry was sent to the Maine Historic Preservation Commission (MHPC) regarding the documented or potential presence of historic resources within the Project area. The response from MHPC is included in **Attachment 10**, and concluded that there will be no historic properties affected by the Project.

Proposed Site Conditions

Solar projects are low-impact in nature, and the proposed Project will minimize impacts by using the existing power lines and previously disturbed land. As previously mentioned, a portion of the Project parcel was formerly a sand and gravel pit. The applicant is proposing to use existing materials on site to grade the slope on the east side of the former sand and gravel pit to a more gradual slope in order to accommodate solar racking. This will allow the Project to install panels in this area, and take advantage of land that was disturbed in the past during the operation of the sand and gravel pit. The use of this space allows the Project LOD to be sited farther away from the eastern and southern property boundaries and preserves the existing tree buffer between the Project and adjacent properties. In addition, the LOD will avoid impacts to the wetlands along the eastern property line. A grading plan has been provided in **Attachment 2**. Racking posts will be driven or screwed directly into the ground. Wiring will run underground throughout the Project area, until the point where a series of typical aboveground power poles must be installed per Central Maine Power's typical engineering design standards to interconnect with the overhead distribution poles on Doughty Road. The Project proposes extending the 3-phase power lines from Greely Road, which is an expense that the Project company would incur, not Maine ratepayers.

The Project will result in 9.78 acres of tree clearing. Total impervious area will be 18,027 square feet (0.41 acres). Impervious surfaces are limited to the gravel access road, equipment pad, power poles, fence posts, and racking posts. Solar panels are not considered impervious by MDEP. The area around and underneath the solar panels will be re-vegetated with a native conservation seed mix. This creates meadow conditions and a stormwater buffer so that the Project area is considered self-treating. Per MDEP rules, the Project area will not be mowed more than twice per year in order for the meadow to qualify as a self-treating stormwater buffer.

The proposed solar panels and solar panel racking will have a maximum height of 10-14 feet, depending on the final racking and solar panel configuration. The Project does not propose the construction of any buildings, and due to the low traffic volume during Project operation, no parking areas are proposed. A turnaround along the Project access road will provide sufficient parking for maintenance vehicles during operation.

The Project has included tree plantings on the east and southern boundaries of the LOD as a visual buffer to neighboring properties. The trees are proposed to be "coniferous" so as to provide year-round buffering.

Solar projects can be built in and over a variety of different soil types, from sand to wet meadow to ledge. A full geotechnical analysis will be conducted prior to finalizing construction plans, to ensure that the Project racking and components are structurally sound. Final designs will be stamped by a licensed structural engineer.

Wetland Impacts

The Project has been designed to avoid wetland impacts to the greatest extent practicable. The total wetland impact of the Project is limited 1,328 square feet of permanent fill in only one wetland (W-KV04) due to the proposed grading within the former sand and gravel pit. As previously discussed, grading this area and filling this wetland allows for the Project to take advantage of a portion of the parcel that has experienced extensive disturbance, in addition to the LOD being sited farther away from the eastern and southern property boundary. Siting the LOD farther away from these property boundaries avoids impacts to three wetlands along the eastern boundary, and leaves existing vegetation untouched between the Project and neighboring properties. The Project has applied for a USACE Self Verification Notification Permit to fill this wetland, a copy of the

application is included as **Attachment 18**. Since the proposed wetland impact is less than 4,300 square feet, this activity is exempt from MDEP permitting under 38 M.R.S. §480(Q)-17. For further discussion of the wetland to be filled, Wetland W-KV-04, see **Attachment 9**.

Groundwater Impacts

Solar projects have minimal groundwater impacts. Construction and operations teams will work closely with the YWD to prevent spills or groundwater contamination of any kind during construction and long-term operation of the Project. During Project operation, stormwater will be self-treated by the meadow buffer, allowing for the continued recharge the underlying aquifer, resulting in no change to recharge volume. Wetlands on the Project parcel, with the exception of the wetland proposed to be filled, will continue to provide stormwater attenuation.

In consultation with the YWD, the Project does not pose a risk to groundwater because there is no proposed discharge or release of effluent wastewater. Test well data is not required because no septic system or effluent discharge is proposed.

The Project has applied for a MDEP Stormwater Permit by Rule, and will follow all MDEP best management practices, during both construction and operation. A Spill Prevention, Control, and Countermeasures (SPCC) Plan has been prepared for the Project, which details the methods, plans, and procedures to prevent impacts to groundwater during construction and operation. All personnel working on the Project will be trained in and required to follow the SPCC Plan procedures. The SPCC Plan is included in **Attachment 11**. The SPCC Plan is also referenced in the Operations and Maintenance Plan, which is included in **Attachment 12**.

In order to maintain a meadow under the solar panels, mowers and hand trimmers will be used. The use of pesticides is strictly prohibited per MDEP rules, so no pesticides or harsh chemicals will be sprayed within the Project area.

List of Equipment and Chemicals

The following is a list of anticipated equipment and chemicals that may be used in the Construction and Operations phases.

Equipment for Construction

- Construction vehicles (trucks, excavators, skid steers, bulldozers, private cars)
- Wood chipper
- Hydraulic foundation driver
- Portable toilet

Chemicals for Construction

- Petroleum products for vehicles (diesel, gas, and oil for construction equipment and private vehicles)

Equipment for Operation

- Single-axis tracker solar panels
- Electrical inverters
- Electrical transformer
- Power lines (underground and overhead)
- Power poles

Chemicals for Operation

- Envirotemp FR3 transformer fluid (see below for more information about this non-toxic, vegetable-based fluid commonly used in transformers)
- Petroleum-based lubricant for racking motors

Instead of mineral oil or petroleum-based oils, the transformer will use Envirotemp FR3 fluid, a vegetable-based, non-toxic, non-hazardous, biodegradable, recyclable liquid. Additional information about Envirotemp FR3 fluid is included in **Attachment 13**. Although this fluid is biodegradable and not harmful to the

environment, the Project will install redundant, secondary containment system around the perimeter of the transformer, as well as pipe bollards to protect against vehicle impacts. Envirotemp FR3 also acts as a fire retardant.

The racking motors that move the solar modules throughout the day will be located outside the 2500-day travel area as defined by the YWD. The Project's final design of the motor layout will be refined during the creation of construction drawings, but it is expected that approximately 6 motors will be installed across the entire Project. Each motor contains approximately 3 liters of petroleum-based lubricants that are contained in a sealed enclosure that does not need to be regularly changed and drained. Again, these motors are not proposed within the 2500-day travel area, but as an extra precaution the Project will install a small secondary containment system under each motor so that if in the event the motors fails and lubricants leak from the enclosure, the secondary containment system will capture any unwanted material that would have otherwise been absorbed into the surrounding ground area.

Hydroseeding may be used to re-vegetate disturbed areas of the Project following construction. Hydroseeding sometimes incorporates a binder, which prevents seeds from washing away, while stabilizing the soil and controlling dust. If a binder is needed to re-vegetate the Project area, a non-toxic, non-hazardous, biodegradable, 100% organic and plant-based product will be used.

No pesticides or harsh chemicals will be used for Project maintenance, and no hazardous chemicals will be stored on-site. The proposed project is located in the Royal River Watershed, but it is not located in the shoreland zone per the North Yarmouth Zoning Map or within the direct watershed of a lake or lake most-at-risk, as listed in 06-096 CMR 502 ("Direct Watersheds of Lakes Most at Risk from New Development, and Urban Impaired Streams"). The Phosphorus Standard does not apply to this project.

Yarmouth Water District Project Review Letter

Because the Project is located on land owned by the Yarmouth Water District (YWD), and because the Project is within the Groundwater Protection Overlay, the YWD has prepared a Project Review Letter. The letter summarizes YWD's due diligence performed to date, as well as a groundwater analysis of the proposed activity and equipment on-site. See **Attachment 14** for a copy of the Project Review Letter.

Noise

During operation of the Project, minimal noise will be generated, mostly from electrical transformers. The Project also proposes the installation of single-axis tracker solar arrays, which use motors that produce very low sound levels when the panels periodically rotate. Noise levels are expected to be below all daytime and nighttime limits established in the *Town of North Yarmouth Land Use Ordinance*, and should not adversely impact nearby properties. The maximum sound pressure value for all equipment operating simultaneously during the day at any property boundary is 42 dBA. The sound pressure value for the transformer during the night at any property boundary is 29 dBA (the transformer is the only piece of project equipment that will produce sound at night). For comparison whispering is usually around 30 dB(A), a quiet library is typically 40 dB(A), and a conversation at home is about 50 dB(A). See **Attachment 15** for specific details about expected noise levels.

Stormwater Management and Erosion Control

Construction and operation will be conducted in accordance with 38 MRS § 420-C and § 420-D (Erosion and Sedimentation Control, and Stormwater Management). The Project will employ best management practices from the *Maine Erosion and Sediment Control Best Management Practices Manual for Designers and Engineers* and the *Maine Erosion and Sediment Control Practices Field Guide for Contractors*.

Erosion and sedimentation control measures will be in place prior to the start of ground disturbance associated with construction, and will be maintained until the site is stabilized. Construction activity will not impede or otherwise alter drainageways so as to have an unreasonable adverse impact on any wetland, waterbody, or adjacent downslope parcel. Complete erosion and sedimentation control plans are included in the Stormwater Permit by Rule application in **Attachment 16**.

Meadow conditions across the Project area under the solar arrays will treat stormwater created by the impervious equipment pad, access road, fence posts, and solar panel racking posts. Following construction, disturbed areas of the site will be seeded with a native conservation seed mix in order to create meadow conditions. Seed will be reapplied as necessary until the site is permanently stabilized (minimum 90% vegetated).

BH2M has provided a Stormwater Management Report studying the stormwater runoff that compared the existing conditions to the proposed conditions of the Project (see **Attachment 16**). The analysis focused on two areas of interest: 1) the eastern property line (AP-1) and 2) the area inside the bottom of the gravel pit (AP-2) which are shown on Sheet A found on page 46 of the Stormwater Management Report. Both study areas assumed that the proposed meadow would act as a stormwater buffer to mitigate stormwater runoff.

The peak flows were studied at 2-Year, 10-Year, and 25-Year storm events as shown in Section 1.6 “Flooding Standards”. The proposed grading will result in a reduced amount of stormwater runoff to the eastern property boundary (AP-1) compared to the existing conditions, and a slight increase in stormwater towards the western property boundary within the bottom of the gravel pit (AP-2). The soils found in the bottom of the pit on the west side of the Project are well draining, so no buildup of stormwater within the contained gravel pit is expected.

The final conclusion of the Stormwater Management Report is that the Project will not result in an increase of overland stormwater runoff beyond the parcel boundaries.

MDEP Stormwater Permit by Rule Application

A Stormwater Permit by Rule (PBR) application has been prepared for the Project by the registered professional engineers at Berry Huff McDonald Milligan Inc (BH2M). The application has been designed in accordance with the most recent version of the *Maine Stormwater Best Management Practices Manual* in order to satisfy MDEP rules governing Stormwater Management (06-096 CMR 500, 501, and 502). The application includes an Erosion and Sedimentation Control Plan; an Inspection and Maintenance Plan for erosion and sedimentation controls; and performance standards to prevent spills and protect groundwater. See **Attachment 16** for the full Stormwater PBR application. The Stormwater PBR was submitted to the DEP on 6/9/23.

USACE Self-Verification Notification Application

The Project team submitted a USACE Self-Verification Notification on 6/2/23 in order to permit 1,328 square feet of wetland fill. A copy of the application is included as **Attachment 17**. As the Project is proposing less than 4,300 square feet of wetland impacts, a NRPA permit is not required. A copy of the approved permit will be shared with the Town, once available.

MDEP Solar Decommissioning Application

The Project owner will be responsible for decommissioning the Project at the end of its operational life, or the expiration/termination of the lease agreement. MDEP requires projects greater than 3 acres to apply for a Decommissioning Permit and provide a form of financial surety to cover the estimated cost of decommissioning. This form of surety must be submitted and approved by the MDEP prior to the start of

construction. Such surety may be in the form of a certified check, performance bond, or irrevocable letter of credit. A copy of this surety will be provided to the Town of North Yarmouth prior to the start of construction. The MDEP Solar Decommissioning Application, which includes estimated costs of decommissioning, is included in **Attachment 17**.

Exterior Lighting and Signs

The Project will install a small informational placard near the entrance gate to list 24-hour emergency contact information. Trespassing and warning signs will be installed around the Project fence, and will not exceed 2 square feet in area. No advertising or other signage is proposed. No signs or placards will be illuminated and there will be no exterior lighting for the Project.

Visual Buffering and Landscaping

The Project has been designed to preserve existing vegetation as much as possible between proposed equipment and abutting properties. In addition, the Project will be planting coniferous trees for additional screening along the eastern and southern LOD boundaries to mitigate viewshed impact as shown on the site plan included in **Attachment 2**. The solar panels will be a maximum of 10-14 feet tall, this buffer will screen the Project from abutters. The Project will also re-seed any disturbed areas following construction with a native wildlife/conservation seed mix.

Floodplains

The Project does not propose to locate any infrastructure or equipment within areas that have a 1% or higher annual flood hazard, as seen in the FEMA 100-year Flood Map included in **Attachment 3**.

Fencing, Security, and Emergency Access

The Project proposes a minimum 7 foot-tall agricultural-style wooden post fence around the solar arrays, as required by the National Electric Code. The agricultural fence is used instead of chain link to better match the character of the local landscape, and the fence will be raised 6 inches off the ground to allow small wildlife to move freely through the property and site.

To prevent unauthorized access, the Project will include a locked entrance gate. The gate will be equipped with a KnoxBox for emergency personnel access. The access road will include a turnaround suitable for fire trucks and other emergency vehicles and will be constructed with materials adequate to support the weight class of these emergency vehicles. Initial consultation to review the proposed site plan with the North Yarmouth Fire Chief was conducted in May 2023, and while the Chief wanted to wait for the code enforcement officer to contact him and request a formal letter about the Project, there were not any initial concerns about the Project or its emergency access.

Solar generation facilities include redundant protective equipment and disconnect switches to prevent electrical faults. The Project team will conduct training for local fire departments, in order to demonstrate system shutdowns and fire safety at an electrical facility.

Traffic, Parking, and Roads

The Project proposes to utilize an existing road off Doughty Road on the northern end of the Property. Following construction during the operational stage of the Project, the traffic volume created by the Project will be very minimal. Routine inspection and maintenance visits are expected to be 2-4 times per year. Inspection and maintenance personnel will be able park vehicles in the turnaround along the access road within

the fence. No additional parking areas are proposed. For safety and security reasons, the site will be inaccessible to the public. The Project will be accessed via a 16-foot wide gravel access drive. The access drive will comply with the design and construction standards outlined in § 8.4 of the North Yarmouth Land Use Ordinance.

Water Supply

The Project will not require any water supply or subsurface wastewater disposal during operation. During construction, water may be used for dust control on the access road. Such water will be drawn from off-site sources and spread on-site by tanker trucks. Any wash water produced during construction will be released on concrete pads or gravel surfaces, or into appropriate containers. The construction team will work closely with the Yarmouth Water District to ensure that there are no unauthorized releases.

Sewage Disposal

Portable toilets serviced by a state-licensed service provider will be used on-site during Project construction. During operation, there will be no day-to-day on-site personnel, and no need for sewage disposal or a septic system.

Solid Waste

Solid waste generation will be limited to the construction phase of the Project. Waste will primarily derive from tree clearing, construction, and packaging materials associated with the shipment of equipment (solar panels, racking, conductors, inverters, and transformers). Solid waste generated during clearing and construction will be hauled and disposed of by a Category A, state-licensed transporter. After tree clearing, remaining stumps will either be left in place or ground on-site to make erosion control mulch. No hazardous waste or wastewater will be generated by the Project.

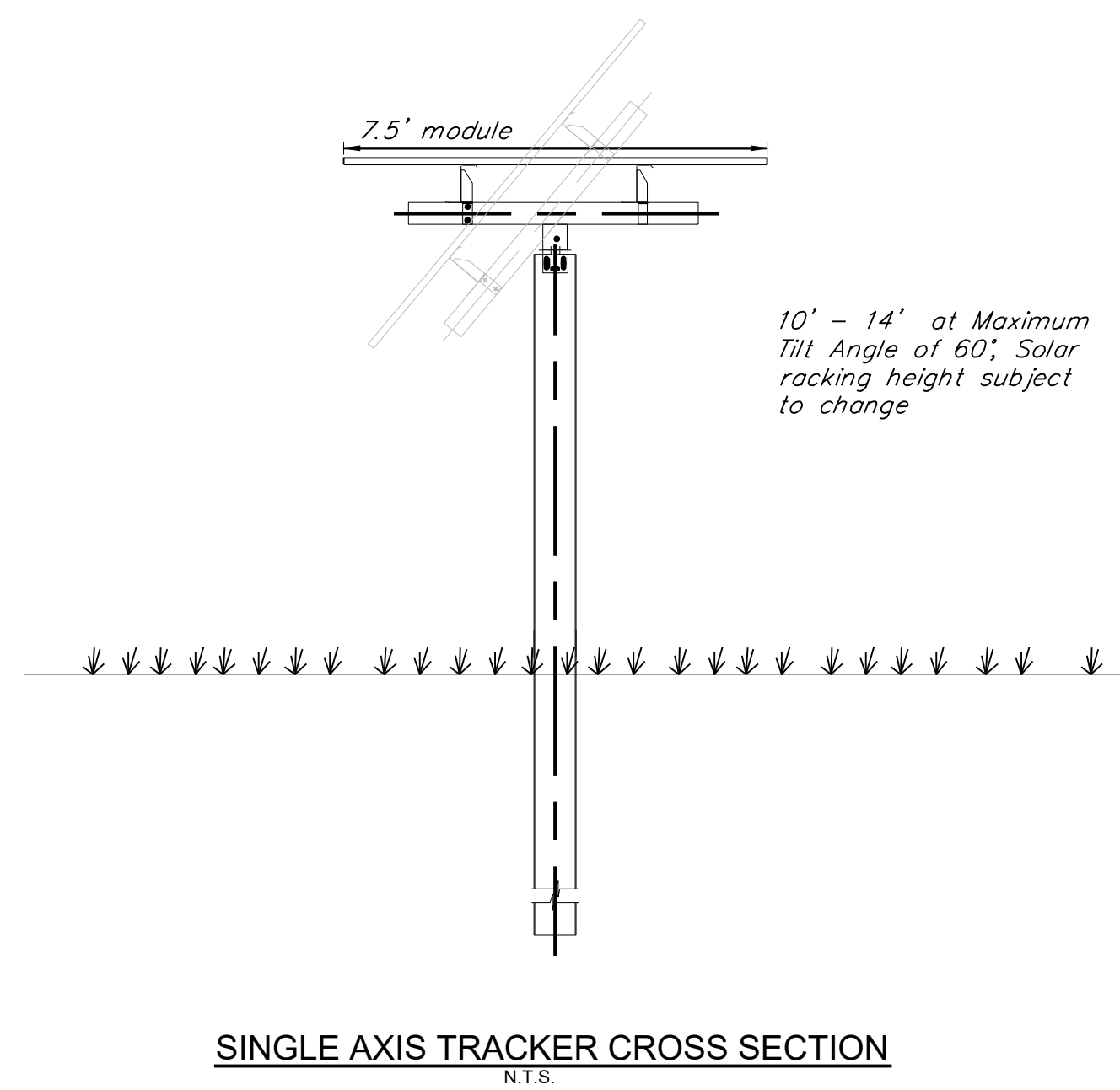
Waiver Request

The Project is not requesting any waivers.

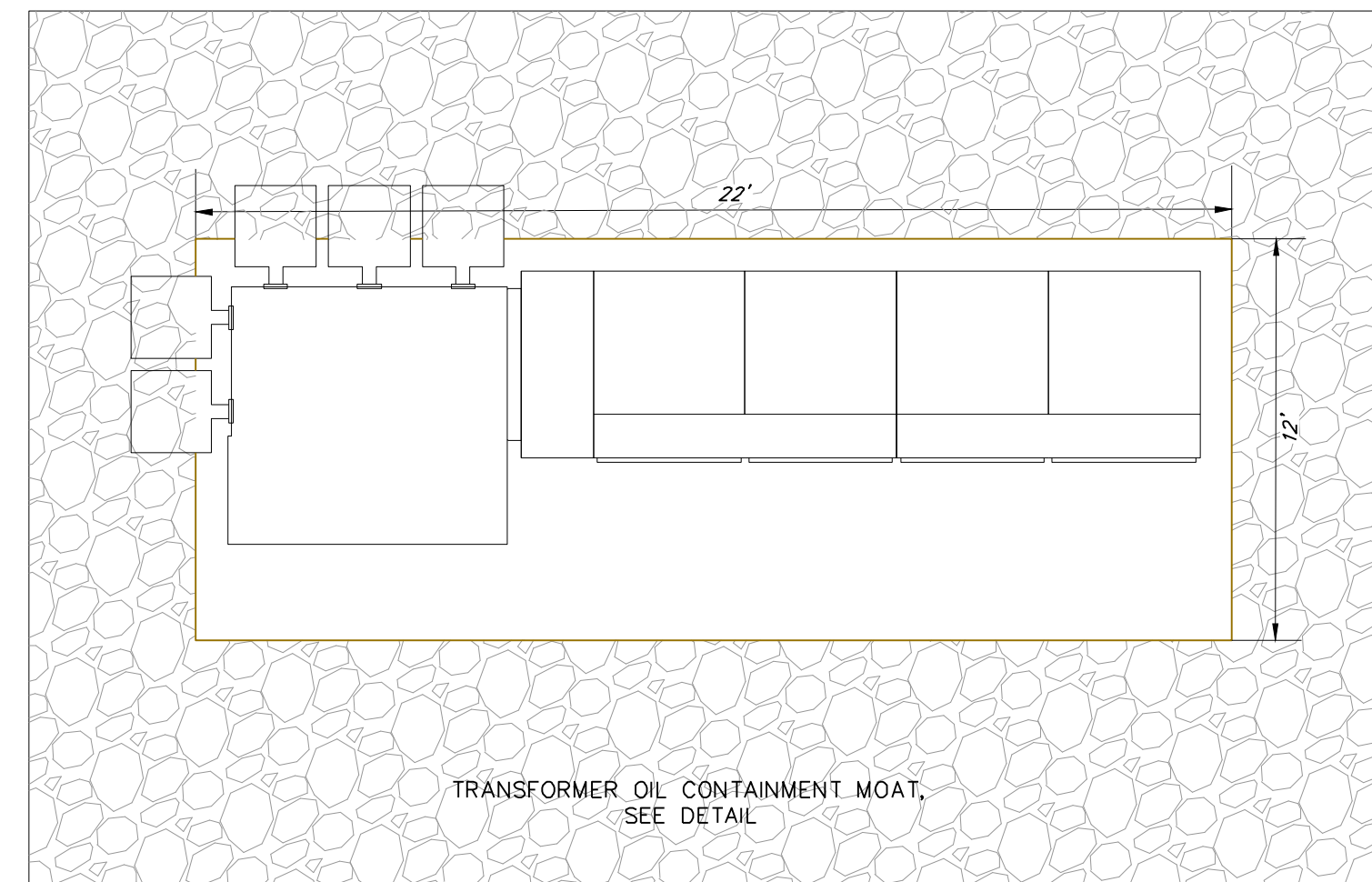


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Attachment 3: Project Maps
(Standard Details Sheet)



SINGLE AXIS TRACKER CROSS SECTION
N.T.S.



SCHEMATIC OF TRANSFORMER PAD WITH
SECONDARY OIL CONTAINMENT
N.T.S.

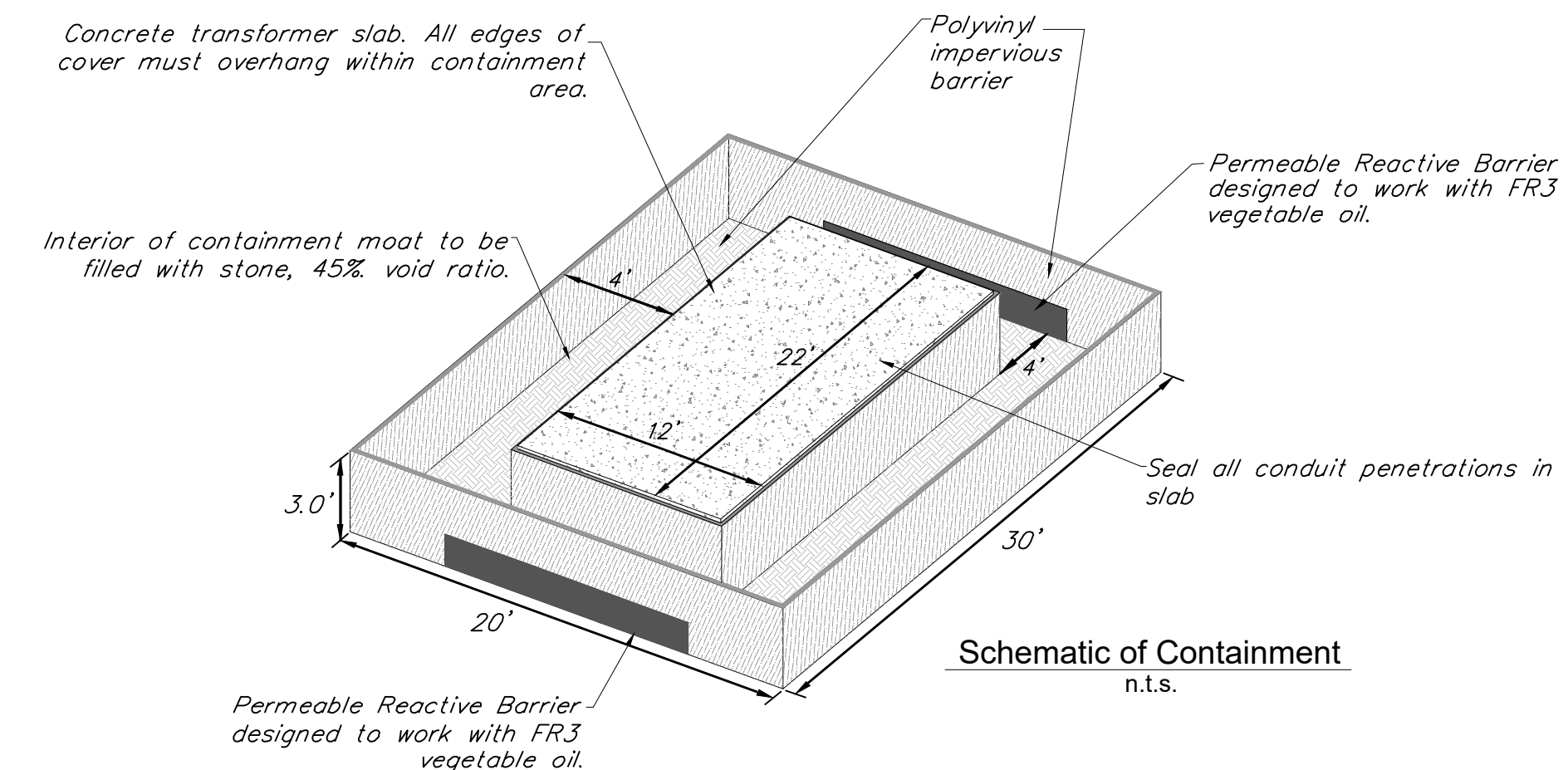
CONTRACTOR TO PROVIDE TWO PRE-CAST CONCRETE SLABS.
NOTE: POURED IN PLACE SLABS ARE ACCEPTABLE AS AN ALTERNATIVE

VOLUME CALCULATIONS:

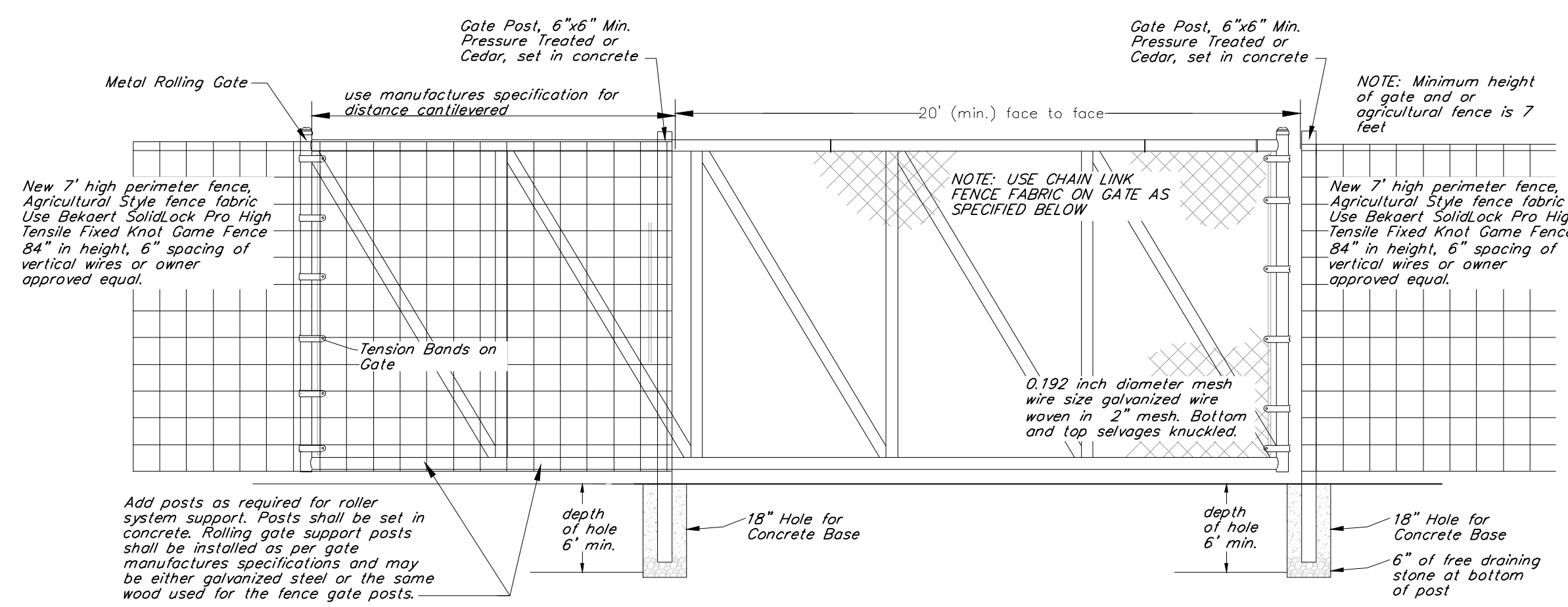
Required Capacity:
125% of the 550 Gallons of Transformer Oil = 687.5 gal. = 92.0 c.f.
Required minimum freeboard (24-hour Duration, 25 Year Storm) = 5.8" or 0.48'
Containment Area & Pad = 20' x 30' = 600.0 s.f.
Volume of freeboard required = 600.0 s.f. x 0.48 ft. = 288.0 c.f.
Total Capacity Required = 92.0 c.f. + 288.0 c.f. = 380.0 c.f.

NOTE: SEE SECONDARY OIL CONTAINMENT DETAIL AND SPCC PLAN, TRANSFORMER OIL IS PROPOSED TO BE FR3 VEGETABLE OIL.

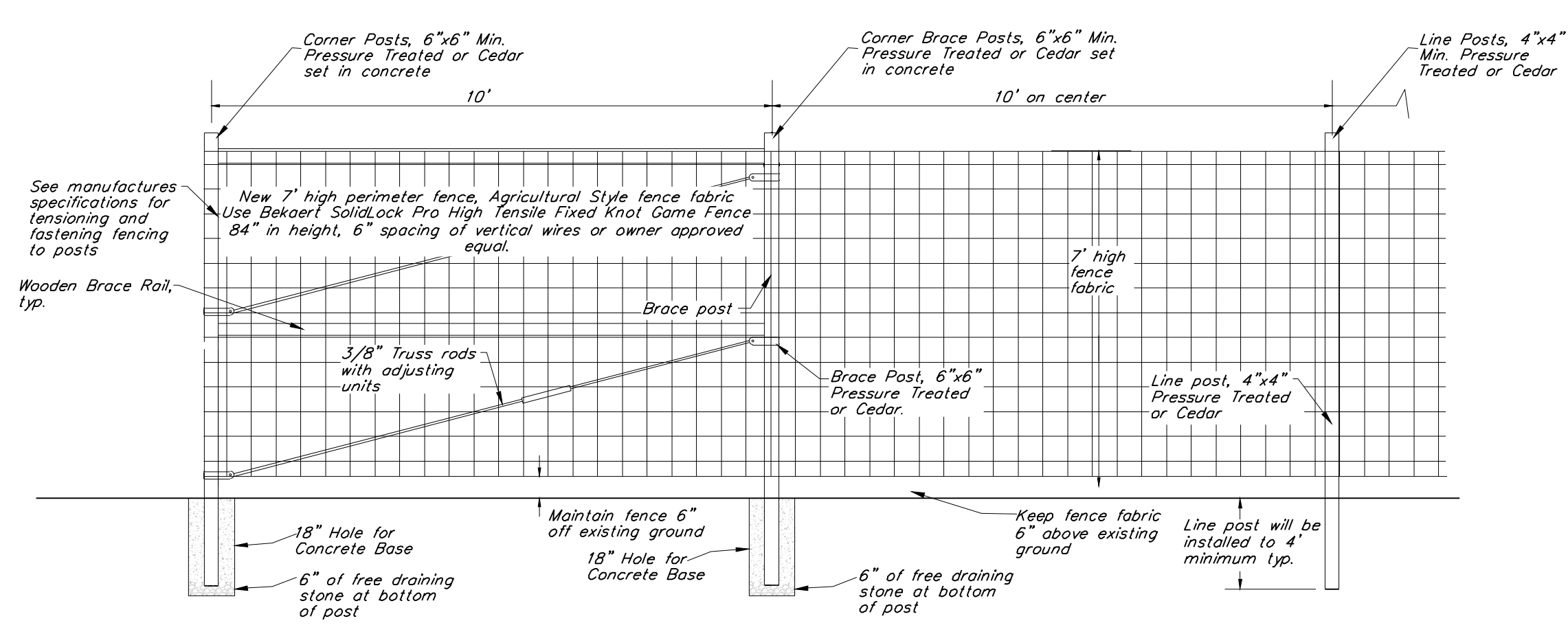
Capacity Provided in Secondary Oil Containment System:
Area of containment = (20'x30') - (12'x22') = 336.0 s.f.
Volume of Containment = 336.0 s.f. x 3.0' of depth = 1,008.0 c.f.
When filled with stone with 45% void ratio = 1,008.0 c.f. * 0.45 = 453.4 c.f.
Total Capacity Provided = 453.4 c.f. > 380.0 c.f. required



Schematic of Containment
n.t.s.



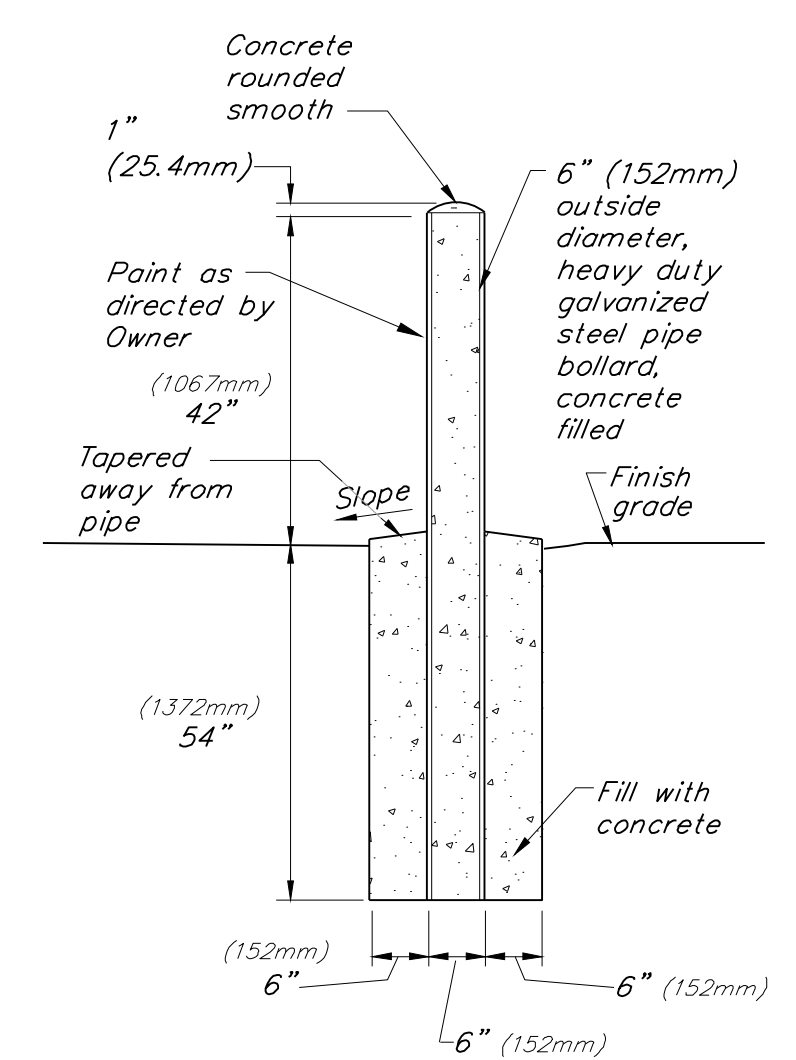
PERMANENT ROLLING GATE
N.T.S.



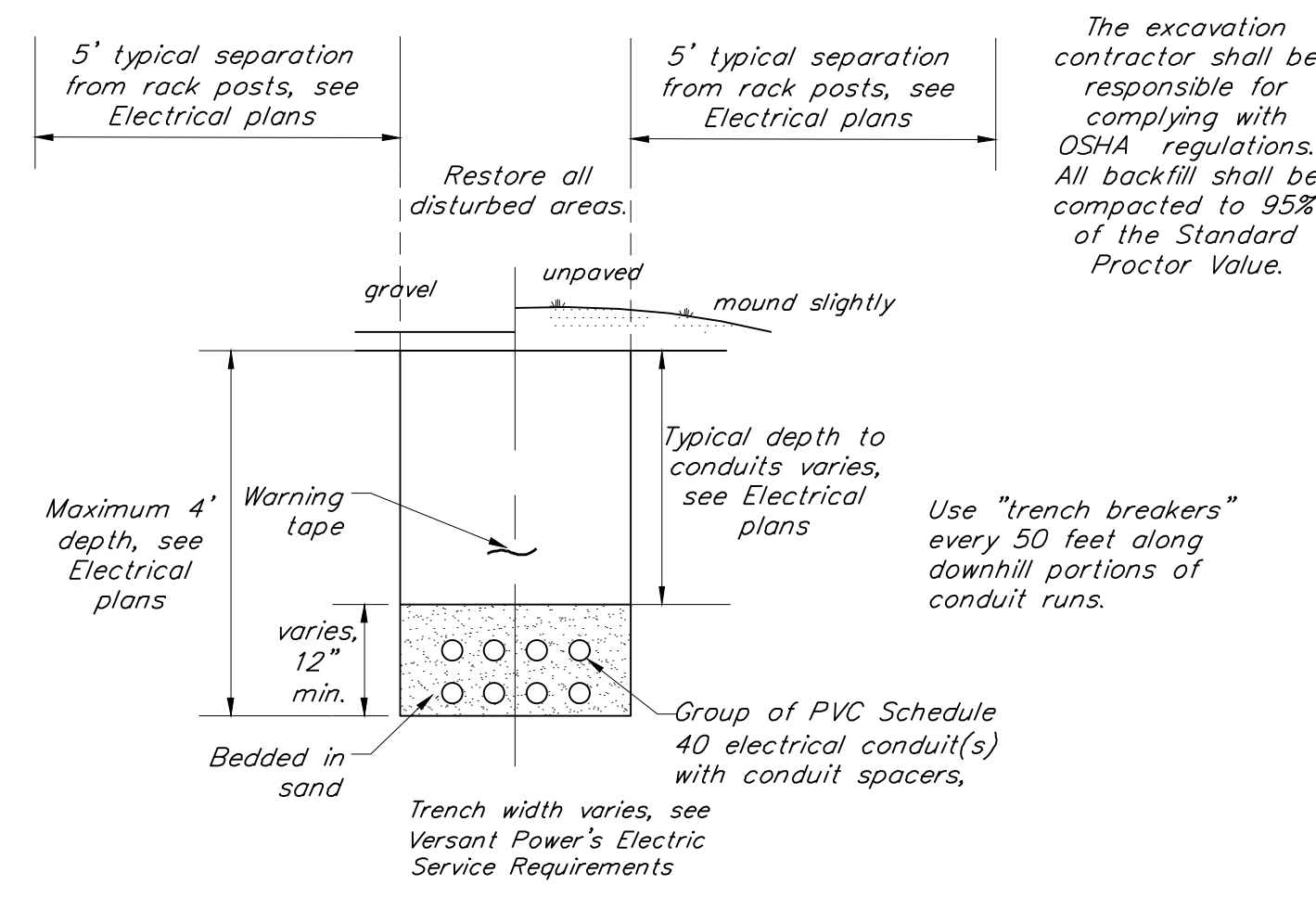
TYPICAL AGRICULTURAL FENCE
N.T.S.

CONSTRUCTION NOTES

- The methods and materials of construction shall be in conformance with all permits and approvals issued for the project. In case of conflict, the more stringent specification shall apply as directed by Engineer. All work shall be done in a workmanlike manner and completed in the time specified by Owner.
- The Contractor shall be responsible for all work and materials shown and required to make the job complete. These drawings do not show every fitting or appurtenance. Materials shall be as specified on the drawings. Manufacturer's product specifications shall be submitted for all materials to the Engineer for approval prior to installation.
- The location and size of existing underground utilities is not warranted to be exact or complete. The Contractor shall field locate all utilities and shall contact the affected utility company, the Engineer and the Town prior to making any hook ups. The Contractor shall be solely responsible for all existing utilities and their uninterrupted services. All off-site backfill, sheeting and shoring, dewatering, clearing and grubbing, erosion control, dust control, traffic control, grading, and all incidentals shall be included as part of the required work.
- The Contractor shall verify all temporary bench marks before use.
- The workmen and public shall be protected by the Contractor from any and all hazards connected with the construction work. Open trenches, materials, or equipment within the working limits are to be guarded by the use of adequate barricades or flagmen. All barricades left in position overnight are to be properly lighted. Kerosene pots are not acceptable. When work narrows the usable pavement, flagmen shall be employed to aid the flow of traffic so that there will be no undue delays. The Contractor shall be held responsible for the safety of all workmen and the general public and all damages to property occurring from or upon the work occasioned by negligence or otherwise growing out of a failure on the part of the Contractor to protect persons or property from hazards of open trenches, materials, or equipment at any time of the day or night within the working area. All work shall be in conformance to OSHA regulations, Title 19, Parts 1926.651 and 1926.652.
- The Contractor shall verify all utility intersections and contact Engineer and Owner with conflicts.
- The Contractor shall call, Dig Safe or other approved equal underground utility identifier prior to any excavation.
- The Contractor shall coordinate with final electrical, structural and landscaping plans.



PIPE BOLLARD DETAIL
N.T.S.



TYPICAL CONDUIT TRENCH
N.T.S.

CONDUIT TRENCHING NOTES

- The methods and materials of construction shall conform to the latest standards of Versant Power's Handbook of Requirements and the State of Maine. All work shall be in conformance with all permits and approvals issued for the project. In case of conflict, the more stringent specification shall apply as directed by the Owners Representative.
- The excavation contractor shall dig the conduit trenching and assist the Electrician in placing the conduit. The conduits shall be placed with conduit spacers when more than two conduits are placed in a trench. All conduit and spacers shall be provided by the Electrical Contractor.
- The excavation contractor shall allow sufficient time for the conduit to be inspected prior to backfilling. If any conduit is backfilled without inspection it will be the excavation contractor's responsibility to uncover the conduit for inspection and backfill the trench without charge.
- The workers and public shall be protected by the excavation contractor from any and all hazards connected with the construction work. Open trenches, materials, or equipment within the working limits are to be guarded by the use of adequate barricades or flaggers. All barricades left in position overnight are to be properly lighted. When work narrows the usable pavement, flaggers shall be employed to aid the flow of traffic so that there will be no undue delays. All work shall be in conformance to OSHA regulations, Title 19, Parts 1926.651 and 1926.652.
- The excavation contractor is responsible for compacting all trench backfill to 95% of the Standard Proctor Value.
- The excavation contractor is responsible for all conduit excavation and backfill necessary to complete the project.

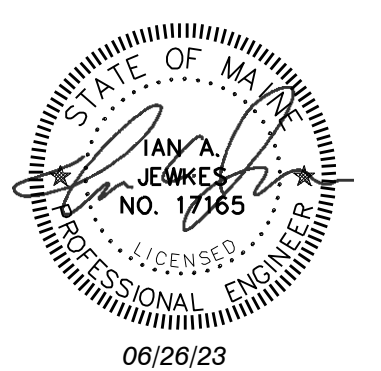
Boundary Line Solar, LLC.

North Yarmouth, Maine
BRANCH RENEWABLE ENERGY
0 Doughty Road, North Yarmouth, Maine 04097

KREBS & LANSING CONSULTING ENGINEERS
164 Main Street, Suite 201 Colchester, Vermont 05446 P: (802) 878-0375 www.krebsandlansing.com

CIVIL DESIGN SET FOR PERMIT REVIEW

MAPPING SOURCE DATA USED FOR PLAN COMPILATION
Civil Engineering:
Krebs and Lansing Consulting Engineers, Inc.
164 Main Street, Suite 201 Colchester, Vermont 05446
Environmental:
BRI Environmental
30 Danforth Street, Suite 213 Portland, ME 04101



REV. NO.	REVISIONS/COMMENTS	DATE
1	Fence detail revised	07/14/23

BOUNDARY LINE SOLAR, LLC STANDARD DETAILS

DATE of Issue: 06/26/2023
Drawn by: EJM Checked by:
Project No.: 23178 Scale: N/A
Drawing No.: Rev No.:



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Attachment 9: Wetlands

Attachment 9: Wetlands

There are two jurisdictional wetlands that lie within the proposed LOD: W-KV-04, and W-KV-05. The larger Property contains three other jurisdictional wetlands, but these wetlands are outside the LOD of the Project (W-KV-01, 02, and 03). A Wetland Impact Map labeling each wetland found on the Property is included in **Attachment 3**. According to definitions in § 10.3 of the *Town of North Yarmouth Land Use Ordinance*, four of the five wetlands on site are classified as low-value wetlands (W-KV-01, 02, 03, 04), one only wetland (W-KV-05), is classified as a high-value wetland.

Wetlands W-KV-01, 02, 03, and 04 are considered “low-value” because they do not meet the parameters for a high-value wetland in Section 10.3 of the *Town of North Yarmouth Land Use Ordinance*. These low-value wetlands do not contain more than 50% of the dominant species in all strata which consist of facultative wetland or obligate wetland plant species, as listed in the National List of Plant Species that Occur in Wetlands, by the U.S. Fish and Wildlife Service. Dominant overstory vegetation in low value wetlands include facultative upland species such as white pine (*Pinus strobus*), pitch pine (*Pinus rigida*), and red oak (*Quercus rubra*), along with the facultative species, red maple (*Acer rubrum*). Additionally, W-KV-04 contains facultative upland invasive shrub species such as multi-flora rose (*Rosa multiflora*) and bush honey suckle (*Lonicera* Spp). Wetland W-KV-05 does qualify as a high-value because 50% of the dominant species in all strata consist of facultative wetland or obligate wetland plant species.

Impacts

The Project has been designed to avoid wetland impacts to the greatest extent practicable. The Project avoids impacts to four of the five wetlands on site, and is proposing only 1,328 square feet of permanent wetland fill in one, single wetland, W-KV-04. Wetland W-KV-05 is within the LOD, however the project is not proposing any impacts or alteration to this wetland.

The isolated nature of W-KV-04, as well as the historical land-use of the site as a former sand and gravel pit reduces the overall function that this wetland provides to the surrounding land. Generally, this wetland provides some localized water quality functions, but as the wetland is very small and isolated within the historic sand and gravel pit the potential for this wetland to provide improvement to overall water quality is low.

The applicant is proposing to use the existing material on site to re-grade the eastern slope of the gravel pit to a more gradual slope in order to accommodate solar racking, and will require filling the wetland. This will allow the Project to take advantage of land that was disturbed during the operation of the gravel pit. Additionally, the use of this space allows the Project LOD to be sited farther away from the eastern property boundary, avoiding impacts to three wetlands along that boundary.

As this proposed impact is less than 4,300 square feet, it is exempt from MDEP Natural Resource Protection Act permitting under 38 M.R.S. §480(Q)-17. However, the project does require a permit from the U.S. Army Corps of Engineers (USACE) for proposing permanent wetland fill. A copy of the Self-Verification Notification Application submitted on 6/2/23 to the USACE for review is included as **Attachment 18**.

The Project team has received written feedback from the North Yarmouth town manager, Diane Barnes, and the town attorney, Natalie Burns, regarding the planning board’s jurisdiction to regulate wetland fill. In an email from Natalie Burns to Diane Barnes on July 18, 2023, Attorney Burns states that:

“The Army Corps of Engineers [ACE] is reviewing the fill permit and the proposed fill does not meet the jurisdictional requirements for a NRPA permit. The Town’s Ordinance does not establish any standards for filling of wetlands and so the Town does not have jurisdiction over

this issue. If the ACE grants its approval, there will no longer be a wetland that triggers setbacks or other requirements of Section 10.3. The Town cannot prohibit the issuance of a permit that meets the requirements of ACE, or DEP when applicable. If ACE has not granted its approval when the Planning Board next takes up this issue, the Board may condition any approval upon the issuance of the ACE permit.”

Based on this opinion from the town’s attorney, the Project is not seeking a waiver to fill wetland W-KV-04 because it has applied for a SVN permit from the USACE. The Project requests that any approvals issued by the Planning Board would be contingent upon the USACE approving the pending SVN permit application.

The Project proposes solar racking structures near the high-value wetland W-KV-05. § 10.3.B.1 indicates **“Vegetative buffers shall be located between all disturbed areas of a development and streams, ponds, vernal pools and high value wetlands.”** However, § 10.3.E.2 outlines exemptions to buffering standards for high-value wetlands by stating that, **“Road crossings, bridges, culverts, and the installation of utilities needed to access property on the other side of wetlands and bodies of water;”**. There is an existing access road that the Project is proposing to improve upon and use for access to the site to the north of the high value wetland. In addition, the overhead utility poles, and underground wiring underneath the solar panels which are proposed near the high-value wetland (W-KV-05) are required for the site to operate and meet the exemption criteria listed in § 10.3.E.2. The overhead utility poles and underground wiring in and around the solar panel racking are “utilities” that are needed to operate the property. Therefore, the requirement of any buffering or setback standards related to this high-value wetland is not applicable and does not require a request for a waiver to construct equipment any distance from this high-value wetland.

Buffering

The purpose of § 10.3 is to “protect water quality, aquatic life, and wildlife habitat in and adjacent to... wetlands... and to protect private and public property from flooding and poor drainage conditions caused by locating buildings in or close to these areas.” To do this, the Ordinance requires vegetative buffers of various widths, depending on the wetland classification and slope, between wetlands and areas of development.

Solar arrays are considered low impact development. While the Project is proposing clearing within the buffer of two wetlands, W-KV-02 and W-KV-05, the Project will revegetate the area with a conservation seed mix, and new trees are proposed to be planted within 25 feet of W-KV-02. This will create meadow conditions within the LOD and provide the necessary buffering as required in § 10.3.C.6; additionally, the organic and duff layer of the underlying soil in this tree planting area shall not be removed. Meadow conditions across the Project LOD will treat stormwater, so there is no threat to public or private property from “poor drainage.” A Stormwater Management Report prepared by BH2M concluded that the Project will not result in an increase of overland stormwater runoff beyond the parcel boundaries. The full report can be found in **Attachment 16**, and a more detailed summary of the results is included in the Stormwater Management and Erosion Control section of the General Description.

Clearing portions of the buffer near these wetlands will not significantly diminish their functions and values. The wetlands themselves will not be impacted, and will still maintain water quality functions and provide wildlife habitat. Additionally, the meadow conditions within the LOD may provide some species diversity, attracting animals to the area that prefer edge habitats.

Waiver Request

The Project is not requesting any waivers related to wetland impact or buffering standards.



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Attachment 15: Noise

Attachment 15: Noise

Project noise levels are not expected to have any adverse effect on neighboring properties. This includes sound generated from construction activities, routine operation, and routine maintenance.

Construction

Typical heavy equipment will be used during construction, including hydraulic foundation drivers to install solar racking posts. Noise from construction activities between 7:00 a.m. and 7:00 p.m. will comply with the hourly sound level limits prescribed by MDEP for protected locations in 06-096 CMR 375 (“No Adverse Environmental Effect Standards of the Site Location of Development Act”). These limits are listed in Table 1.

All construction activity outside of these hours will strictly adhere to the sound level limits prescribed for “regular or frequent” noise in § 10.16 of the *Town of North Yarmouth Land Use Ordinance*. No construction activities will occur between the hours of 7:00 p.m. and 6:00 a.m.

Table 1. Noise Limits at Protected Locations During Construction Activities

Duration of Activity	Hourly Sound Level Limit
12 hours	87 dBA
8 hours	90 dBA
6 hours	92 dBA
4 hours	95 dBA
3 hours	97 dBA
2 hours	100 dBA
1 hour or less	105 dBA

Operation

During normal Project operation, some noise will be generated by the proposed transformer or inverters. The transformer operates 24/7, but the inverters only operate during the daytime. Additionally, the Project proposes to install single-axis tracker solar arrays, which include motors that produce low sound levels. The motors will run for 30 seconds approximately every 15 minutes during the day to adjust the position of the solar panels. Table 2 lists the sound pressure emitted from each piece of sound emitting equipment measured at 3 feet.

Table 2: Equipment Sound Pressure Level Assumptions

Equipment	dBA	Measured Distance (feet)
Single Axis Tracker Motor	54	3
Inverter	69	3
Transformer	58	3

The Project engineering team has provided an updated, more detailed chart summarizing the maximum sound pressure values at each property line in Table 3. The Project’s western, eastern, and southern property lines

Boundary Line Solar Project



abut residential use properties, whereas the northern property line of the Project abuts a commercial use property due to the Central Maine Power transmission lines to the north. Depending on the use of the abutting property lines, the Land Use Ordinance specifies different maximum sound pressure values that the Project must comply with which have been inserted for reference in Table 3.

All sound pressure levels from Project equipment at all property lines are below all daytime and nighttime sound pressure limits listed in § 10.16 of the *Town of North Yarmouth Land Use Ordinance*.

Table 3: Maximum Sound Pressure Chart Measured at Abutting Property Lines (dBA)

		6am - 10pm			
Abutting Property Boundary to Solar Project	Abutting Property "Use" Classification	Maximum Allowed Sound Pressure (dBA) per LUO	All Equipment Operating Simultaneously	Transformer & Inverters	All Single Axis Tracker Motors Operating Simultaneously
North	Commercial	65	42	41	35
East	Residential	55	39	37	35
South	Residential	55	35	34	26
West	Residential	55	38	37	28

		10pm - 6am			
Abutting Property Boundary to Solar Project	Abutting Property "Use" Classification	Maximum Allowed Sound Pressure (dBA) per LUO	Transformer	Inverters (No Operation at Night)	All Single Axis Tracker Motors (No Operation at Night)
North	Commercial	55	29	0	0
East	Residential	45	25	0	0
South	Residential	45	23	0	0
West	Residential	45	26	0	0



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Attachment 11: Spill Prevention, Control, Countermeasures Plan

Spill Prevention, Control, and Countermeasures Plan

Boundary Line Solar Project North Yarmouth, Maine

Submitted on behalf of:



Prepared by:



Krebs & Lansing Consulting Engineers, INC.
164 Main Street
Colchester, Vermont 05446
(802) 878-0375

June 20th, 2023

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6.0 – Reporting	Page 3

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Appendix B – Transformer Secondary Oil Containment Plan

Appendix C – Transformer Secondary Oil Containment Capacity Calculations

Appendix D – U.S. EPA Tier I Qualified Facility SPCC Plan

Appendix E – Oil Spill Contingency Plan

Appendix F – Transformer Specifications

Appendix G – Material Safety Data Sheet for Envirotemp FR3 Fluid

Section 1.0 – Introduction

The proposed 0.99 MW AC Solar Array will be located at 0 Doughty Road in North Yarmouth, Maine and will be owned and operated by Branch Renewable Energy. This facility will have one oil filled transformer located in the central area of the proposed solar array adjacent to the access roads. Each of these transformers contain approximately 550 gallons of FR3 dielectric fluid derived from vegetable oil. The transformers make the site a "Tier I qualified facility". Therefore, secondary transformer oil containment will be provided for all the transformer.

Section 2.0 – Purpose

This plan will prescribe the minimum requirements to be met in order to create a self-certifying Spill Prevention, Control, and Countermeasures (SPCC) Plan. A copy of this plan shall be kept on site at the project substation, and will be kept available for review by Project Owner or their representative.

Section 3.0 – Regulatory Authority

The U.S. Environmental Protection Agency has issued the Spill Prevention, Control, and Countermeasures Rule (SPCC), last revised November 10, 2010 and codified under 40 C.F.R. Part 112. This plan will describe the manner in which this facility will comply with the requirements prescribed under 40 C.F.R. § 112.7 and the attached EPA document entitled "U.S. Environmental Protection Agency Tier I Qualified Facility SPCC Plan Template".

Section 4.0 – Responsible Parties

The Owner of the facility, their heirs and assigns, is ultimately responsible for the correct formulation and implementation of the SPCC. The firm contracted to complete the Operations and Maintenance (O&M) for the facility will assume this responsibility for the Owner. Only firms qualified to complete the environmental work, qualified to perform the limited work within the transformer, and properly insured will be contracted to this work. The firm contracted to complete the operations and maintenance work will be responsible for any and all reporting required by the current EPA SPCC Rule, any and all updates of that rule, any and all State of Maine land use and environmental permit reporting requirements. The plan must be periodically reviewed, at least once every five years. The plan must also be updated if any changes are made to the facility. Prior to operations, the O&M firm shall be responsible for providing a quantity of spill control materials such as sorbents, tools and any other necessary materials to be kept on site in the vicinity of the project transformers in a secure central location to deal with small spills from maintenance vehicles and project equipment. All project transformers have a secondary oil containment area designed to sufficiently capture and contain all the oil present within each transformer. At a minimum, the following materials will be available on site:

- A 32-gallon barrel marked "Spill Kit"

and clean-up of a spill shall be inventoried to determine a sufficient quantity is on-site and checked for expiration each quarter.

- Bi-Annually

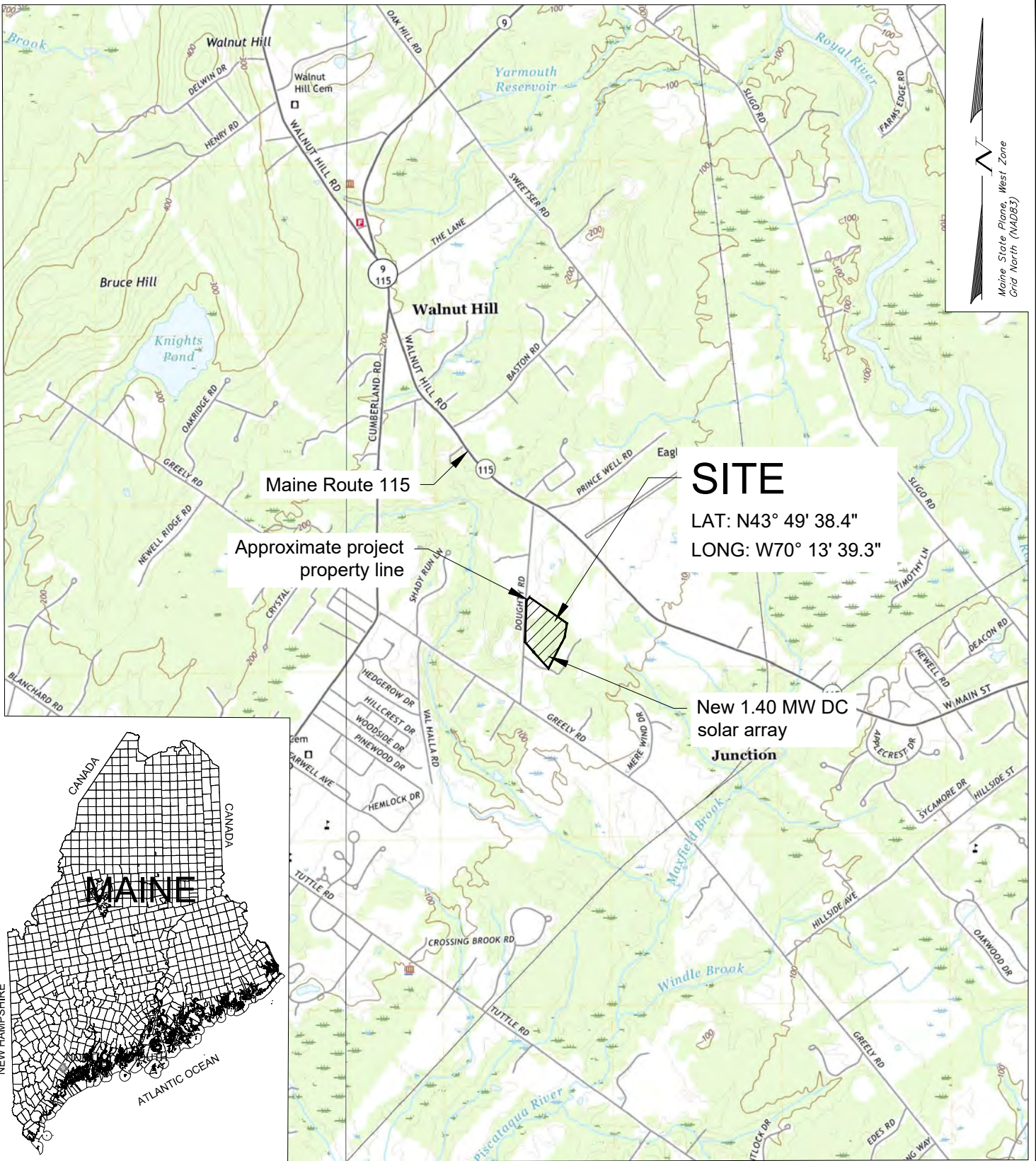
Same as quarterly inspection plus a more detailed examination of the transformer. The exterior of the transformer will be carefully inspected for signs of corrosion, deterioration, or physical damage. This inspection will include opening the transformer cabinet. The interior of the cabinet area will be examined for corrosion. The oil level sight glass inside the transformer will be examined and the oil level recorded. The oil level will be compared to earlier measurements. Sampling port and pressure relief valve will be examined for damage or any signs of oil leakage/discharge. No inspection of the permeable reactive barrier membrane is required for systems with a permeable reactive barrier window in the containment membrane. If the system has been fitted with any Petro Plug type permeable reactive barrier control a detailed examination of the Petro-Pipe reactive plug outlet shall be completed. Plug should be functioning properly. Debris shall be cleaned from around the filter cage. Plug should be replaced if not functioning properly, i.e. water is dammed in secondary containment basin or plug is physically damaged. The O&M Firm will also review the Tier I Spill Prevention, Control, and Countermeasures Plan and the associated Oil Spill Contingency Plan documents and determine if any updates are needed. Any updates will be completed prior to the next quarterly inspection.

Section 6.0 – Reporting Requirements

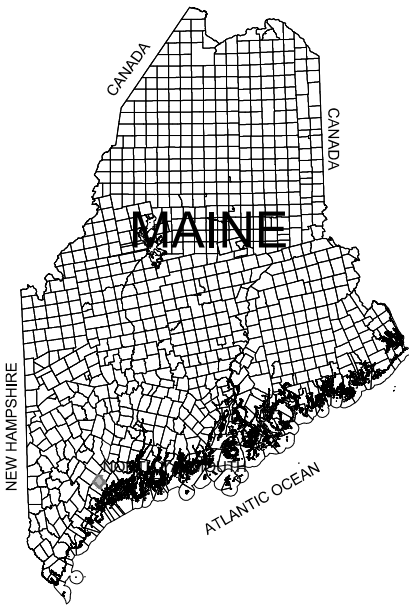
The Operations and Maintenance Firm (O&M Firm) will report any deficiencies to the Owner. If repairs are needed, the Operations and Maintenance Firm (O&M Firm) will return to the site after the repairs and complete the "Bi-Annual" inspection procedure. If the transformer oil is discharged for any reason this event will be reported to the EPA. This reporting will be in strict conformance with the requirements defined in the attached U.S. Environmental Protection Agency Tier I Qualified Facility SPCC Plan Template. Additionally, the Maine DEP has stringent oil spill reporting requirements. All spills must be reported to the Maine DEP within two hours of discovery. To report an oil spill, call the Maine DEP's 24-hour emergency spill hotline at (800) 482-0777.

Appendix A

Location Map



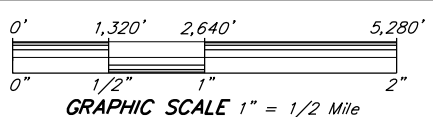
Maine State Plane, West Zone
Grid North (NAD83)



164 Main Street, Suite 201
Colchester, Vermont 05446
P: (802) 878-0375
www.krebsandlansing.com

LOCATION MAP

BOUNDARY LINE SOLAR
North Yarmouth, Maine



Drawn by: EJM
Date: June 20, 2023
Project #: 23178
Scale: 1" = 1/2 Mile

Appendix B

Transformer Secondary Oil Containment Plan

BOUNDARY LINE SOLAR

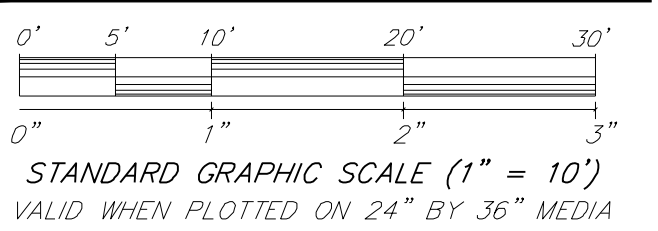
0 Doughty Road, North Yarmouth, Maine 04097



ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION

SOURCE DATA LEGEND

MAPPING SOURCE DATA USED FOR PLAN COMPILATION
Civil Engineering:
Krebs and Lansing Consulting Engineers, Inc.
164 Main Street, Suite 201
Colchester, Vermont 05446



Secondary Transformer Oil Containment Plan

REV. NO.	REVISIONS/COMMENTS	DATE

Drawing Title:

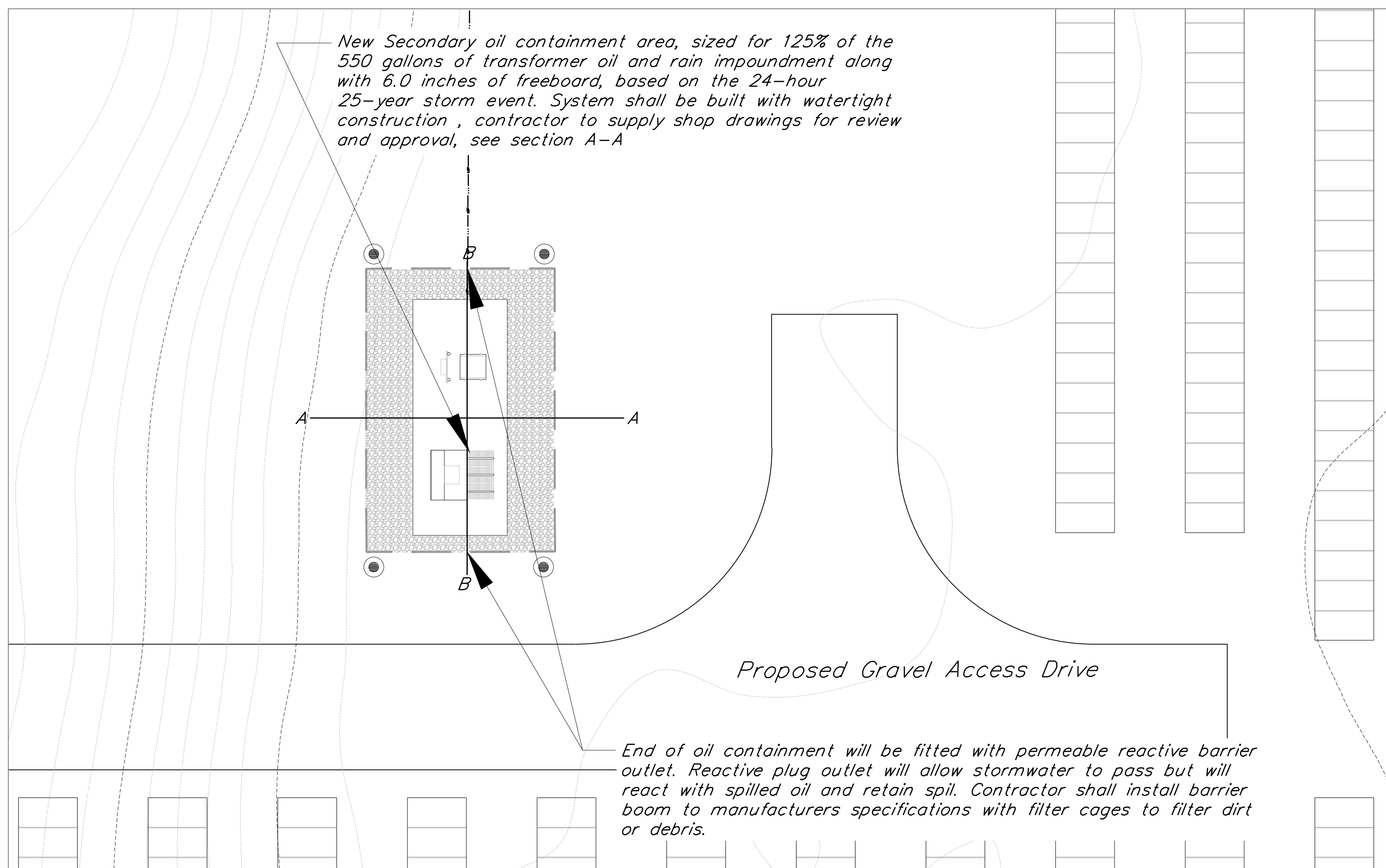
BOUNDARY LINE SOLAR SECONDARY TRANSFORMER OIL CONTAINMENT

DATE of Issue: 06/20/2023
Drawn by: NEH Checked by: EJM
Project No.: 21388 Scale: N/A
Drawing No.: Rev No.:

C-1.00

Note:

The O&M firm will review the installation for safety and code compliance (by the appropriate qualified licensed mechanical and electrical professional), accurate and up to date reporting information and updates required. please note that the Krebs and Lansing Consulting Engineers Inc. work pertains to the stormwater controls only. the safety and code compliance portion of the design and review shall be completed by the appropriate licensed mechanical and electrical professionals (engineers) hired by the O&M firm prior to construction of the project. Any appropriate code or safety modifications dictated by that review shall be incorporated into O&M protocols for the site prior to construction commencing.



Plan View of Typical Transformer Area

SCALE: 1" = 10'

VOLUME CALCULATIONS:

Required Capacity:

125% of the 550 Gallons of Transformer Oil = 687.5 gal. = 92.0 c.f.

Required minimum freeboard (24-hour Duration, 25 Year Storm) = 6.0" or 0.50'

Containment Area & Pad = 20' x 30' = 600 s.f.

Volume of freeboard required = 600 s.f. x 0.50 ft. = 300.0 c.f.

Total Capacity Required = 92.0 c.f. + 300.0 c.f. = 392.0 c.f.

Capacity Provided in Secondary Oil Containment System:

Area of containment = (20'x30') - (12'x22') = 336.0 s.f.

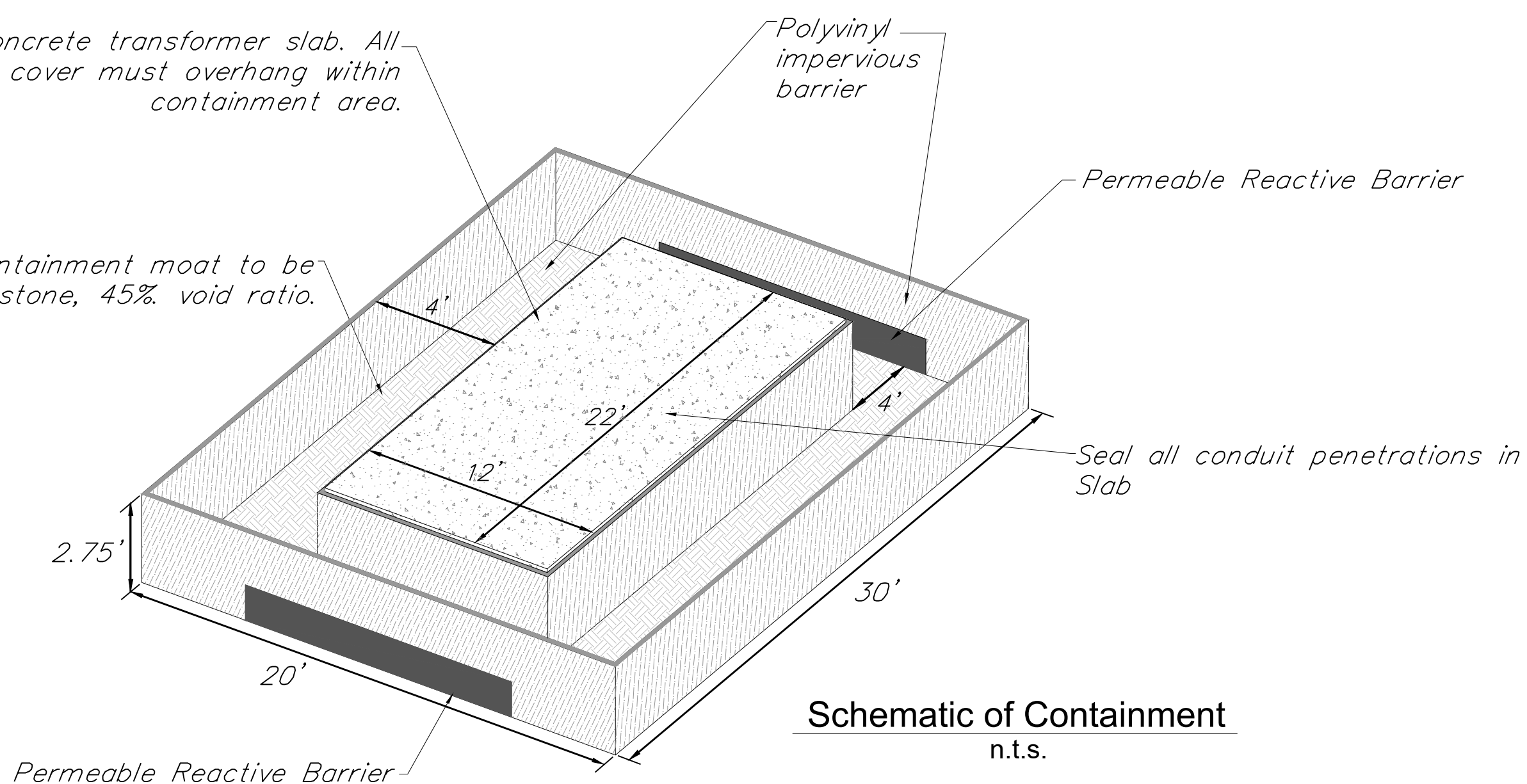
Volume of Containment = 336.0 s.f. x 2.75' of depth = 924.0 c.f.

When filled with stone with 45% void ratio = 924.0 c.f. * 0.45 = 415.8 c.f.

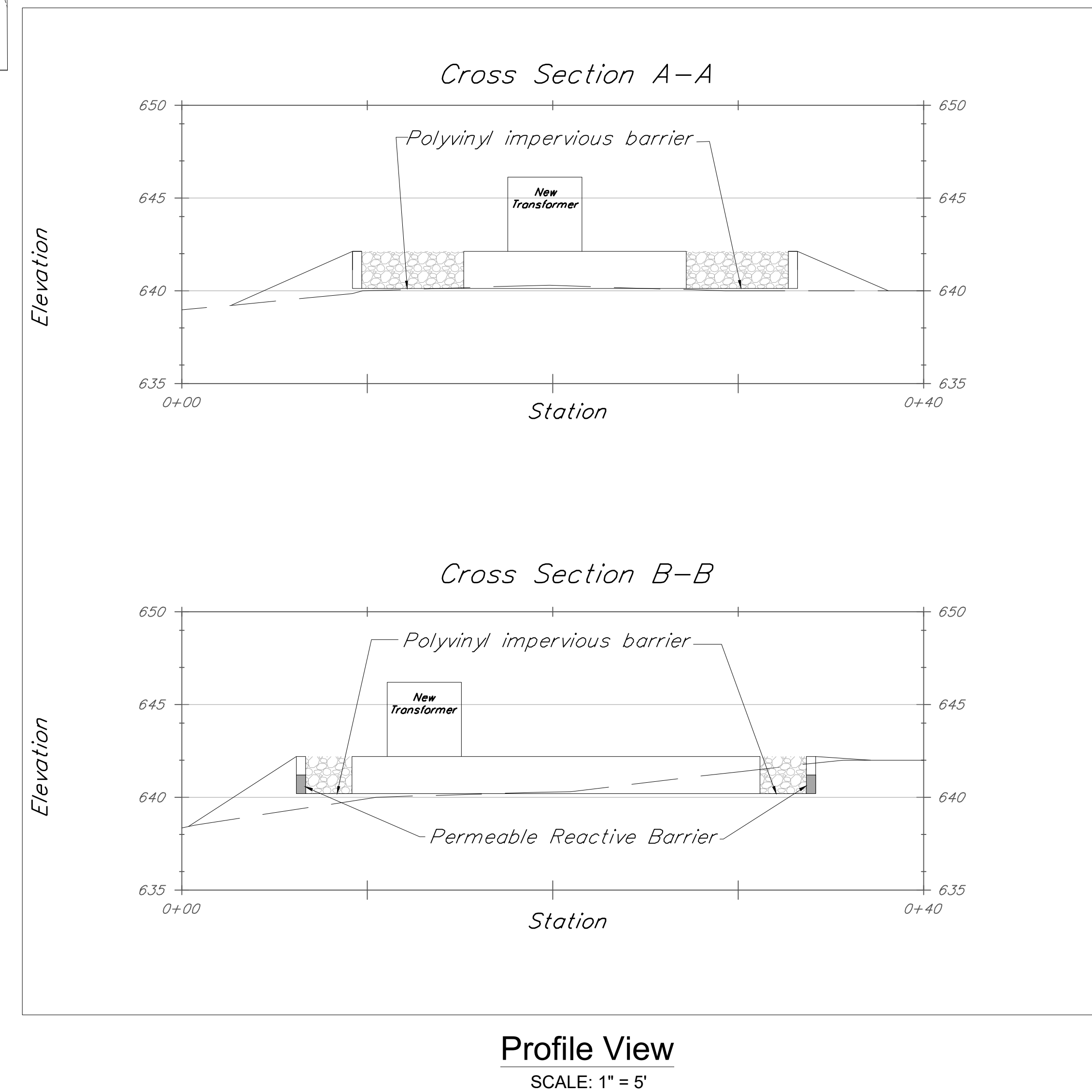
Total Capacity Provided = 415.8 c.f. > 392.0 c.f. required

12' x 22' concrete transformer slab. All edges of cover must overhang within containment area.

Interior of containment moat to be filled with stone, 45% void ratio.



Typical Transformer Site Area



Appendix C

Transformer Secondary Oil Containment Capacity Calculations

Boundary Line Solar
North Yarmouth, Maine

Required Capacity:

125% of the 550 Gallons of Transformer Oil = 687.5 gal. = 92.0 c.f.

Required minimum freeboard (24-hour Duration, 25 Year Storm) = 6.0" or 0.50'

Containment Area & Pad = 20' x 30' = 600 s.f.

Volume of freeboard required = 600 s.f. x 0.50 ft. = 300.0 c.f.

Total Capacity Required = 92.0 c.f. + 300.0 c.f. = **392.0 c.f.**

Capacity Provided in Secondary Oil Containment System:

Area of containment = (20'x30') - (12'x22') = 336.0 s.f.

Volume of Containment = 336.0 s.f. x 2.75' of depth = 924.0 c.f.

When filled with stone with 45% void ratio = 924.0 c.f. * 0.45 = 415.8 c.f. Total

Capacity Provided = **415.8 c.f. > 392.0 c.f. required**

Appendix D

U.S. EPA Tier I Qualified Facility
SPCC Plan



U.S. ENVIRONMENTAL PROTECTION AGENCY TIER I QUALIFIED FACILITY SPCC PLAN TEMPLATE

Instructions to Complete this Template

This template is intended to help the owner or operator of a Tier I qualified facility develop a self-certified Spill Prevention, Control, and Countermeasure (SPCC) Plan. To use this template, your facility must meet all of the applicability criteria of a Tier I qualified facility listed under §112.3(g)(1) of the SPCC rule. This template provides every SPCC rule requirement necessary for a Tier I qualified facility, which you must address and implement.

You may use this template to comply with the SPCC regulation or use it as a model and modify it as necessary to meet your facility-specific needs. If you modify the template, your Plan must include a section cross-referencing the location of each applicable requirement of the SPCC rule and you must ensure that your Plan is an equivalent Plan that meets all applicable rule requirements of 40 CFR 112.6(a)(3).

You may complete this template either electronically or by hand on a printed copy. This document is a reformatted version of the template found in Appendix G of 40 CFR part 112.^a No substantive changes have been made. Please note that a "Not Applicable" ("N/A") column has been added to both Table G-10 (General Rule Requirements for Onshore Facilities) and Table G-11 (General Rule Requirements for Onshore Oil Production Facilities). The "N/A" column should help you complete your self-certification when a required rule element does not apply to your facility. Use of the "N/A" column is optional and is not required by rule.

All Tier I qualified facility self-certifiers must complete Sections I, II, and III. Additionally, the owner or operator of an:

- Onshore facility (excluding production) must complete Section A.
- Onshore oil production facility (excluding drilling and workover facilities) must complete Section B.
- Onshore oil drilling and workover facility must complete Section C.

Complete and include with your Plan the appropriate attachments. You should consider printing copies of the attachments for use in implementing the SPCC Plan (e.g. Attachment 3.1 - Inspection Log & Schedule; Attachment 4 - Discharge Notification Form).

To complete the template, check the box next to the requirement to indicate that it has been adequately addressed. Either write "N/A" in the column or check the box under the "N/A" column to indicate those requirements that are not applicable to the facility. Where a section requires a description or listing, write in the spaces provided (or attach additional descriptions if more space is needed).

Below is a key for the colors used in the section headers:

Sections I, II, and III: Required for all Tier I qualified facilities
Section A: Onshore facilities (excluding production)
Section B: Onshore oil production facilities (excluding drilling and workover facilities)
Section C: Onshore oil drilling and workover facilities
Attachments: 1 - Five Year Review and Technical Amendment Logs 2 - Oil Spill Contingency Plan and Checklist 3 - Inspections, Dike Drainage and Personnel Training Logs 4 - Discharge Notification Form

After you have completed all appropriate sections, certify and date your Plan, and then implement it by the compliance date. If your facility was in operation before August 16, 2002, and you do not already have a Plan, then implement this template immediately. Conduct inspections and tests in accordance with the written procedures that you have developed for your facility. You must keep with the SPCC Plan a record of these inspections and tests, signed by the appropriate supervisor or inspector, for a period of three years.

Do not forget to periodically review your Plan (at least once every five years) or to update it when you make changes to your facility. You must prepare amendments within six months of the facility change, and implement them as soon as possible, but not later than six months following preparation of any amendment.

^a Please note that the use of this template is not mandatory for a Tier I qualified facility. You may also meet the SPCC Plan requirement by preparing a satisfactory Tier II qualified facility Plan, preparing a satisfactory Plan that is certified by a Professional Engineer, or by developing an equivalent Plan for a Tier I qualified facility. Further information on the requirements of these methods can be found in 40 CFR part 112.6(a)(1). If you use any of these alternative methods you must include a cross reference in your Plan that shows how the equivalent Plan meets all applicable 40 CFR part 112 requirements.

In the event that your facility releases oil to navigable waters or adjoining shorelines, immediately call the National Response Center (NRC) at 1-800-424-8802. The NRC is the federal government's centralized reporting center, which is staffed 24 hours

Tier I Qualified Facility SPCC Plan

per day by U.S. Coast Guard personnel.

This template constitutes the SPCC Plan for the facility, when completed and signed by the owner or operator of a facility that meets the applicability criteria in §112.3(g)(1). This template addresses the requirements of 40 CFR part 112. Maintain a complete copy of the Plan at the facility if the facility is normally attended at least four hours per day, or for a facility attended fewer than four hours per day, at the nearest field office. When making operational changes at a facility that are necessary to comply with the rule requirements, the owner/operator should follow state and local requirements (such as for permitting, design and construction) and obtain professional assistance, as appropriate.

Facility Description

Facility Name Boundary Line Solar
 Facility Address 0 Doughty Road
 City North Yarmouth State Maine ZIP 04097
 County Cumberland Tel. Number () -
 Owner or Operator Name County
 Owner or Operator Address _____
 City _____ State _____ ZIP _____
 County _____ Tel. Number () -

I. Self-Certification Statement (§112.6(a)(1))

The owner or operator of a facility certifies that each of the following is true in order to utilize this template to comply with the SPCC requirements:

I _____ certify that the following is accurate:

1. I am familiar with the applicable requirements of 40 CFR part 112;
2. I have visited and examined the facility;
3. This Plan was prepared in accordance with accepted and sound industry practices and standards;
4. Procedures for required inspections and testing have been established in accordance with industry inspection and testing standards or recommended practices;
5. I will fully implement the Plan;
6. This facility meets the following qualification criteria (under §112.3(g)(1)):
 - a. The aggregate aboveground oil storage capacity of the facility is 10,000 U.S. gallons or less; and
 - b. The facility has had no single discharge as described in §112.1(b) exceeding 1,000 U.S. gallons and no two discharges as described in §112.1(b) each exceeding 42 U.S. gallons within any twelve month period in the three years prior to the SPCC Plan self-certification date, or since becoming subject to 40 CFR part 112 if the facility has been in operation for less than three years (not including oil discharges as described in §112.1(b) that are the result of natural disasters, acts of war, or terrorism); and
 - c. There is no individual oil storage container at the facility with an aboveground capacity greater than 5,000 U.S. gallons.
7. This Plan does not deviate from any requirement of 40 CFR part 112 as allowed by §112.7(a)(2) (environmental equivalence) and §112.7(d) (impracticability of secondary containment) or include any measures pursuant to §112.9(c)(6) for produced water containers and any associated piping;
8. This Plan and individual(s) responsible for implementing this Plan have the full approval of management and I have committed the necessary resources to fully implement this Plan.

I also understand my other obligations relating to the storage of oil at this facility, including, among others:

1. To report any oil discharge to navigable waters or adjoining shorelines to the appropriate authorities. Notification information is included in this Plan.
2. To review and amend this Plan whenever there is a material change at the facility that affects the potential for an oil discharge, and at least once every five years. Reviews and amendments are recorded in an attached log [See Five Year Review Log and Technical Amendment Log in Attachments 1.1 and 1.2.]
3. Optional use of a contingency plan. A contingency plan:
 - a. May be used in lieu of secondary containment for qualified oil-filled operational equipment, in accordance with the requirements under §112.7(k), and;
 - b. Must be prepared for flowlines and/or intra-facility gathering lines which do not have secondary containment at an oil production facility, and;
 - c. Must include an established and documented inspection or monitoring program; must follow the provisions of 40 CFR part 109; and must include a written commitment of manpower, equipment and materials to expeditiously remove any quantity of oil discharged that may be harmful. If applicable, a copy of the contingency plan and any additional documentation will be attached to this Plan as Attachment 2.

I certify that I have satisfied the requirement to prepare and implement a Plan under §112.3 and all of the requirements under §112.6(a). I certify that the information contained in this Plan is true.

Signature _____ Title: __
 Name _____ Date: __ / __ / 23

II. Record of Plan Review and Amendments

Five Year Review (§112.5(b)):

Complete a review and evaluation of this SPCC Plan at least once every five years. As a result of the review, amend this Plan within six months to include more effective prevention and control measures for the facility, if applicable. Implement any SPCC Plan amendment as soon as possible, but no later than six months following Plan amendment. Document completion of the review and evaluation, and complete the Five Year Review Log in Attachment 1.1. If the facility no longer meets Tier I qualified facility eligibility, the owner or operator must revise the Plan to meet Tier II qualified facility requirements, or complete a full PE certified Plan.

Table G-1 Technical Amendments (§§112.5(a), (c) and 112.6(a)(2))	
This SPCC Plan will be amended when there is a change in the facility design, construction, operation, or maintenance that materially affects the potential for a discharge to navigable waters or adjoining shorelines. Examples include adding or removing containers, reconstruction, replacement, or installation of piping systems, changes to secondary containment systems, changes in product stored at this facility, or revisions to standard operating procedures.	<input checked="" type="checkbox"/>
Any technical amendments to this Plan will be re-certified in accordance with Section I of this Plan template. [§112.6(a)(2)] [See Technical Amendment Log in Attachment 1.2]	<input checked="" type="checkbox"/>

Table G-4 below identifies the tanks and containers at the facility with the potential for an oil discharge; the mode of failure; the flow direction and potential quantity of the discharge; and the secondary containment method and containment capacity that is provided.

Table G-4 Containers with Potential for an Oil Discharge					
Area	Type of failure (discharge scenario)	Potential discharge volume (gallons)	Direction of flow for uncontained discharge	Secondary containment method ^a	Secondary containment capacity (gallons)
<i>Bulk Storage Containers and Mobile/Portable Containers^b</i>					
<i>Oil-filled Operational Equipment (e.g., hydraulic equipment, transformers)^c</i>					
Transformer	Breach of Transformer wall from accident or corrosion, discharge from pressure relieve valve due to overpressure condition	550		Rectangular Remote Impoundment Structure	3,392 per transformer
<i>Piping, Valves, etc.</i>					
Fittings on Transformers	Relief Valve			Rectangular Remote Impoundment Structure	3,392 per transformer
	Level Gauge			Rectangular Remote Impoundment Structure	3,392 per transformer
<i>Product Transfer Areas (location where oil is loaded to or from a container, pipe or other piece of equipment.)</i>					
<i>Other Oil-Handling Areas or Oil-Filled Equipment (e.g. flow-through process vessels at an oil production facility)</i>					

^a Use one of the following methods of secondary containment or its equivalent: (1) Dikes, berms, or retaining walls sufficiently impervious to contain oil; (2) Curbing; (3) Culverting, gutters, or other drainage systems; (4) Weirs, booms, or other barriers; (5) Spill diversion ponds; (6) Retention ponds; or (7) Sorbent materials.

^b For storage tanks and bulk storage containers, the secondary containment capacity must be at least the capacity of the largest container plus additional capacity to contain rainfall or other precipitation.

^c For oil-filled operational equipment: Document in the table above if alternative measures to secondary containment (as described in §112.7(k)) are implemented at the facility.

3. Inspections, Testing, Recordkeeping and Personnel Training (§§112.7(e) and (f), 112.8(c)(6) and (d)(4), 112.9(c)(3), 112.12(c)(6) and (d)(4)):

Table G-5 Inspections, Testing, Recordkeeping and Personnel Training	
An inspection and/or testing program is implemented for all aboveground bulk storage containers and piping at this facility. [§§112.8(c)(6) and (d)(4), 112.9(c)(3), 112.12(c)(6) and (d)(4)]	<input checked="" type="checkbox"/>
<p>The following is a description of the inspection and/or testing program (e.g. reference to industry standard utilized, scope, frequency, method of inspection or test, and person conducting the inspection) for all aboveground bulk storage containers and piping at this facility:</p> <p>1) Assign qualified employees of the firm hired to complete the Operations and Maintenance of the facility (the O&M Firm) to perform periodic inspections of the transformer and surrounding area.</p> <p>2) The O&M Firm will review the SPCC Plan for completeness, accurate and up to date reporting information and updates required. O&M Firm shall complete all updates to the SPCC Plan.</p> <p>3) The firm shall complete the inspections, associated logs and record keeping as detailed below: Daily - Inspection of oil gauge alarm if tripped. Quarterly - Visual inspection of the site to look for leaking oil, obvious faulty operation of the transformer, and obvious physical damage to the transformer. Faulty transformer operation would be indicated by excessive noise or transformer surface temperature. Bi-Annually - Same as quarterly inspection plus a more detailed examination of the transformer. The exterior of the transformer will be carefully inspected for signs of corrosion, deterioration, or physical damage. This inspection will include opening the transformer cabinet. The interior of the cabinet area will be examined for corrosion. The oil level sight glass inside the transformer will be examined and the oil level recorded. The oil level will be compared to earlier measurements. Sampling port and pressure relief valve will be examined for damage or any signs of oil leakage/discharge. The O&M Firm will also examine review the Tier I Spill Prevention, Control, and Countermeasures Plan and the associated Oil Spill Contingency Plan documents and determine if any updates are needed. Any updates will be completed prior to the next quarterly inspection.</p>	
Inspections, tests, and records are conducted in accordance with written procedures developed for the facility. Records of inspections and tests kept under usual and customary business practices will suffice for purposes of this paragraph. [§112.7(e)]	<input checked="" type="checkbox"/>
A record of the inspections and tests are kept at the facility or with the SPCC Plan for a period of three years. [§112.7(e)] [See Inspection Log and Schedule in Attachment 3.1]	<input checked="" type="checkbox"/>
Inspections and tests are signed by the appropriate supervisor or inspector. [§112.7(e)]	<input checked="" type="checkbox"/>
Personnel, training, and discharge prevention procedures [§112.7(f)]	
Oil-handling personnel are trained in the operation and maintenance of equipment to prevent discharges; discharge procedure protocols; applicable pollution control laws, rules, and regulations; general facility operations; and, the contents of the facility SPCC Plan. [§112.7(f)]	<input checked="" type="checkbox"/>
A person who reports to facility management is designated and accountable for discharge prevention. [§112.7(f)]	<input checked="" type="checkbox"/>
Name/Title: <u>(Add name of responsible party once O&M firm has been selected)</u>	
Discharge prevention briefings are conducted for oil-handling personnel annually to assure adequate understanding of the SPCC Plan for that facility. Such briefings highlight and describe past reportable discharges or failures, malfunctioning components, and any recently developed precautionary measures. [§112.7(f)] [See Oil-handling Personnel Training and Briefing Log in Attachment 3.4]	<input checked="" type="checkbox"/>

4. Security (excluding oil production facilities) §112.7(g):**Table G-6 Implementation and Description of Security Measures**

Security measures are implemented at this facility to prevent unauthorized access to oil handling, processing, and storage area.	<input type="checkbox"/>
--	--------------------------

The following is a description of how you secure and control access to the oil handling, processing and storage areas; secure master flow and drain valves; prevent unauthorized access to starter controls on oil pumps; secure out-of-service and loading/unloading connections of oil pipelines; address the appropriateness of security lighting to both prevent acts of vandalism and assist in the discovery of oil discharges:

- 1) The facility will have restricted gated access and perimeter fencing. Only authorized personnel from Branch Renewable Energy and the O&M Firm will have access to the site.
- 2) The transformer cabinet will be locked.

5. Emergency Procedures and Notifications (§112.7(a)(3)(iv) and 112.7(a)(5)):**Table G-7 Description of Emergency Procedures and Notifications**

The following is a description of the immediate actions to be taken by facility personnel in the event of a discharge to navigable waters or adjoining shorelines [§112.7(a)(3)(iv) and 112.7(a)(5)]:

- 1) Contact Central Maine Power and have the transformer disconnected.
- 2) Contact Maine DEP within 2 hours of discovery of the spill.
- 3) Contact Cleanup Contractor and complete actions necessary to contain and clean up spill.
- 4) Concurrently contact the Owner, National Response Center, Environmental Assistance Hotline, Fire Department, Police.
- 5) Review the spill and any possible effects on the surrounding area. Determine if any actions are needed and complete those actions.

6. Contact List (§112.7(a)(3)(vi)):

Table G-8 Contact List	
Contact Organization / Person	Telephone Number
National Response Center (NRC)	1-800-424-8802
Cleanup Contractor(s) ACV Enviro Skowhegan, ME	207-474-0530
Key Facility Personnel	
Designated Person Accountable for Discharge Prevention:	Office:
	Emergency:
Central Maine Power	Office: 800-565-3181
	Emergency: 1-800-696-1000
Maine Department of Environmental Protection	Office: 207-287-7688
	Emergency: 800-482-0777
	Office:
	Emergency:
State Oil Pollution Control Agencies Maine DEP Hazardous Material Spill Hotline (24/7/365)	800-452-4664
Other State, Federal, and Local Agencies Cumberland County EMA	207-892-6785
Local Fire Department North Yarmouth Fire Department	207-829-3025
Local Police Department Cumberland Police Department	207-829-6391
Hospital Mid Coast Hospital	207-373-6000
Other Contact References (e.g., downstream water intakes or neighboring facilities)	

7. NRC Notification Procedure (§112.7(a)(4) and (a)(5)):

Table G-9 NRC Notification Procedure	
In the event of a discharge of oil to navigable waters or adjoining shorelines, the following information identified in Attachment 4 will be provided to the National Response Center immediately following identification of a discharge to navigable waters or adjoining shorelines [See Discharge Notification Form in Attachment 4]: <i>[\$112.7(a)(4)]</i>	<input checked="" type="checkbox"/>
<ul style="list-style-type: none"> • The exact address or location and phone number of the facility; • Date and time of the discharge; • Type of material discharged; • Estimate of the total quantity discharged; • Estimate of the quantity discharged to navigable waters; • Source of the discharge; 	<ul style="list-style-type: none"> • Description of all affected media; • Cause of the discharge; • Any damages or injuries caused by the discharge; • Actions being used to stop, remove, and mitigate the effects of the discharge; • Whether an evacuation may be needed; and • Names of individuals and/or organizations who have also been contacted.

8. SPCC Spill Reporting Requirements (Report within 60 days) (§112.4):

Submit information to the EPA Regional Administrator (RA) and the appropriate agency or agencies in charge of oil pollution control activities in the State in which the facility is located within 60 days from one of the following discharge events:

- A single discharge of more than 1,000 U.S. gallons of oil to navigable waters or adjoining shorelines or
- Two discharges to navigable waters or adjoining shorelines each more than 42 U.S. gallons of oil occurring within any twelve month period

You must submit the following information to the RA:

- (1) Name of the facility;
- (2) Your name;
- (3) Location of the facility;
- (4) Maximum storage or handling capacity of the facility and normal daily throughput;
- (5) Corrective action and countermeasures you have taken, including a description of equipment repairs and replacements;
- (6) An adequate description of the facility, including maps, flow diagrams, and topographical maps, as necessary;
- (7) The cause of the reportable discharge, including a failure analysis of the system or subsystem in which the failure occurred; and
- (8) Additional preventive measures you have taken or contemplated to minimize the possibility of recurrence
- (9) Such other information as the Regional Administrator may reasonably require pertinent to the Plan or discharge

* * * * *

NOTE: Complete one of the following sections (A, B or C) as appropriate for the facility type.

A. Onshore Facilities (excluding production) (§§112.8(b) through (d), 112.12(b) through (d)):

The owner or operator must meet the general rule requirements as well as requirements under this section. Note that not all provisions may be applicable to all owners/operators. For example, a facility may not maintain completely buried metallic storage tanks installed after January 10, 1974, and thus would not have to abide by requirements in §§112.8(c)(4) and 112.12(c)(4), listed below. **In cases where a provision is not applicable, write "N/A".**

Table G-10 General Rule Requirements for Onshore Facilities		N/A
Drainage from diked storage areas is restrained by valves to prevent a discharge into the drainage system or facility effluent treatment system, except where facility systems are designed to control such discharge. Diked areas may be emptied by pumps or ejectors that must be manually activated after inspecting the condition of the accumulation to ensure no oil will be discharged. [§§112.8(b)(1) and 112.12(b)(1)]	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Valves of manual, open-and-closed design are used for the drainage of diked areas. [§§112.8(b)(2) and 112.12(b)(2)]	<input type="checkbox"/>	<input checked="" type="checkbox"/>
The containers at the facility are compatible with materials stored and conditions of storage such as pressure and temperature. [§§112.8(c)(1) and 112.12(c)(1)]	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Secondary containment for the bulk storage containers (including mobile/portable oil storage containers) holds the capacity of the largest container plus additional capacity to contain precipitation. Mobile or portable oil storage containers are positioned to prevent a discharge as described in §112.1(b). [§112.6(a)(3)(ii)]	<input checked="" type="checkbox"/>	<input type="checkbox"/>
If uncontaminated rainwater from diked areas drains into a storm drain or open watercourse the following procedures will be implemented at the facility: [§§112.8(c)(3) and 112.12(c)(3)] <ul style="list-style-type: none"> • Bypass valve is normally sealed closed • Retained rainwater is inspected to ensure that its presence will not cause a discharge to navigable waters or adjoining shorelines • Bypass valve is opened and resealed under responsible supervision • Adequate records of drainage are kept [See Dike Drainage Log in Attachment 3.3] 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
For completely buried metallic tanks installed on or after January 10, 1974 at this facility [§§112.8(c)(4) and 112.12(c)(4)]: <ul style="list-style-type: none"> • Tanks have corrosion protection with coatings or cathodic protection compatible with local soil conditions. • Regular leak testing is conducted. 	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
For partially buried or bunkered metallic tanks [§112.8(c)(5) and §112.12(c)(5)]: <ul style="list-style-type: none"> • Tanks have corrosion protection with coatings or cathodic protection compatible with local soil conditions. 	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Each aboveground bulk container is tested or inspected for integrity on a regular schedule and whenever material repairs are made. Scope and frequency of the inspections and inspector qualifications are in accordance with industry standards. Container supports and foundations are regularly inspected. [See Inspection Log and Schedule and Bulk Storage Container Inspection Schedule in Attachments 3.1 and 3.2] [§112.8(c)(6) and §112.12(c)(6)(i)]	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Outsides of bulk storage containers are frequently inspected for signs of deterioration, discharges, or accumulation of oil inside diked areas. [See Inspection Log and Schedule in Attachment 3.1] [§§112.8(c)(6) and 112.12(c)(6)]	<input checked="" type="checkbox"/>	<input type="checkbox"/>
For bulk storage containers that are subject to 21 CFR part 110 which are shop-fabricated, constructed of austenitic stainless steel, elevated and have no external insulation, formal visual inspection is conducted on a regular schedule. Appropriate qualifications for personnel performing tests and inspections are documented. [See Inspection Log and Schedule and Bulk Storage Container Inspection Schedule in Attachments 3.1 and 3.2] [§112.12(c)(6)(ii)]	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Table G-10 General Rule Requirements for Onshore Facilities		N/A
Each container is provided with a system or documented procedure to prevent overfills for the container. Describe: 1) The transformer has an oil level gauge inside the cabinet. The oil level shall be monitored when filling. 2) Drip pans shall be used under fittings if refilling of the transformer oil is required. 3) A spill kit will be used to contain any small spills.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Liquid level sensing devices are regularly tested to ensure proper operation [See Inspection Log and Schedule in Attachment 3.1] . <i>[\$112.6(a)(3)(iii)]</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Visible discharges which result in a loss of oil from the container, including but not limited to seams, gaskets, piping, pumps, valves, rivets, and bolts are promptly corrected and oil in diked areas is promptly removed. <i>[\$112.8(c)(10) and 112.12(c)(10)]</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Aboveground valves, piping, and appurtenances such as flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces are inspected regularly. [See Inspection Log and Schedule in Attachment 3.1] <i>[\$112.8(d)(4) and 112.12(d)(4)]</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Integrity and leak testing are conducted on buried piping at the time of installation, modification, construction, relocation, or replacement. [See Inspection Log and Schedule in Attachment 3.1] <i>[\$112.8(d)(4) and 112.12(d)(4)]</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

B. Onshore Oil Production Facilities (excluding drilling and workover facilities) (§112.9(b), (c), and (d)):

The owner or operator must meet the general rule requirements as well as the requirements under this section. Note that not all provisions may be applicable to all owners/operators. **In cases where a provision is not applicable, write "N/A".**

Table G-11 General Rule Requirements for Onshore Oil Production Facilities		N/A
At tank batteries, separation and treating areas, drainage is closed and sealed except when draining uncontaminated rainwater. Accumulated oil on the rainwater is returned to storage or disposed of in accordance with legally approved methods. [§112.9(b)(1)]	<input type="checkbox"/>	<input type="checkbox"/>
Prior to drainage, diked areas are inspected and [§112.9(b)(1)]:		
<ul style="list-style-type: none"> • Retained rainwater is inspected to ensure that its presence will not cause a discharge to navigable waters • Bypass valve is opened and resealed under responsible supervision • Adequate records of drainage are kept [See Dike Drainage Log in Attachment 3.3] 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Field drainage systems and oil traps, sumps, or skimmers are inspected at regularly scheduled intervals for oil, and accumulations of oil are promptly removed [See Inspection Log and Schedule in Attachment 3.1] [§112.9(b)(2)]	<input type="checkbox"/>	<input type="checkbox"/>
The containers used at this facility are compatible with materials stored and conditions of storage. [§112.9(c)(1)]	<input type="checkbox"/>	<input type="checkbox"/>
All tank battery, separation, and treating facility installations (except for flow-through process vessels) are constructed with a capacity to hold the largest single container plus additional capacity to contain rainfall. Drainage from undiked areas is safely confined in a catchment basin or holding pond. [§112.9(c)(2)]	<input type="checkbox"/>	<input type="checkbox"/>
Except for flow-through process vessels, containers that are on or above the surface of the ground, including foundations and supports, are visually inspected for deterioration and maintenance needs on a regular schedule. [See Inspection Log and Schedule in Attachment 3.1] [§112.9(c)(3)]	<input type="checkbox"/>	<input type="checkbox"/>
New and old tank batteries at this facility are engineered/updated in accordance with good engineering practices to prevent discharges including at least one of the following:	<input type="checkbox"/>	<input type="checkbox"/>
<ul style="list-style-type: none"> i. adequate container capacity to prevent overflow if regular pumping/gauging is delayed; ii. overflow equalizing lines between containers so that a full container can overflow to an adjacent container; iii. vacuum protection to prevent container collapse; or iv. high level sensors to generate and transmit an alarm to the computer where the facility is subject to a computer production control system. [§112.9(c)(4)] 		
Flow-through process vessels and associated components are:		
<ul style="list-style-type: none"> • Are constructed with a capacity to hold the largest single container plus additional capacity to contain rainfall. Drainage from undiked areas is safely confined in a catchment basin or holding pond; [§112.9(c)(2)] and • That are on or above the surface of the ground, including foundations and supports, are visually inspected for deterioration and maintenance needs on a regular schedule. [See Inspection Log and Schedule in Attachment 3.1] [§112.9(c)(3)] 	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Or		
<ul style="list-style-type: none"> • Visually inspected and/or tested periodically and on a regular schedule for leaks, corrosion, or other conditions that could lead to a discharge to navigable waters; and • Corrective action or repairs are applied to flow-through process vessels and any associated components as indicated by regularly scheduled visual inspections, tests, or evidence of an oil discharge; and • Any accumulations of oil discharges associated with flow-through process vessels are promptly removed; and • Flow-through process vessels are provided with a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation within six months of a discharge from flow-through process vessels of more than 1,000 U.S. gallons of oil in a single discharge as described in §112.1(b), or a discharge more than 42 U.S. gallons of oil in each of two discharges as described in §112.1(b) within any twelve month period. [§112.9(c)(5)] (Leave blank until such time that this provision is applicable.) 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Table G-11 General Rule Requirements for Onshore Oil Production Facilities		N/A
All aboveground valves and piping associated with transfer operations are inspected periodically and upon a regular schedule. The general condition of flange joints, valve glands and bodies, drip pans, pipe supports, pumping well polish rod stuffing boxes, bleeder and gauge valves, and other such items are included in the inspection. [See Inspection Log and Schedule in Attachment 3.1] <i>[\$112.9(d)(1)]</i>	<input type="checkbox"/>	<input type="checkbox"/>
An oil spill contingency plan and written commitment of resources are provided for flowlines and intra-facility gathering lines [See Oil Spill Contingency Plan and Checklist in Attachment 2 and Inspection Log and Schedule in Attachment 3.1] <i>[\$112.9(d)(3)]</i> or Appropriate secondary containment and/or diversionary structures or equipment is provided for flowlines and intra-facility gathering lines to prevent a discharge to navigable waters or adjoining shorelines. The entire secondary containment system, including walls and floor, is capable of containing oil and is constructed so that any discharge from the pipe, will not escape the containment system before cleanup occurs.	<input type="checkbox"/>	<input type="checkbox"/>
A flowline/intra-facility gathering line maintenance program to prevent discharges from each flowline has been established at this facility. The maintenance program addresses each of the following: <ul style="list-style-type: none"> Flowlines and intra-facility gathering lines and associated valves and equipment are compatible with the type of production fluids, their potential corrosivity, volume, and pressure, and other conditions expected in the operational environment; Flowlines, intra-facility gathering lines and associated appurtenances are visually inspected and/or tested on a periodic and regular schedule for leaks, oil discharges, corrosion, or other conditions that could lead to a discharge as described in §112.1(b). The frequency and type of testing allows for the implementation of a contingency plan as described under part 109 of this chapter. Corrective action and repairs to any flowlines and intra-facility gathering lines and associated appurtenances as indicated by regularly scheduled visual inspections, tests, or evidence of a discharge. Accumulations of oil discharges associated with flowlines, intra-facility gathering lines, and associated appurtenances are promptly removed. <i>[\$112.9(d)(4)]</i> 	<input type="checkbox"/>	<input type="checkbox"/>
The following is a description of the flowline/intra-facility gathering line maintenance program implemented at this facility:		

C. Onshore Oil Drilling and Workover Facilities (§112.10(b), (c) and (d)):

The owner or operator must meet the general rule requirements as well as the requirements under this section.

Table G-12 General Rule Requirements for Onshore Oil Drilling and Workover Facilities	
Mobile drilling or worker equipment is positioned or located to prevent discharge as described in §112.1(b). <i>[\$112.10(b)]</i>	<input type="checkbox"/>
Catchment basins or diversion structures are provided to intercept and contain discharges of fuel, crude oil, or oily drilling fluids. <i>[\$112.10(c)]</i>	<input type="checkbox"/>
A blowout prevention (BOP) assembly and well control system was installed before drilling below any casing string or during workover operations. <i>[\$112.10(d)]</i>	<input type="checkbox"/>
The BOP assembly and well control system is capable of controlling any well-head pressure that may be encountered while the BOP assembly and well control system are on the well. <i>[\$112.10(d)]</i>	<input type="checkbox"/>

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ATTACHMENT 2 – Oil Spill Contingency Plan and Checklist

An oil spill contingency plan and written commitment of resources is required for:

- Flowlines and intra-facility gathering lines at oil production facilities and
- Qualified oil-filled operational equipment which has no secondary containment.

An oil spill contingency plan meeting the provisions of 40 CFR part 109, as described below, and a written commitment of manpower, equipment and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful is attached to this Plan.	<input checked="" type="checkbox"/>
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Complete the checklist below to verify that the necessary operations outlined in 40 CFR part 109 - Criteria for State, Local and Regional Oil Removal Contingency Plans - have been included.

Table G-15 Checklist of Development and Implementation Criteria for State, Local and Regional Oil Removal Contingency Plans (§109.5)^a

(a) Definition of the authorities, responsibilities and duties of all persons, organizations or agencies which are to be involved in planning or directing oil removal operations.	<input checked="" type="checkbox"/>
(b) Establishment of notification procedures for the purpose of early detection and timely notification of an oil discharge including: (1) The identification of critical water use areas to facilitate the reporting of and response to oil discharges. (2) A current list of names, telephone numbers and addresses of the responsible persons (with alternates) and organizations to be notified when an oil discharge is discovered. (3) Provisions for access to a reliable communications system for timely notification of an oil discharge, and the capability of interconnection with the communications systems established under related oil removal contingency plans, particularly State and National plans (e.g., NCP). (4) An established, prearranged procedure for requesting assistance during a major disaster or when the situation exceeds the response capability of the State, local or regional authority.	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
(c) Provisions to assure that full resource capability is known and can be committed during an oil discharge situation including: (1) The identification and inventory of applicable equipment, materials and supplies which are available locally and regionally. (2) An estimate of the equipment, materials and supplies which would be required to remove the maximum oil discharge to be anticipated. (3) Development of agreements and arrangements in advance of an oil discharge for the acquisition of equipment, materials and supplies to be used in responding to such a discharge.	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
(d) Provisions for well defined and specific actions to be taken after discovery and notification of an oil discharge including: (1) Specification of an oil discharge response operating team consisting of trained, prepared and available operating personnel. (2) Predesignation of a properly qualified oil discharge response coordinator who is charged with the responsibility and delegated commensurate authority for directing and coordinating response operations and who knows how to request assistance from Federal authorities operating under existing national and regional contingency plans. (3) A preplanned location for an oil discharge response operations center and a reliable communications system for directing the coordinated overall response operations. (4) Provisions for varying degrees of response effort depending on the severity of the oil discharge. (5) Specification of the order of priority in which the various water uses are to be protected where more than one water use may be adversely affected as a result of an oil discharge and where response operations may not be adequate to protect all uses. (6) Specific and well defined procedures to facilitate recovery of damages and enforcement measures as provided for by State and local statutes and ordinances.	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>

^a The contingency plan must be consistent with all applicable state and local plans, Area Contingency Plans, and the National Contingency Plan (NCP)

ATTACHMENT 3 – Inspections, Dike Drainage and Personnel Training Logs

ATTACHMENT 3.1 – Inspection Log and Schedule

Table G-16 Inspection Log and Schedule
 This log is intended to document compliance with §§112.6(a)(3)(iii), 112.8(c)(6), 112.8(d)(4), 112.9(b)(2), 112.9(c)(3), 112.9(d)(1), 112.9(d)(4), 112.12.(c)(6), and 112.12(d)(4), as applicable.

Date of Inspection	Container / Piping / Equipment	Describe Scope (or cite Industry Standard)	Observations	Name/ Signature of Inspector	Records maintained separately ^a
		Quarterly visual inspection of transformer and surrounding site as prescribed in G-5			<input type="checkbox"/>
		Quarterly visual inspection of transformer and surrounding site as prescribed in G-5			<input type="checkbox"/>
		Quarterly visual inspection of transformer and surrounding site as prescribed in G-5			<input type="checkbox"/>
		Quarterly visual inspection of transformer and surrounding site as prescribed in G-5			<input type="checkbox"/>
		Quarterly visual inspection of transformer and surrounding site as prescribed in G-5			<input type="checkbox"/>

^a Indicate in the table above if records of facility inspections are maintained separately at this facility.

ATTACHMENT 3.2 – Bulk Storage Container Inspection Schedule – onshore facilities (excluding production):

To comply with integrity inspection requirement for bulk storage containers, inspect/test each shop-built aboveground bulk storage container on a regular schedule in accordance with a recognized container inspection standard based on the minimum requirements in the following table.

Table G-17 Bulk Storage Container Inspection Schedule	
Container Size and Design Specification	Inspection requirement
Portable containers (including drums, totes, and intermodal bulk containers (IBC))	Visually inspect quarterly for signs of deterioration, discharges or accumulation of oil inside diked areas
55 to 1,100 gallons with sized secondary containment	Visually inspect quarterly for signs of deterioration, discharges or accumulation of oil inside diked areas plus any annual inspection elements per industry inspection standards
1,101 to 5,000 gallons with sized secondary containment and a means of leak detection ^a	
1,101 to 5,000 gallons with sized secondary containment and no method of leak detection ^a	Visually inspect quarterly for signs of deterioration, discharges or accumulation of oil inside diked areas, plus any annual inspection elements and other specific integrity tests that may be required per industry inspection standards

^a Examples of leak detection include, but are not limited to, double-walled tanks and elevated containers where a leak can be visually identified.

ATTACHMENT 3.3 – Dike Drainage Log

Table G-18 Dike Drainage Log

Date	Bypass valve sealed closed	Rainwater inspected to be sure no oil (or sheen) is visible	Open bypass valve and reseal it following drainage	Drainage activity supervised	Observations	Signature of Inspector
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

ATTACHMENT 3.4 – Oil-handling Personnel Training and Briefing Log

Table G-19 Oil-Handling Personnel Training and Briefing Log

Date	Description / Scope	Attendees
	To be completed by O&M firm at commissioning of facility	

ATTACHMENT 4 – Discharge Notification Form

In the event of a discharge of oil to navigable waters or adjoining shorelines, the following information will be provided to the National Response Center [also see the notification information provided in Section 7 of the Plan]:

Table G-20 Information provided to the National Response Center in the Event of a Discharge			
Discharge/Discovery Date		Time	
Facility Name	Boundary Line Solar		
Facility Location (Address/Lat-Long/Section Township Range)	0 Doughty Road, North Yarmouth, Maine 04097 43°48'28.2"N 70°14'07.6"W		
Name of reporting individual		Telephone #	
Type of material discharged		Estimated total quantity discharged	Gallons/Barrels
Source of the discharge		Media affected	<input type="checkbox"/> Soil
			<input type="checkbox"/> Water (specify)
			<input type="checkbox"/> Other (specify)
Actions taken			
Damage or injuries	<input type="checkbox"/> No <input type="checkbox"/> Yes (specify)	Evacuation needed?	<input type="checkbox"/> No <input type="checkbox"/> Yes (specify)
Organizations and individuals contacted	<input type="checkbox"/> National Response Center 800-424-8802 Time		
	<input type="checkbox"/> Cleanup contractor (Specify) Time		
	<input type="checkbox"/> Facility personnel (Specify) Time		
	<input type="checkbox"/> State Agency (Specify) Time		
	<input type="checkbox"/> Other (Specify) Time		

Appendix E

Oil Spill Contingency Plan

OIL SPILL CONTINGENCY PLAN

Instructions: Complete the following information to (1) generate an Oil Spill Contingency Plan that meets the provisions of 40 CFR part 109 and (2) provide a written commitment of manpower, equipment and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful. The contingency plan must be consistent with all applicable state and local plans, Area Contingency Plans, and the National Contingency Plan (NCP). Attach all of the information in this Appendix to your SPCC Plan.

DISCLAIMER: Completion of this Oil Spill Contingency Plan Template does not guarantee compliance. Each owner/operator is responsible for ensuring that his or her facility meets the requirements of 40 CFR 109 and 40 CFR 112 (74 FR 58811) and its proposed revisions.

List the authorities, responsibilities, and duties of all persons, organizations or agencies which are to be involved in planning or directing oil removal operations.

Boundary Line Solar

Operations and Maintenance Firm (to be identified prior to site commissioning) Duties will include all inspections, reporting, SPCC Plan updates, contact with appropriate State and Federal regulatory agencies, contact and direction of Cleanup Contractor needed. ACV Enviro (Cleanup Contractor) Duties will include all removal and cleanup of spilled oil.

Establish notification procedures for the purpose of early detection and timely notification of an oil discharge including:

Identify critical water use areas.

The site eventually drains to wetlands and tributaries of the Royal River, and from there to Casco Bay.

Provide a current list of names, telephone numbers and addresses of the responsible persons and organizations to be notified when an oil discharge is discovered

See Emergency Contact Information and Table 10: Discharge Notification Form in the SPCC Plan

Access to a reliable communication system is provided for timely notification of an oil discharge. This system is capable of interconnection with the communications systems established under related oil removal contingency plans, particularly State and National Plans (e.g., NCP).

See Emergency Contact Information in the SPCC Plan

What is the procedure for requesting assistance during a major disaster or when the situation exceeds the response capability of the State, local, or regional authority?

All parties listed in Table 10 of the SPCC Plan shall be notified. All parties will be notified and the National Response Center shall be contacted in the unlikely event that the situation (spill of any transformer with up to 550 gallons of dielectric vegetable oil) exceeds the response capability of the State, local, or regional authorities.

The following provisions have been made to assure that all available resources have been identified and can be committed during an oil discharge situation including:

Identify and list applicable equipment, materials and supplies which are available locally and regionally	See <i>Emergency Cleanup Contractors/Individuals</i> information in the SPCC Plan
Estimate the type and amount of equipment, materials, and supplies which could be required to remove the maximum potential oil discharge to be anticipated	
	<p>Equipment To be completed by O&M Firm with assistance of Cleanup Contractor (ACV Enviro) prior to commissioning of facility.</p> <p>Materials To be completed by O&M Firm with assistance of Cleanup Contractor (ACV Enviro) prior to commissioning of facility.</p> <p>Supplies To be completed by O&M Firm with assistance of Cleanup Contractor (ACV Enviro) prior to commissioning of facility.</p>
<p>List entities for which agreements and arrangements in advance of an oil discharge have been developed:</p> <p>To be completed by O&M Firm with assistance of Cleanup Contractor (ACV Enviro) prior to commissioning of facility.</p>	

The following information describes the provisions made for well defined and specific actions to be taken after an oil discharge has been discovered and reported.

<p>List name and phone numbers of your designated oil discharge response team. This team must consist of trained, prepared, and available operating personnel.</p> <p>To be completed by O&M Firm with the assistance of Cleanup Contractor (ACV Enviro) prior to commissioning of facility.</p>
<p>Name the designated oil discharge response coordinator.</p> <p><input checked="" type="checkbox"/> This coordinator has the responsibility and delegated commensurate authority to direct and coordinate response operations.</p> <p><input checked="" type="checkbox"/> This coordinator knows how to request assistance from Federal authorities operating under existing national and regional contingency plans.</p>

Location of oil discharge response operations center and reliable communications system:

To be completed by the O&M Firm prior to commissioning of the facility.

Describe the response efforts and procedures that will be used for oil discharges of different severities:

To be completed by the O&M Firm prior to commissioning of the facility.

List the order in which the critical water use areas need to be protected:

Yarmouth Water District Well-Protection Areas
Royal River

Provide the well defined and detailed procedures that are in place to facilitate the recovery of damages and enforcement measures as provided for by State and local statues and ordinances:

Contact all parties as described in Item 5 of the SPCC Plan after cleanup and verify all damages are corrected or paid. Also verify that all enforcement measures resulting from the incident are completed.

WRITTEN COMMITMENT OF RESOURCES (§112.7(d)(2)):

Instructions: In the space and table below describe the manpower, equipment, and materials committed to quickly controlling and removing any quantity of discharged oil that may be harmful. List any arrangements made with individuals or contractors to share personnel, and/or equipment¹, supplies², and services³ during an emergency cleanup of an oil discharge. Attach any written agreements to this plan.

To be completed by the O&M Firm with the assistance of the Cleanup Firm (ACV Envrio) prior to site commissioning.

Table 13: Emergency Cleanup Contractors

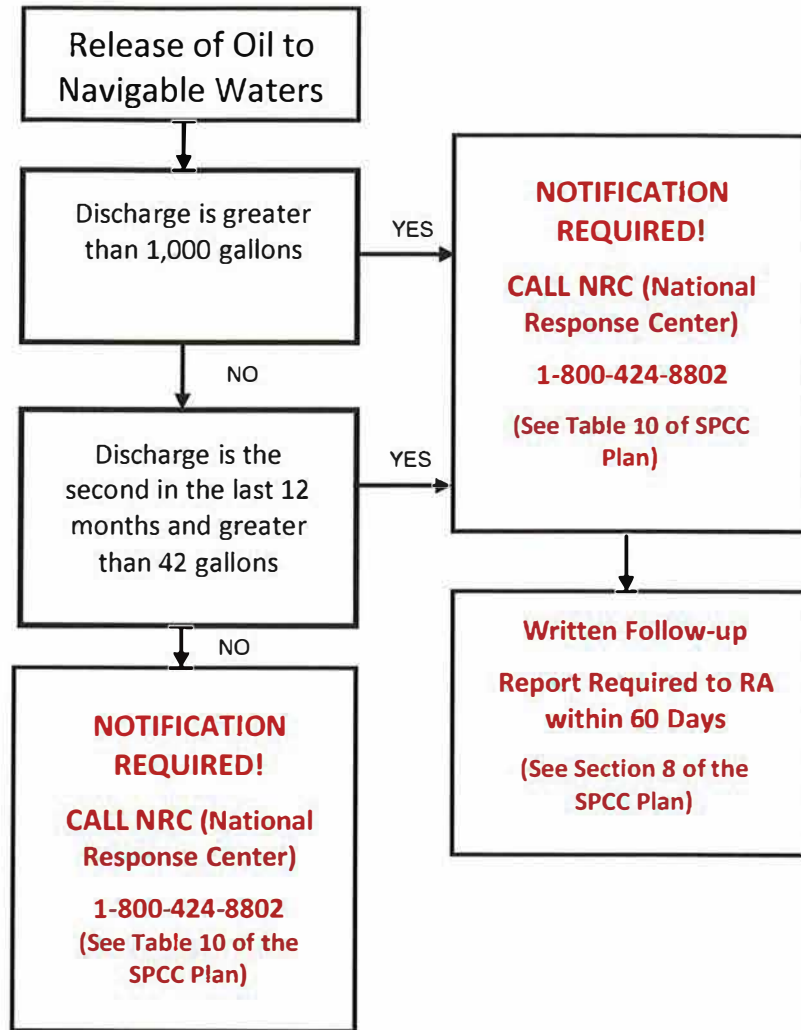
Name/Company	Signed Agreement?	Phone	Location/Address	Equipment ^a , Supplies ^b , Services ^c Provided
Branch Renewable Energy	Yes <input type="checkbox"/> No <input type="checkbox"/>			
BRI Environmental	Yes <input type="checkbox"/> No <input type="checkbox"/>			
(O&M Firm, name to be added)	Yes <input type="checkbox"/> No <input type="checkbox"/>			
	Yes <input type="checkbox"/> No <input type="checkbox"/>			
	Yes <input type="checkbox"/> No <input type="checkbox"/>			

¹ Example equipment: vacuum slurry tank, irrigation pumps, bulldozer/track loader, backhoe

² Example supplies: oil absorbent materials (pads, pillows, socks, booms)

³ Example services: emergency response cleanup

Discharge Reporting and Notification Requirements



Appendix F

Transformer Specifications

Three-phase pad-mounted compartmental type transformer



General

At Eaton, we are constantly striving to introduce new innovations to the transformer industry, bringing you the highest quality, most reliable transformers. Eaton's Cooper Power series Transformer Products are ISO 9001 compliant, emphasizing process improvement in all phases of design, manufacture, and testing. In order to drive this innovation, we have invested both time and money in the Thomas A. Edison Technical Center, our premier research facility in Franksville, Wisconsin. Such revolutionary products as distribution-class UltraSIL™ Polymer-Housed Evolution™ surge arresters and Envirotemp™ FR3™ fluid have been developed at our Franksville lab.

With transformer sizes ranging from 45 kVA to 12 MVA and high voltages ranging from 2400 V to 46 kV, Eaton has you covered. From fabrication of the tanks and cabinets to winding of the cores and coils, to production of arresters, switches, tap changers, expulsion fuses, current limit fuses, bushings (live and dead) and molded rubber goods, Eaton does it all. Eaton's Cooper Power series transformers are available with electrical grade mineral oil or Envirotemp™ FR3™ fluid, a less-flammable and bio-degradable fluid. Electrical codes recognize the advantages of using Envirotemp™ FR3™ fluid both indoors and outdoors for fire sensitive applications. The bio-based fluid meets Occupational Safety and Health Administration (OSHA) and Section 450.23 NEC Requirements.

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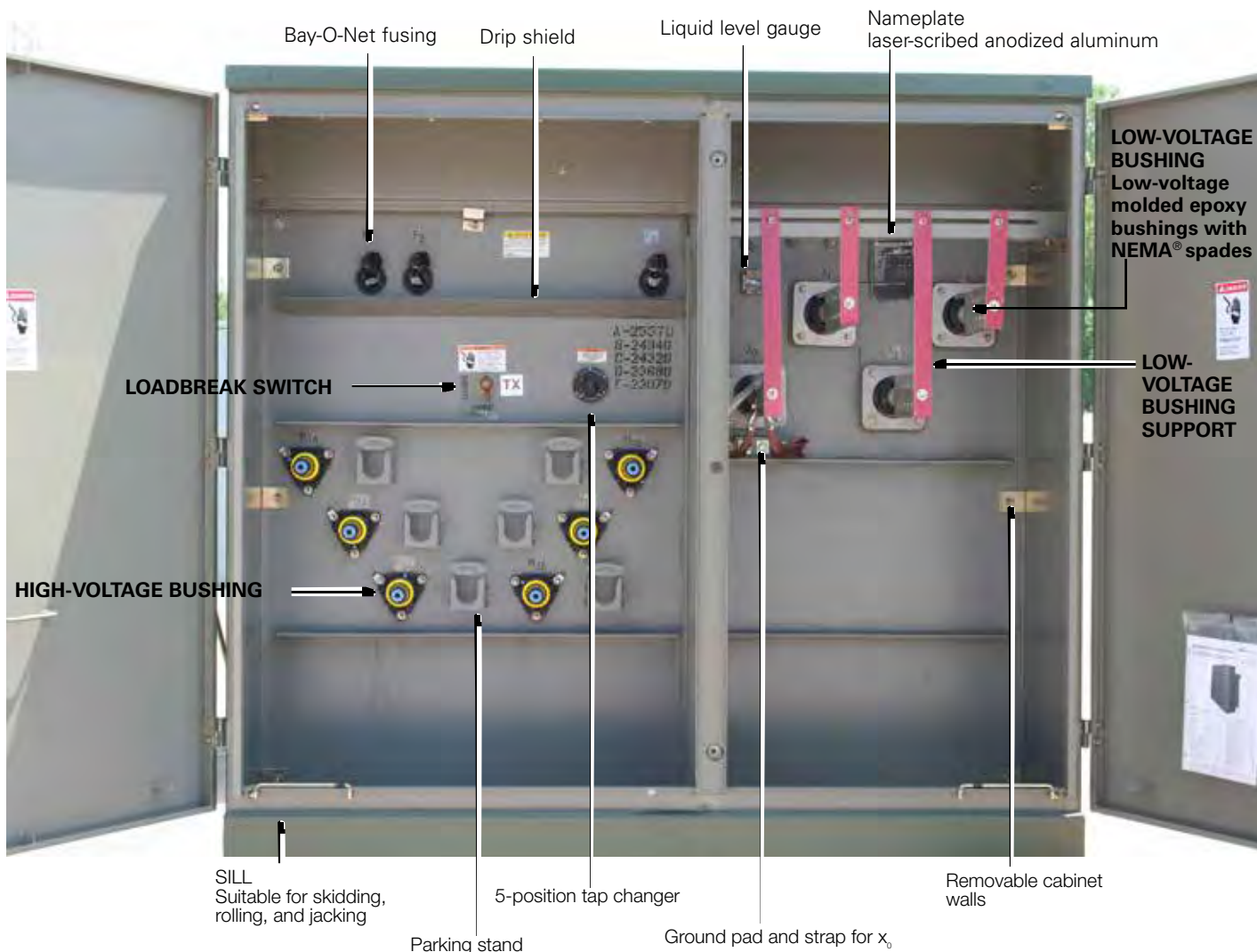


Figure 1. Three-phase pad-mounted compartmental type transformer.

Table 1. Product Scope

Type	Three Phase, 50 or 60 Hz, 65 °C Rise (55 °C, 55/65 °C), 65/75 °C, 75 °C
Fluid Type	Mineral oil or Envirotemp™ FR3™ fluid
Coil Configuration	2-winding or 4-winding or 3-winding (Low-High-Low), 3-winding (Low-Low-High)
Size	45 – 10,000 kVA
Primary Voltage	2,400 – 46,000 V
Secondary Voltage	208Y/120 V to 14,400 V
Specialty Designs	Inverter/Rectifier Bridge
	K-Factor (up to K-19)
	Vacuum Fault Interrupter (VFI)
	UL® Listed & Labeled and Classified
	Factory Mutual (FM) Approved®
	Solar/Wind Designs
	Differential Protection
	Seismic Applications (including OSHPD)
	Hardened Data Center

Table 2. Three-Phase Ratings

Three-Phase 50 or 60 Hz

kVA Available¹
 45, 75, 112.5, 150, 225, 300, 500, 750, 1000, 1500, 2000, 2500, 3000, 3750, 5000, 7500, 10000

¹Transformers are available in the standard ratings and configurations shown or can be customized to meet specific needs.

Table 3. Impedance Voltage

Rating (kVA)	Low-voltage rating		
	≤ 600 V	2400 Δ through 4800 Δ	6900 Δ through 13800GY/7970 or 13800 Δ
45-75	2.70-5.75	2.70-5.75	2.70-5.75
112.5-300	3.10-5.75	3.10-5.75	3.10-5.75
500	4.35-5.75	4.35-5.75	4.35-5.75
750-2500	5.75	5.75	5.75
3750	5.75	5.75	6.00
5000		6.00	6.50

Note: The standard tolerance is ± 7.5%

Table 4. Audible Sound Levels

Self-Cooled, Two Winding kVA Rating	NEMA® TR-1 Average
	Decibels (dB)
45-500	56
501-700	57
701-1000	58
1001-1500	60
1501-2000	61
2001-2500	62
2501-3000	63
3001-4000	64
4001-5000	65
5001-6000	66
6001-7500	67
7501-10000	68

Table 5. Insulation Test Levels

KV Class	Induced Test 180 or 400 Hz 7200 Cycle	kV BIL Distribution	Applied Test 60 Hz (kV)
1.2	Twice Rated Voltage	30	10
2.5		45	15
5		60	19
8.7		75	26
15		95	34
25		125	40
34.5		150	50

Table 6. Temperature Rise Ratings 0-3300 Feet (0-1000 meters)

	Standard	Optional
Unit Rating (Temperature Rise Winding)	65 °C	55 °C, 55/65 °C, 75 °C
Ambient Temperature Max	40 °C	50 °C
Ambient Temperature 24 Hour Average	30 °C	40 °C
Temperature Rise Hotspot	80 °C	65 °C

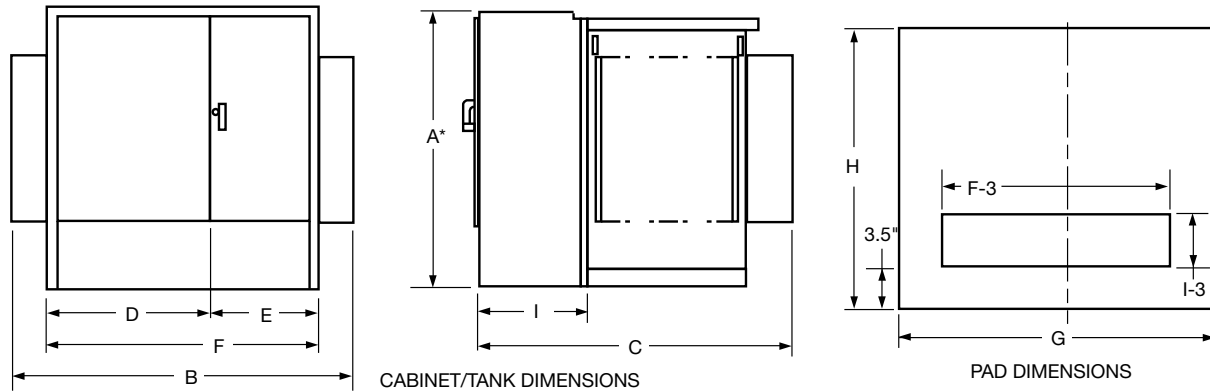


Figure 2. Transformer and pad dimensions.

* Add 9" for Bay-O-Net fusing.

Table 7. Fluid-filled—aluminum windings 55/65 °C Rise¹

65° Rise	DEAD-FRONT—LOOP OR RADIAL FEED—BAY-O-NET FUSING OIL FILLED—ALUMINUM WINDINGS										Gallons of Fluid	Approx. Total Weight (lbs.)
	OUTLINE DIMENSIONS (in.)											
kVA Rating	A*	B	C	D	E	F	G	H	I			
45	50	68	39	42	26	68	72	43	20	110	2,100	
75	50	68	39	42	26	68	72	43	20	115	2,250	
112.5	50	68	49	42	26	68	72	53	20	120	2,350	
150	50	68	49	42	26	68	72	53	20	125	2,700	
225	50	72	51	42	30	72	76	55	20	140	3,150	
300	50	72	51	42	30	72	76	55	20	160	3,650	
500	50	89	53	42	30	72	93	57	20	190	4,650	
750	64	89	57	42	30	72	93	61	20	270	6,500	
1000	64	89	59	42	30	72	93	63	20	350	8,200	
1500	73	89	86	42	30	72	93	90	24	410	10,300	
2000	73	72	87	42	30	72	76	91	24	490	12,500	
2500	73	72	99	42	30	72	76	103	24	530	14,500	
3000	73	84	99	46	37	84	88	103	24	620	16,700	
3750	84	85	108	47	38	85	88	112	24	660	19,300	
5000	84	96	108	48	48	96	100	112	24	930	25,000	
7500	94	102	122	54	48	102	100	126	24	1,580	41,900	

¹ Weights, gallons of fluid, and dimensions are for reference only and not for construction. Please contact Eaton for exact dimensions.

* Add 9" for Bay-O-Net fusing.

Table 8. Fluid-Filled—Copper Windings 55/65 °C Rise¹

65° Rise	DEAD-FRONT—LOOP OR RADIAL FEED—BAY-O-NET FUSING OIL FILLED—COPPER WINDINGS										Gallons of Fluid	Approx. Total Weight (lbs.)
	OUTLINE DIMENSIONS (in.)											
kVA Rating	A*	B	C	D	E	F	G	H	I			
45	50	64	39	34	30	64	69	43	20	110	2,100	
75	50	64	39	34	30	64	69	43	20	115	2,350	
112.5	50	64	49	34	30	64	69	53	20	115	2,500	
150	50	64	49	34	30	64	69	53	20	120	2,700	
225	50	64	51	34	30	64	73	55	20	140	3,250	
300	50	64	51	34	30	64	75	55	20	160	3,800	
500	50	81	53	34	30	64	85	57	20	200	4,800	
750	64	89	57	42	30	72	93	61	20	255	6,500	
1000	64	89	59	42	30	72	93	63	20	300	7,800	
1500	73	89	86	42	30	72	93	90	24	410	10,300	
2000	73	72	87	42	30	72	76	91	24	420	11,600	
2500	73	72	99	42	30	72	76	103	24	500	14,000	
3000	73	84	99	46	37	84	88	103	24	720	18,700	
3750	84	85	108	47	38	85	88	112	24	800	20,500	
5000	84	96	108	48	48	96	100	112	24	850	25,000	
7500	94	102	122	54	48	102	100	126	24	1,620	46,900	

¹ Weights, gallons of fluid, and dimensions are for reference only and not for construction. Please contact Eaton for exact dimensions.

* Add 9" for Bay-O-Net fusing.

Standard features

Connections and neutral configurations

- Delta - Wye: Low voltage neutral shall be a fully insulated X0 bushing with removable ground strap.
- Grounded Wye-Wye: High voltage neutral shall be internally tied to the low voltage neutral and brought out as the H0X0 bushing in the secondary compartment with a removable ground strap.
- Delta-Delta: Transformer shall be provided without a neutral bushing.
- Wye-Wye: High voltage neutral shall be brought out as the H0 bushing in the primary compartment and the low voltage neutral shall be brought as the X0- bushing in the secondary compartment.
- Wye-Delta: High voltage neutral shall be brought out as the H0 bushing in the primary compartment. No ground strap shall be provided (line to line rated fusing is required).

High and low voltage bushings

- 200 A bushing wells (15, 25, and 35 kV)
- 200 A, 35 kV Large Interface
- 600 A (15, 25, and 35 kV) Integral bushings (dead-front)
- Electrical-grade wet-process porcelain bushings (live-front)

Tank/cabinet features

- Bolted cover for tank access (45-2500 kVA)
- Welded cover with hand hole (>2500 kVA)
- Three-point latching door for security
- Removable sill for easy installation
- Lifting lugs (4)
- Stainless steel cabinet hinges and mounting studs
- Steel divider between HV and LV compartment
- 20" Deep cabinet (45-1000 kVA)
- 24" Deep cabinet (1500-7500 kVA)
- 30" Deep cabinet (34.5/19.92 kV)
- Pentahead captive bolt
- Stainless steel 1-hole ground pads (45-500 kVA)
- Stainless steel 2-hole ground pads (750-10,000 kVA)
- Parking Stands (dead-front)

Valves/plugs

- One-inch upper filling plug
- One-inch drain plug (45-500 kVA)
- One-inch combination drain valve with sampling device in low voltage compartment (750-10,000 kVA)
- Automatic pressure relief valve

Nameplate

- Laser-scribed anodized aluminum nameplate



Figure 3. Drain valve with sampler.



Figure 4. Automatic Pressure relief valve.



Figure 5. Liquid level gauge.



Figure 6. External Gauges.



Figure 7. External visible break with gauges.

Optional features

High and low voltage bushings

- 200 A (15, 25 kV) bushing inserts
- 200 A (15, 25 kV) feed thru inserts
- 200 A (15, 25 kV) (HTN) bushing wells with removable studs
- High-voltage 600 A (15, 25, 35 kV) deadbreak one-piece bushings
- Low voltage 6-, 8-holes spade
- Low voltage 12-, 16-, 20-holes spade (750-2500 kVA)
- Low voltage bushing supports

Tank/cabinet features

- Stainless steel tank base and cabinet
- Stainless steel tank base, cabinet sides and sill
- 100% stainless steel unit
- Service entrance (2 inch) in sill or cabinet side
- Touch-up paint (domestic)
- Copper ground bus bar
- Kirk-Key provisions
- Nitrogen blanket
- Bus duct cutout

Special designs

- Factory Mutual (FM)
- UL® Classified
- Triplex
- High altitude
- K-Factors
- Step-up
- Critical application
- Modulation transformers
- Seismic applications (including OSHPD)

Switches

- One, two, or three On/Off loadbreak switches
- 4-position loadbreak V-blade switch or T-blade switch
- Delta-wye switch
- 3-position V-Blade selector switch
- 100 A, 150 A, 300 A tap changers
- Dual voltage switch
- Visible break with VFI interrupter interlock
- External visible break (15, 25, and 35 kV, up to 3 MVA)
- External visible break with gauges (15, 25, and 35 kV, up to 3 MVA)

Gauges and devices

- Liquid level gauge (optional contacts)
- Pressure vacuum gauge (optional contacts and bleeder)
- Dial-type thermometer (optional alarm contacts)
- Cover mounted pressure relief device (optional alarm contacts)
- Ground connectors
- Hexhead captive bolt
- Molded case circuit breaker mounting provisions
- External gauges in padlockable box

Overcurrent protection

- Bay-O-Net fusing (Current sensing, dual sensing, dual element, high amperage overload)
- Bay-O-Net expulsion fuse in series with a partial range under-oil ELSP current limiting fuse (below 23 kV)
- Cartridge fusing in series with a partial range under-oil ELSP current limiting fuse (above 23 kV)
- MagneX™ interrupter with ELSP current-limiting fuse
- Vacuum Fault Interrupter (VFI)
- Visible break window
- Fuse/switch interlock

Valves/plugs

- Drain/sampling valve in high-voltage compartment
- Globe type upper fill valve

Overvoltage protection

- Distribution-, intermediate-, or station-class surge arresters
- Elbow arresters (for dead-front connections)

Metering/fan/control

- Full metering package
- Current Transformers (CTs)
- Metering Socket
- NEMA® 4 control box (optional stainless steel)
- NEMA® 7 control box (explosion proof)
- Fan Packages

Testing

- Customer test witness
- Customer final inspection
- Zero Sequence Impedance Test
- Heat Run Test
- ANSI® Impulse Test
- Audible Sound Level Test
- RIV (Corona) Test
- Dissolved Gas Analysis (DGA) Test
- 8- or 24-Hour Leak Test

Coatings (paint)

- ANSI® Bell Green
- ANSI® #61 Light Gray
- ANSI® #70 Sky Gray
- Special paint available per request

Nameplate

- Stainless steel nameplate

Decals and labels

- High voltage warning signs
- Mr. Ouch
- Bi-lingual warning
- DOE compliant
- Customer stock code
- Customer stenciling
- Shock and arc flash warning decal
- Non-PCB decal

Construction

Core

The three-legged, step-lap mitered core construction is manufactured using a high-quality cutting machine. For maximum efficiency, cores are precisely stacked, virtually eliminating gaps in the corner joints.

Five-legged wound core or shell-type triplex designs are used for wye-wye connected transformers, and other special transformer designs.

Cores are manufactured with precision cut, burr-free, grain-oriented silicon steel or amorphous metal, depending on customer preference or optimal material based upon performance requirements. Many grades of core steel are available for optimizing core loss efficiency.

Coils

Pad-mounted transformers feature a rectangular coil configuration with wire-wound, high-voltage primaries and sheet-wound secondaries. The design minimizes axial stress developed by short circuits and provides for magnetic balancing of tap connections.

Coils are wound using the highest quality winding machines providing exacting tension control and conductor placement for superior short-circuit strength and maximum efficiency.

Extra mechanical strength is provided by diamond pattern, epoxy-coated paper insulation, used throughout the coil, with additional epoxy at heavy stress points. The diamond pattern distribution of the epoxy and carefully arranged ducts, provide a network of passages through which cooling fluid can freely circulate.

Coil assemblies are heat-cured under calculated hydraulic pressure to ensure performance against short-circuit forces.

Core and coil assemblies

Pad-mounted transformer core and coil assemblies are braced with heavy steel ends to prevent the rectangular coil from distorting under short-circuit conditions. Plates are clamped in place using presses, and welded or bolted to form a solid core and coil assembly. Core and coil assemblies exceed ANSI® and IEEE® requirements for short-circuit performance. Due to the rigidity of the design, impedance shift after short-circuit is comparable to that of circular wound assemblies.

Tanks

Transformer tanks are designed for high strength and ease of handling, installation, and maintenance. Tanks are welded using precision-cut, hot rolled, pickled and oiled steel. They are sealed to protect the insulating fluid and other internal components.

Transformer tanks are pressure-tested to withstand 7 psig without permanent distortion and 15 psig without rupture.

Tank finish

An advanced multi-stage finishing process exceeds IEEE Std C57.12.28™-2014 standards. The eight-stage pre-treatment process assures coating adhesion and retards corrosion. It converts tank surfaces to a nonmetallic, water insoluble iron phosphate coating.

The paint method consists of two distinct layers of paint. The first is an epoxy primer (E-coat) layer which provides a barrier against moisture, salt and corrosives. The two-component urethane final coat seals and adds ultraviolet protection.

Vacuum processing

Transformers are dried and filled with filtered insulating fluid under vacuum, while secondary windings are energized. Coils are heated to drive out moisture, ensuring maximum penetration of fluid into the coil insulation system.

Insulating fluid

Eaton's Cooper Power series transformers are available with

electrical-grade mineral insulating oil or Envirotemp™ FR3™ fluid. The highly refined fluids are tested and degassed to assure a chemically inert product with minimal acid ions. Special additives minimize oxygen absorption and inhibit oxidation. To ensure high dielectric strength, the fluid is re-tested for dryness and dielectric strength, re-filtered, heated, dried, and stored under vacuum before being added to the completed transformer.

Eaton's Cooper Power series transformers filled with Envirotemp™ FR3™ fluid enjoy unique fire safety, environmental, electrical, and chemical advantages, including insulation life extending properties.

A bio-based, sustainable, natural ester dielectric coolant, Envirotemp™ FR3™ fluid quickly and thoroughly biodegrades in the environment and is non-toxic per acute aquatic and oral toxicity tests.

Building for Environmental and Economic Sustainability (BEES) total life cycle assessment software, utilized by the US Dept. of Commerce, reports its overall environmental performance impact score at 1/4th that reported for mineral oil. Envirotemp™ FR3™ fluid has also earned the EPA Environmental Technology Verification of transformer materials.

With a fire point of 360 °C, Envirotemp™ FR3™ fluid is FM Approved® and Underwriters Laboratories (UL®) Classified "Less-Flammable" per NEC® Article 450-23, fitting the definition of a Listed



Figure 8. VFI transformer with visible break.

Product per NEC®.

Pad-mounted VFI transformer

Eaton's Cooper Power series VFI transformer combines a conventional distribution transformer with the proven Vacuum Fault Interrupter (VFI). This combination provides both voltage transformation and transformer over current protection in one space saving and money saving package. The pad-mounted VFI transformer protects the transformer and provides proper coordination with upstream protective devices. When a transformer fault or overload condition occurs, the VFI breaker trips and isolates the transformer.

The three-phase VFI breaker has independent single-phase initiation, but is three-phase mechanically gang-tripped. A trip signal on any phase will open all three phases. This feature eliminates single-phasing of three phase loads. It also enables the VFI breaker to be used as a three-phase load break switch.

Due to the resettable characteristics of the VFI breaker, restoring three-phase service is faster and easier.

The sealed visible break window and switch is an option that can be installed to provide visible break contact. This feature provides enhanced safety and allows an operator to see if the loadbreak switch contacts are in an open or closed position before performing

Effective April 2016

maintenance.

Envirotran™ FM Approved special protection transformer

Eaton's Cooper Power series Envirotran™ transformer is FM Approved and suitable for indoor locations. Factory Mutual Research Corporation's (FMRC) approval of the Envirotran transformer line makes it easy to comply with and verify compliance with Section 450.23, 2008 NEC, Less-Flammable Liquid-Filled Transformer Requirements for both indoor and outdoor locations.

Envirotran FM Approved transformers offer the user the benefit of a transformer that can be easily specified to comply with NEC, and makes FM Safety Data Sheet compliance simpler, while also providing maximum safety and flexibility for both indoor and outdoor installations.

Because the "FM Approved" logo is readily visible on the transformer and its nameplate, NEC compliance is now easily verifiable by the inspector.

Envirotran FM Approved transformers are manufactured under strict compliance with FMRC Standard 3990 and are filled with



FM Approved Envirotemp™ FR3™ fluid, a fire-resistant dielectric coolant.

Special application transformers

Data Center transformer

With focus rapidly shifting from simply maximizing uptime and supporting demand to improving energy utilization, the data center industry is continually looking for methods to increase its energy efficiency and reliability. Utilizing cutting edge technology, Eaton's Cooper Power series Hardened Data Center (HDC) transformers are the solution. Designed with special attention given to surge protection, HDC liquid-filled transformers provide superior performance under the harshest electrical environments. Contrary to traditional dry-type units, HDC transformers provide unsurpassed reliability, overloadability, operational life, efficiency, thermal loading and installed footprint. These units have reliably served more than 100 MW of critical data center capacity for a total of more than 6,000,000 hours without any reported downtime caused by a thermal or short-circuit coil failure.

The top priority in data center operations is uninterrupted service. Envirotran HDC transformers from Eaton, having substantially higher levels of insulation, are less susceptible to voltage surges. Eaton has experienced zero failures due to switching transients. The ANSI® and IEEE® standard impulse withstand ratings are higher for liquid-filled transformers, making them less susceptible to insulation failure. The Envirotran HDC transformer provides ultimate protection by increasing the BIL rating one level higher than standard liquid-filled transformer ratings. The cooling system of liquid-filled transformers provides better protection from severe overloads—overloads that can lead to significant loss of life or failure.

Data center design typically includes multiple layers of redundancy, ensuring maximum uptime for the critical IT load. When best in class transformer manufacturing lead times are typically weeks, not days, an unexpected transformer failure will adversely affect the facility's reliability and profitability. Therefore, the ability to determine the electrical and mechanical health of a transformer can reduce the probability of costly, unplanned downtime. Routine diagnostic tests, including key fluid properties and dissolved gas analysis (DGA), can help determine the health of a liquid-filled transformer. Although sampling is not required for safe operation, it will provide the user with valuable information, leading to scheduled repair or

replacement, and minimizing the duration and expense of an outage. With a dry-type transformer, there is no reliable way to measure the health or likelihood of an impending failure.

Solar transformer

As a result of the increasing number of states that are adopting aggressive Renewable & Alternative Energy Portfolio Standards, the solar energy market is growing—nearly doubling year over year. Eaton, a key innovator and supplier in this expanding market, is proud to offer its Cooper Power series Envirotran transformers specifically designed for Solar Photovoltaic medium-voltage applications. Eaton is working with top solar photovoltaic developers, integrators and inverter manufacturers to evolve the industry and change the way we distribute power.

In accordance with this progressive stance, every Envirotran Solar transformer is filled with non-toxic, biodegradable Envirotemp™ FR3™ dielectric fluid, made from renewable seed oils. On top of its biodegradability, Envirotemp™ FR3™ fluid substantially extends the life of the transformer insulation, saving valuable resources. What better way to distribute green power than to use a green transformer. In fact, delaying conversion to Envirotran transformers places the burden of today's environmental issues onto tomorrow's generations. Eaton can help you create a customized transformer, based on site specific characteristics including: temperature profile, site altitude, solar profile and required system life. Some of the benefits gained from this custom rating include:

- Reduction in core losses
- Improved payback on investment
- Reduction in footprint
- Improved fire safety
- Reduced environmental impact

For the solar photovoltaic industry, Eaton is offering standard step up transformers and dual secondary designs, including 4-winding, 3-winding (Low-High-Low) and 3-winding (Low-Low-High) designs.

Wind transformer

Eaton is offering custom designs for renewable energy power generation. Eaton manufactures its Cooper Power series Generator Step-Up (GSU) transformers for installation at the base of every wind turbine. Additionally, grounding transformers are available for wind power generation.

DOE efficiency

The United States Department of Energy (DOE) has mandated efficiency values for most liquid type, medium voltage transformers. As a result, all applicable Eaton's Cooper Power series transformers 2500 kVA and below conform to efficiency levels as specified in the DOE ruling "10 CFR Part 431 Energy Conservation Program."

Underwriters Laboratories® (UL®) Listed and Labeled/Classified

The Envirotran transformer from Eaton can be specified as UL® Listed & Labeled, and/or UL® Classified. Underwriters Laboratories (UL®) listing is a verification of the design and construction of the transformer to the ANSI® and IEEE® standards. UL® listing generally is the most efficient, cost-effective solution for complying with relevant state and local electrical codes. UL® Combination Classification/Listing is another way in which to comply with Section 450.23, 2008 NEC® requirements. This combines the UL® listed transformer with a UL® Classified Less-Flammable Liquid and complies with the use restrictions found within the liquid Classification.



K-Factor transformer

With a drastic increase in the use of ferromagnetic devices, arcing devices, and electric power converters, higher frequency loads have increased significantly. This harmonic loading has the potential to generate higher heat levels within a transformer's windings and leads by as much as 300%. Harmonic loading has the potential to induce premature failure in standard-design distribution transformers.

In addition to standard UL® "K-Factor" ratings, transformers can be designed to customer-provided specifications detailing precise loading scenarios. Onsite measurements of magnitude and frequency, alongside harmonic analysis of the connected load can be performed by Eaton engineers or a third party consultant. These field measurements are used to determine exact customer needs and outline the transformer specifications.

Eaton will design harmonic-resistant transformers that will be subjected to the unique harmonic loads. These units are designed to maintain normal temperature rise under harmonic, full-load conditions. Standard UL® "K-Factor" designs can result in unnecessary costs when the "next-highest" K-Factor must be selected for a calculated design factor. To save the customer these unnecessary costs, Eaton can design the transformer to the specific harmonic spectrum used in the application. Eaton's Cooper Power series K-factor transformers are filled with mineral oil or Envirotemp™ FR3™ fluid and enjoy the added benefits of dielectric cooling such as higher efficiencies than dry-type transformers.

Modulation transformer

Bundled with an Outboard Modulation Unit (OMU) and a Control and Receiving Unit (CRU), a Modulation Transformer Unit (MTU) is designed to remotely achieve two way communication.

The use of an MTU reduces travel time and expense versus traditional meter reading performed by high voltage electricians. Additionally, with MTU it is possible to manage and evaluate energy consumption data, providing reduced metering costs and fewer tenant complaints.

An MTU utilizes existing utility infrastructure, therefore eliminating the need to engineer and construct a dedicated communication network.



Figure 9. Modular transformer.

Inverter/rectifier bridge

Eaton complements its range of applications for transformers by offering dual winding designs. These designs are intended for connection to 12-pulse rectifier bridges.

Product attributes

To set us apart from other transformer manufactures, Eaton includes the following guarantees with every three-phase pad-mounted transformer.

Engineered to order (ETO)

Providing the customer with a well developed, cost-effective solution is the number one priority at Eaton. Using customer specifications, Eaton will work with the customer from the beginning to the end to develop a solution to fit their needs. Whether it is application specific, site specific, or a uniquely specified unit, Eaton will provide transformers with the best in class value and performance, saving the customer time and money.

Made in the U.S.A.

Eaton's three-phase pad-mounted transformers are produced right here in the United States of America. Our manufacturing facilities are positioned strategically for rapid shipment of products. Furthermore, should the need arise, Eaton has a broad network of authorized service repair shops throughout the United States.

Superior paint performance

Protecting transformers from nature's elements worldwide, Eaton's E-coat system provides unrivaled transformer paint life, and exceeds IEEE Std C57.12.28™-2014 and IEEE Std C57.12.29™-2005 standards. In addition to the outside of the unit, each transformer receives a gray E-coat covering in the interior of the tank and cabinet, providing superior rust resistance and greater visibility during service.

If the wide range of standard paint selections does not suit the customer's needs, Eaton will customize the paint color to meet their requirements.

Rectangular coil design

Eaton utilizes a rectangular coil design. This winding technique results in a smaller overall unit footprint as well as reducing the transformer weight. The smaller unit size does not hinder the transformer performance in the least. Units have proven short circuit withstand capabilities up to 10 MVA.

Testing

Eaton performs routing testing on each transformer manufactured including the following tests:

- **Insulation Power Factor:** This test verifies that vacuum processing has thoroughly dried the insulation system to required limits.
- **Ratio, Polarity, and Phase Relation:** Assures correct winding ratios and tap voltages; checks insulation of HV and LV circuits. Checks entire insulation system to verify all live-to-ground clearances.
- **Resistance:** This test verifies the integrity of internal high-voltage and low-voltage connections; provides data for loss upgrade calculations.
- **Routine Impulse Tests:** The most severe test, simulating a lightning surge. Applies one reduced wave and one full wave to verify the BIL rating.
- **Applied Potential:** Applied to both high-voltage and low-voltage windings, this test stresses the entire insulation system to verify all live-to-ground clearances.
- **Induced Potential:** 3.46 times normal plus 1000 volts for reduced neutral designs.
- **Loss Test:** These design verification tests are conducted to assure that guaranteed loss values are met and that test values are

within design tolerances. Tests include no-load loss and excitation current along with impedance voltage and load loss.

- Leak Test: Pressurizing the tank to 7 psig assures a complete seal, with no weld or gasket leaks, to eliminate the possibility of moisture infiltration or fluid oxidation.

Design performance tests

The design performance tests include the following:

- Temperature Rise: Our automated heat run facility ensures that any design changes meet ANSI® and IEEE® temperature rise criteria.
- Audible Sound Level: Ensures compliance with NEMA® requirements.
- Lightning Impulse: To assure superior dielectric performance, this test consists of one reduced wave, two chopped waves and one full wave in sequence, precisely simulating the harshest conditions.

Thomas A Edison Research and Test Facility

We are constantly striving to introduce new innovations to the transformer industry, bringing you the highest quality transformer for the lowest cost. Eaton's Cooper Power series Transformer Products are ISO 9001 compliant, emphasizing process improvement in all phases of design, manufacture, and testing. We have invested millions of dollars in the Thomas A. Edison Technical Center, our premier research facility in Franksville, Wisconsin affirming our dedication to introducing new innovations and technologies to the transformer industry. This research facility is fully available for use by our customers to utilize our advanced electrical and chemical testing labs.

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For Eaton's Cooper Power series three-phase transformer product information call 1-877-277-4636 or visit: www.eaton.com/cooperpowerseries.

Appendix G

Material Safety Data Sheet
For Envirotemp FR3 Fluid

Safety Data Sheet

According to OSHA Hazard Communication Standard, 29 CFR 1910.1200

Initial preparation date: 12.14.2017

Page 1 of 8

Revision date: 05.21.2018

ENVIROTEMP™ FR3™ FLUID

SECTION 1: Identification

Product identifier

Product name: ENVIROTEMP™ FR3™ FLUID

Product code: 100088941; 100089128; 100089127; 100089129;
110013820; 110016511



Recommended use of the product and restriction on use

Relevant identified uses: Dielectric fluid

Uses advised against: Not determined or not applicable.

Reasons why uses advised against: Not determined or not applicable.

Manufacturer or supplier details

Manufacturer:

United States

Cargill, Incorporated
Cargill Industrial Specialties
13400 15th Avenue North
Plymouth, MN 55441
1-800-842-3631, 1-952-984-9122
CIS_CustomerService@Cargill.com

Emergency telephone number:

United States

ChemTel Inc

North America: 1-800-255-3924

International: 01-813-248-0585

SECTION 2: Hazard(s) identification

GHS classification: Not a hazardous substance or mixture

Label elements

Hazard pictograms: None

Signal word: None

Hazard statements: None

Precautionary statements: None

Hazards not otherwise classified: None

SECTION 3: Composition/information on ingredients

Identification	Name	Weight %
CAS number: 8001-22-7	Soybean Oil	>99

Additional Information:

*This material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)

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SECTION 4: First aid measures

Description of first aid measures

General notes:

No special measures required

After inhalation:

If inhaled, remove to fresh air
Get medical advice if you feel unwell

After skin contact:

Wash with plenty of water / soap and rinse thoroughly
Get medical advice if skin irritation occurs or you feel unwell

After eye contact:

Rinse cautiously with water for several minutes
Remove contact lenses, if present and easy to do. Continue rinsing
If symptoms persist, consult a doctor

After swallowing:

Rinse mouth and do not induce vomiting
Get medical advice if you feel unwell or concerned

Most important symptoms and effects, both acute and delayed

Acute symptoms and effects:

Any additional important symptoms and effects are described in Section 11: Toxicological Information

Delayed symptoms and effects:

Not determined or not applicable.

Immediate medical attention and special treatment

Specific treatment:

Not determined or not applicable.

Notes for the doctor:

Not determined or not applicable.

SECTION 5: Firefighting measures

Extinguishing media

Suitable extinguishing media:

Use Water (fog only), dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam

Unsuitable extinguishing media:

Do not use water as an extinguisher

Specific hazards during fire-fighting:

Thermal decomposition can lead to release of irritating gases and vapors

Special protective equipment for firefighters:

Use typical firefighting equipment, self-contained breathing apparatus, special tightly sealed suit

Special precautions:

Rags, steel wool, or waste contaminated with this product may spontaneously catch fire if improperly discarded

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures:

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Spilled material may cause a slipping hazard. Use appropriate safety equipment

Environmental precautions:

Should not be released into the environment
Prevent from reaching drains, sewers, or waterways

Methods and material for containment and cleaning up:

Large spills: Dike area to contain spill. Knock down and dilute vapors with water fog or spray. Collect with vacuum equipment or inert materials. Approach release upwind
Small spills: Absorb with non-combustible liquid-binding material (sand, diatomaceous earth (clay), acid binders, universal binders). Remove with shovel. Collect in suitable and properly labeled containers
Wash surfaces with aqueous cleaner and hot water. Used rags or other cleaning materials should be soaked with water and placed in a sealed container to prevent spontaneous combustion
Dispose of contents / container in accordance with local regulations

Reference to other sections:

Not determined or not applicable.

SECTION 7: Handling and storage

Precautions for safe handling:

Use appropriate personal protective equipment (see Section 8).
Avoid breathing mist or vapor. Use with adequate ventilation. Avoid repeated and prolonged skin contact. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse.
Surfaces of porous or fibrous materials saturated with this material can self-heat and auto ignite when exposed to air. Thin films of material on non-porous surfaces in contact with air will polymerize over time making it increasingly more difficult to clean.
Immediately after use, place rags, steel wool, or waste in a sealed water-filled metal container.

Conditions for safe storage, including any incompatibilities:

Protect material from extreme temperatures, humidity, and water prior to use. Store in labeled, tightly closed containers at 10-40° C (50-104° F) in dry, isolated and well-ventilated areas, away from sources of ignition and heat.

SECTION 8: Exposure controls/personal protection

Only those substances with limit values have been included below.

Occupational Exposure limit values:

Country (Legal Basis)	Substance	Identifier	Permissible concentration
United States (OSHA)	Vegetable oil mist	NA	OSHA PEL 15 mg/m ³ (Total); 5 mg/m ³ (Respirable fraction)
	Vegetable oil mists (except castor, cashew nut or similar irritant oils)	NA	California (OSHA) PEL 10 mg/m ³ (Total); 5 mg/m ³ (Respirable fraction)
NIOSH	Vegetable oil mist	NA	NIOSH REL 10-hr TWA 10 mg/m ³ (Total); 5 mg/m ³ (Respirable fraction)
ACGIH	Vegetable oil mists (except castor, cashew nut or similar irritant oils)	NA	ACGIH TLV TWA: 5 mg/m ³ (respirable fraction), 10 mg/m ³ (As 'Oil mist, mineral')

Biological limit values:

No biological exposure limits noted for the ingredient(s).

Information on monitoring procedures:

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Monitoring procedures should be chosen according to the indications set by national authorities or recognized standards.

Appropriate engineering controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor and mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Personal protection equipment

Eye and face protection:

Safety glasses, goggles, or face shield recommended to protect eyes from mists or splashing.

Skin and body protection:

Wear protective clothing as necessary to minimize prolonged skin contact. Selection of specific items will depend on task

Respiratory protection:

Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator.

General hygienic measures:

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Wash hands before breaks and at the end of work. Wash contaminated clothing before reusing.

SECTION 9: Physical and chemical properties

Information on basic physical and chemical properties

Appearance	Light green liquid
Odor	Slight
Odor threshold	Not determined or not available.
pH	Not determined or not available.
Melting point/freezing point	Not determined or not available.
Initial boiling point/range	>360°C (>680°F)
Flash point (closed cup)	>265°C (Closed Cup)
Evaporation rate	Not determined or not available.
Flammability (solid, gas)	Not determined or not available.
Upper flammability/explosive limit	Not determined or not available.
Lower flammability/explosive limit	Not determined or not available.
Vapor pressure	< 1.3 Pa (<0.01 mmHg)
Vapor density	Not determined or not available.
Density	0.92 g/cm ³ (7.677 lbs./gal)
Relative density	Not determined or not available.
Solubilities	Insoluble.
Partition coefficient (n-octanol/water)	Not determined or not available.
Auto/Self-ignition temperature	401-404°C (ASTM E659)
Decomposition temperature	Not determined or not available.
Dynamic viscosity	Not determined or not available.

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Kinematic viscosity	33-35 mm ² /s @ 40°C
Explosive properties	Not determined or not available.
Oxidizing properties	Not determined or not available.

Other information

SECTION 10: Stability and reactivity

Reactivity:

Does not react under normal conditions of use and storage.

Chemical stability:

Stable under normal conditions.

Possibility of hazardous reactions:

None under normal conditions of use and storage.

Conditions to avoid:

To avoid thermal decomposition, avoid temperatures > 250C

Incompatible materials:

Strong oxidizing agents.

Strong alkali.

Hazardous decomposition products:

Carbon monoxide, carbon dioxide.

SECTION 11: Toxicological information

Acute toxicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

Route	Result
Oral	LD50 > 5000 mg/kg bw (calculated)
Dermal	LD50 > 2000 mg/kg bw (calculated)
Inhalation	Acute inhalation toxicity data not available. At room temperature, exposure to vapor is minimal due to low volatility; single exposure is not likely to be hazardous

Substance data: No data available.

Skin corrosion/irritation

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to cause irritation base on component or similar materials.

Substance data: No data available.

Serious eye damage/irritation

Assessment: Based on available data, the classification criteria are not met.

Product data:

Minimal irritation or no effect expected base on component or similar materials.

Substance data: No data available.

Respiratory or skin sensitization

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to be a skin sensitizer based on animal data for similar substances.

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Substance data: No data available.

Carcinogenicity

Assessment: Based on available data, the classification criteria are not met.

Product data: No data available.

Substance data: No data available.

International Agency for Research on Cancer (IARC): None of the ingredients are listed.

National Toxicology Program (NTP): None of the ingredients are listed.

Germ cell mutagenicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to be a germ cell mutagen. In vitro and in vivo tests did not show mutagenic effects using similar materials.

Substance data: No data available.

Reproductive toxicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to be toxic to reproductive or developmental based on testing in rats for similar materials.

Substance data: No data available.

Specific target organ toxicity (single exposure)

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to cause organ damage from a single exposure.

Substance data: No data available.

Specific target organ toxicity (repeated exposure)

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to cause organ damage from prolonged or repeated exposure based on animal studies for similar materials.

Substance data: No data available.

Aspiration toxicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

No data available.

Substance data: No data available.

Information on likely routes of exposure:

No data available.

Symptoms related to the physical, chemical and toxicological characteristics:

No data available.

Other information:

No data available.

SECTION 12: Ecological information

Acute (short-term) toxicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

Fish	This product is not expected to be harmful to aquatic organisms.
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Substance data: No data available.

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Chronic (long-term) toxicity

Product data: No data available.

Substance data: No data available.

Persistence and degradability

Product data:

Readily biodegradable

Substance data: No data available.

Bioaccumulative potential

Product data:

Not expected to bioaccumulate based on testing of similar substance in fish.

Substance data: No data available.

Mobility in soil

Product data:

Product has low mobility in soil.

Substance data: No data available.

Other adverse effects: No data available.

SECTION 13: Disposal considerations

Disposal methods:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory agencies. Product and packaging must be disposed of in accordance with relevant national and local regulations. May be incinerated. Unopened product may be returned for reclamation.

SECTION 14: Transport information

United States Transportation of dangerous goods (49 CFR DOT)

UN number	Not Regulated
UN proper shipping name	Not Regulated
UN transport hazard class(es)	None
Packing group	None
Environmental hazards	None
Special precautions for user	None

International Maritime Dangerous Goods (IMDG)

UN number	Not Regulated
UN proper shipping name	Not Regulated
UN transport hazard class(es)	None
Packing group	None
Environmental hazards	None
Special precautions for user	None

International Air Transport Association Dangerous Goods Regulations (IATA-DGR)

UN number	Not Regulated
UN proper shipping name	Not Regulated
UN transport hazard class(es)	None

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Packing group	None
Environmental hazards	None
Special precautions for user	None

SECTION 15: Regulatory information

United States regulations

Inventory listing (TSCA): All ingredients are listed.

Significant New Use Rule (TSCA Section 5): Not applicable.

Export notification under TSCA Section 12(b): Not applicable.

SARA Section 302 extremely hazardous substances: Not listed.

SARA Section 313 toxic chemicals: Not listed.

CERCLA: Not listed.

RCRA: See Section 13.

Section 112(r) of the Clean Air Act (CAA): Not listed.

Massachusetts Right to Know: Not listed.

New Jersey Right to Know: Not listed.

New York Right to Know:

NA	Vegetable oil >5%	Listed
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Pennsylvania Right to Know:

8001-22-7	Soybean Oil	Listed
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California Proposition 65: Not listed.

SECTION 16: Other information

Abbreviations and Acronyms: None

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NFPA: 0-1-0

HMIS: 0-1-0

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End of Safety Data Sheet

FR3[®] fluid: Acceptable delivery specifications

Electrical Apparatus
R2000

DESCRIPTION

Cargill FR3[®] fluid is a renewable, biobased natural ester dielectric coolant for use in distribution and power class transformers where its unique fire safety, environmental, electrical, and chemical properties are advantageous. Acceptance limits for new fluid are shown in Table 1. More than 20 years of field experience - with more than two million FR3 fluid filled transformers in service - confirms excellent performance.

FR3 fluid is formulated from seed oils and performance enhancing additives. It does not contain petroleum, halogens, silicones or corrosive sulfur. It quickly and thoroughly biodegrades¹ in the environment. The fluid is non-toxic in acute aquatic² and oral toxicity tests³. The Color Green tint reflects its favorable environmental profile (See Table 2) and readily distinguishes it from petroleum based oils.

FR3 fluid has exceptionally high flash/fire points of approximately 330/360 °C - the highest ignition resistance of any high fire point dielectric fluid currently available. It qualifies as a “high-fire-point,” “less-flammable,” “IEC Class K,”

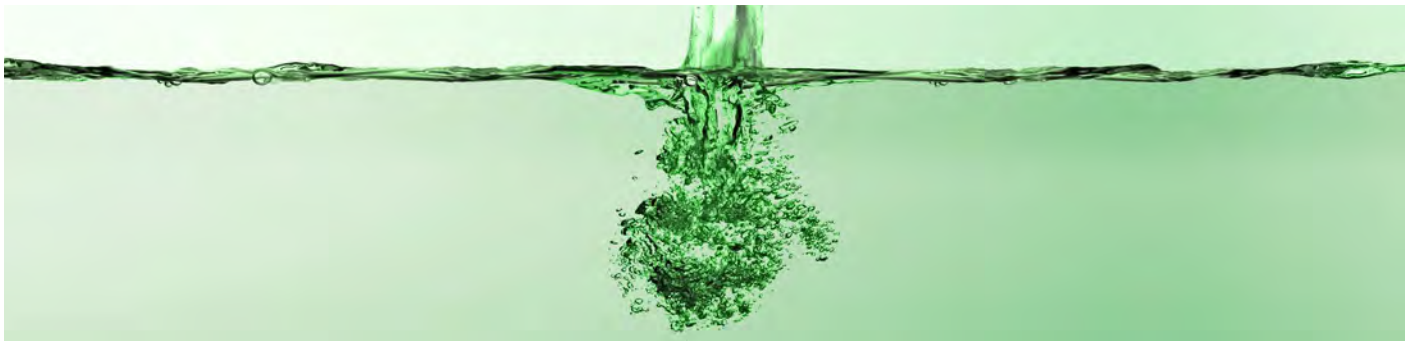
and “non-propagating” fluid. FR3 fluid is Approved⁴ by FM Global and Classified⁵ by Underwriters Laboratories as a Less-Flammable Dielectric Liquid for use in complying with the National Electric Code⁶ (NEC) and insurance listing requirements⁷.

FR3 fluid is compatible with standard transformer construction materials and components. FR3 fluid should be stored, handled, and processed in a similar meticulous manner as transformer mineral oil. See Cargill’s FR3 Fluid Storage and Handling Guide, S10, for additional information.

A transformer filled with FR3 fluid complies with the transformer temperature operating range requirements defined in IEEE C57.12.00 and IEC 60076-2.

In addition to new distribution and power class transformers, a variety of other equipment, including voltage regulators, sectionalizing switches, transformer rectifiers, and electromagnets use FR3 fluid. The fluid is also used in retrofill applications for transformers and other fluid-filled distribution and power equipment.





Acceptable limits for receipt of shipments of Cargill FR3 fluid

Table 1
FR3 fluid Acceptance Limits

PROPERTY	Standard test methods		ASTM D6871/IEEC C57.147	IEC 62770	FR3 fluid	
	ASTM	ISO/IEC	As-received new fluid property requirements	Unused new fluid property requirements	TYPICAL	
Physical						
Color	D1500	ISO 2211	≤1.0	–	0.5	
Flash Point PMCC (°C)	D93	ISO 2719	–	≥250	260-270	
Flash Point COC (°C)	D92	ISO 2592	≥275	–	320-330	
Fire Point (°C)	D92	ISO 2592	≥300	>300	350-360	
Pour Point (°C)	D97	ISO 3016	<-10	≤-10	-18 to -21	
Density at 20°C (g/cm ³)	–	ISO 3675	–	≤1.0	0.92	
Relative Density (Specific Gravity) 15°C	D1298	–	≤0.96	–	0.92	
Viscosity (mm ² /sec)						
	100°C	D445	ISO 3104	≤15	≤15	7.7 - 8.3
	40°C			≤50	≤50	32 - 34
	0°C			≤500	–	190
	-20°C					650*
Visual Examination	D1524	IEC 62770 4.2.1	bright and clear	clear, free from sediment and suspended matter	clear, light green	
Biodegradation	OECD 301B		readily biodegradable	readily biodegradable	readily biodegradable	
Aquatic and Oral Acute Toxicity	OECD 202, 203, OECD 420		non-toxic	non-toxic	non-toxic	
Electrical						
Dielectric Breakdown (kV)	D877	–	≥30	–	>45	
Dielectric Breakdown (kV)						
	1 mm gap	D1816	–	≥20	–	>25
	2 mm gap	D1816	–	≥35	–	>50
	2.5 mm gap	–	IEC 60156	–	≥35	>55
Dielectric Breakdown under Impulse (kV)						
	25.4 mm gap	D3300	–	>130	–	140
Gassing Tendency (μl/min)	D2300	–	≤0	–	-79	
Dissipation Factor						
	25°C (%)	D924	–	≤0.20	–	0.010 - 0.15
	90°C (tan δ)	–	IEC 60247	–	≤0.05	0.01 - 0.03
	100°C (%)	D924	–	≤4.0	–	1.00 - 3.85
Chemical						
Corrosive Sulfur	D1275	IEC 62697	non-corrosive	non-corrosive	non-corrosive	
Water Content (mg/kg)	D1533	IEC 60814	≤200	≤200	4 - 50	
Acid Number (mg KOH/g)	D974	IEC 62021.3	≤0.06	≤0.06	0.01 - 0.05	
PCB Content (mg/kg)	D4059	IEC 61619	not detectable	free from PCBs	not detectable	
Total Additives	–	IEC 60666	–	Max weight fraction 5%	<2%	
Oxidation Stability (48 hrs, 120°C)	–	IEC 61125 IEC 62770				
	Total Acidity (mg KOH/g)	–	IEC 62621.3	–	≤0.6	0.1 - 0.3
	Viscosity at 40°C (mm ² /sec)	–	ISO 3104	–	≤30% increase over initial	17% - 23% increase
	Dissipation Factor at 90°C (tan δ)	–	IEC 60247	–	≤0.5	0.1
Oxidation Induction Time 130°C/500psi (min)	D6186**				62±2 min	

* Measurement of viscosity near pour point may be inaccurate.

** A more specific version of the test indicated by ASTM D6186 is under development.

NOTE: Specifications should be written referencing only the defined ASTM or IEC industry standard acceptance values and test methods. The listed 'typical' values are average values summarized from a significant number of data points over many years; they are not to be identified as acceptance values.

ASTM D6871 Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus. IEC 62770: Fluids for electrotechnical applications – Unused natural esters liquids for transformers and similar electrical equipment. A transformer filled with FR3 fluid complies with the transformer temperature operating range requirements defined in IEC 60076-1.

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Table 2
FR3 fluid's environmental attributes

Attribute	Results	Method
Readily Biodegradation	Readily	EPA OPPTS 835.3110 or OECD 301B, C or F
Biodegradation	>99%	Comprehensive analysis ⁸
Acute Aquatic Toxicity	Non-toxic	OECD 203
Acute Oral Toxicity	Non-toxic	OECD 420
Biobased Material Content	>95%	USDA Biopreferred Program
Total Life Cycle Carbon Footprint	Carbon Neutral	Department of Commerce NIST BEES V4.0
Overall Environmental Impact	1/4 impact of mineral oil	Department of Commerce NIST BEES V4.0

ENVIRONMENTAL AND HEALTH

FR3 fluid is specifically formulated to help minimize health and environmental risks. The base oils come from renewable resources - commodity seeds - and are recyclable and reusable.

The US and California Environmental Protection Agencies published CARGILL FR3 fluid's Environmental Technology Verification Report in 2003. The verification process includes biodegradation and toxicity testing. Results from the aquatic biodegradation test confirm that FR3 fluid's rate of biodegradation is the same as that of the standard reference material. FR3 fluid meets the "ultimately biodegradable" criteria (Figure 1). When tested for acute oral toxicity, FR3 fluid is not toxic.

The Edible Oil Regulatory Reform Act (US Public Law 104-55, 1995) makes FR3 fluid eligible for current and future regulatory relief. The options of alternative spill response procedures, such as bio-based remediation, are now available. The fluid's inherent viscosity and tendency of thin layers to polymerize help prevent migration along the surface and into subsurface soils.

The EPA, Occupational Safety & Health Administration

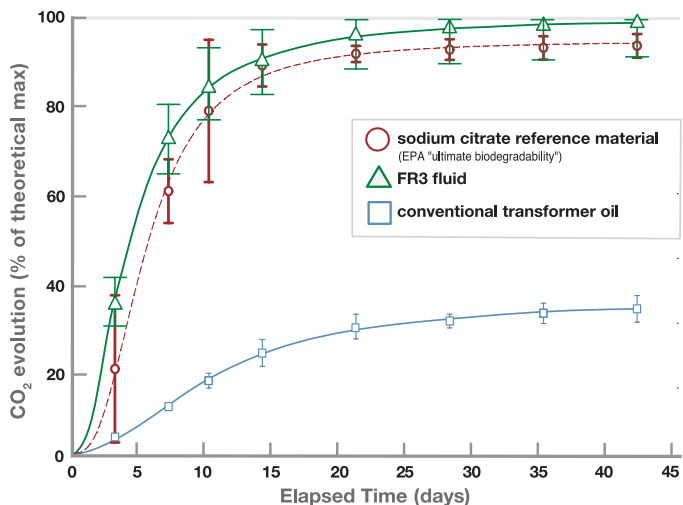


Figure 1
Aerobic Aquatic Biodegradation Graph EPA Test OPPTS 835.3100

(OSHA), and the Department of Transportation (DOT) do not list Cargill FR3 fluid as hazardous. Its Hazardous Material Information System (HMIS) rating is 1 for both health and reactivity. FR3 fluid is not classified as bio-accumulating or mutagenic. It is not listed as a carcinogen by National Toxicology Program (NTP), in International Agency for Research on Cancer (IARC) monographs, or by OSHA Regulation. The products of complete combustion of FR3 fluid are essentially carbon dioxide and water.

SUSTAINABILITY

Building for Environmental and Economic Sustainability (BEES) software⁹, available from the National Institute of Standards and Technology, uses a life-cycle assessment approach, analyzing raw material acquisition, manufacture, transportation, installation, use, and recycling and waste management, to determine a product's global warming potential.

Table 3 shows the BEES amounts of greenhouse gas generated from raw materials through end of life for mineral oil and FR3 fluid. The cost of mineral oil, in terms of carbon emissions, is expensive. Meanwhile, FR3 fluid is relatively inexpensive, about 8.2 lb/gal less green house gas emitted to produce it. Additionally, the study reports that FR3 fluid's overall environmental performance impact score is 1/4th that reported for mineral oil (and that's without consideration for FR3 fluid's transformer insulation life extending properties). This cumulative score results from adding the impacts of water intake, smog, ozone depletion, indoor air, human health, habitat alteration, global warming, fossil fuel depletion, eutrophication, ecological toxicity, critical air pollutants, and acidification.

FR3 fluid, and transformers filled with FR3 fluid are listed in the US Federal BioPreferredSM Products Program, making them readily identifiable as BioPreferred to all applicable Federal agencies. FR3 fluid is an excellent option for ISO 14000, Green Build, and other similar environmental programs that promote the use of alternative, environmentally preferable and sustainable materials and procedures.

Table 3
Greenhouse gases^a attributed to transformer fluid for its complete life cycle.

Category	Grams Per Unit ^b		Tons Per 1000 Gallons	
	Mineral oil	FR3 fluid	Mineral oil	FR3 fluid
Raw materials	1,048,184	-381,590	2.306	-0.839
Manufacturing	544,363	160,212	1.198	0.352
Transportation	122,478	71,498	0.269	0.157
Use	154,124	153,450	0.339	0.338
End of life	30,825	30,690	0.068	0.068
Total	1,899,973	34,260	4.180	0.075

^a carbon dioxide equivalents

^b In BEES 4.0e, one unit is a 1000 kVA transformer containing 500 gallons of fluid

FIRE SAFETY

FR3 fluid has a fire point of approximately 360°C, well above the minimum of 300°C required for high fire point fluid classifications. Its flash point (approximately 330°C) is higher than the fire point of most other ignition resistant dielectric fluids in use today (Figure 2).

In laboratory and full-scale ignition tests, FR3 fluid has demonstrated greater fire resistance than other dielectric fluid types. Based on large-scale arc ignition testing, FM Global concluded that the probability of a pool fire evolving from FR3 fluid was so low that a heat release rate need not be determined or considered for FM Global approval.

Based on large-scale arc ignition and hot metal ignition tests, FM Global recognizes FR3 fluid as an equivalent safeguard to space separation, fire barriers, and fire suppression systems for most installations.

FM Global recognizes FR3 fluid as a component of Approved transformers per FM Global Standard 3990. When used in transformers containing 10,000 gallons of fluid or less, transformers' separation distance to buildings and other equipment may be up to 1/10th the distance required for mineral oil filled transformers, without fire walls or deluge systems.

OSHA recognizes this FM Global standard as fitting the definition of a Listed and Labeled Product per NEC Section 110-3(b). The standard permits FR3 fluid-filled transformers to be installed indoors, typically without sprinklers or vaults, with a minimum clearance to walls of just 3 feet (0.9m).

UL Standard 340 compares the fire hazard ratings of various fluids. Figure 3 shows the favorable rating assigned to FR3 fluid.

There are no known reports of dielectric pool fires involving FR3 fluid filled transformers.

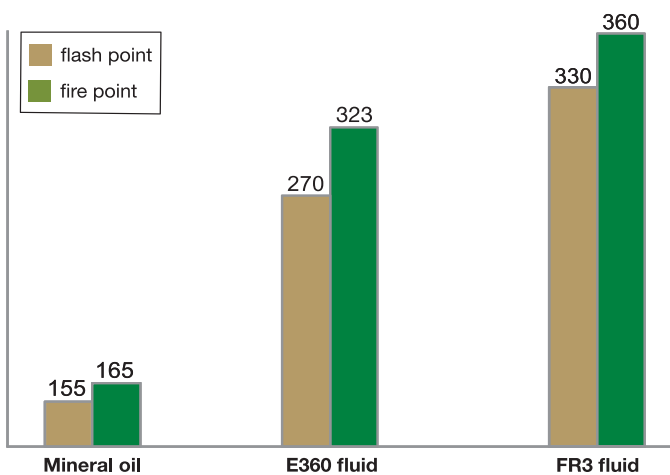


Figure 2
Flash & Fire Point of Dielectric Fluids (°C).

MEETING THE CODES

Less-Flammable fluids are recognized as a fire safeguard in Section 15 of the National Electrical Safety Code (Accredited Standards Committee C2) for generation and distribution substations. Cargill FR3 fluid meets the National Electrical Code Section 450-23 requirements as a listed less-flammable liquid. It is covered by OSHA Article §1910.305, Section 5(v).

FR3 fluid is FM Global Approved and Underwriters Laboratories Classified "Less-Flammable" per NEC Article 450-23, fitting the definition of a Listed Product per NEC. For additional information, request Cargill's NEC Requirement Guidelines 2008 Code Options for the Installation of Listed Less-Flammable Liquid Filled Transformers.

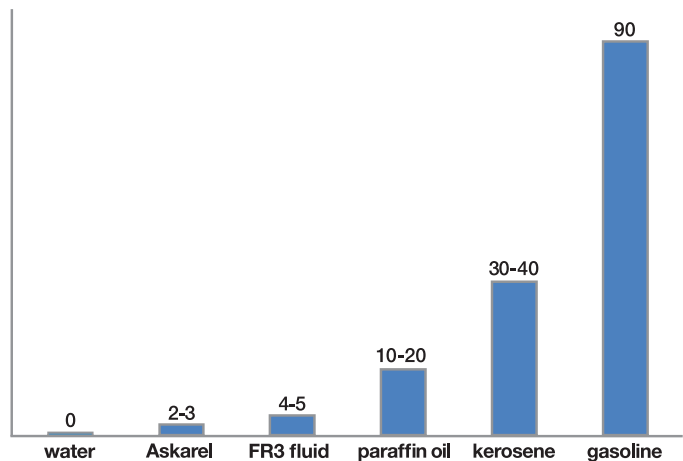


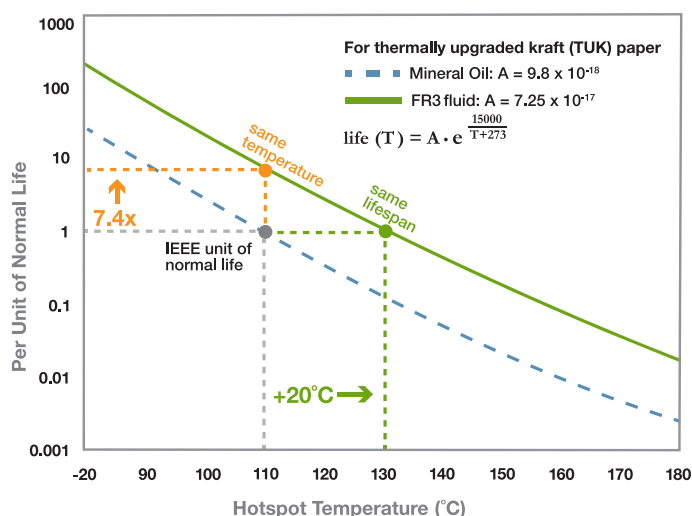
Figure 3
Fire Hazard Rating UL Standard 340.

FLUID/PAPER INSULATION SYSTEM

The unique chemical structure of Cargill FR3 fluid provides superior insulation system performance compared to other types of dielectric fluids. The thermal properties of FR3 fluid make it a more efficient coolant than higher molecular weight silicone and hydrocarbon dielectric coolants.

FR3 fluid has an exceptional ability to remove water generated by aging paper. This enables the fluid to significantly reduce the aging rate of transformer insulating paper. Per IEEE C57.100, accelerated aging tests show that Thermally Upgraded Paper (TUK) paper insulation aged in FR3 fluid takes 5-8 times longer to reach the same end-of-life points as TUK paper insulation aged in conventional mineral oil.

Table 4
Arrhenius curve for thermally upgraded kraft paper immersed in mineral oil and in natural ester liquids.



The chart presented in Table 4 brings the Arrhenius curves for TUK paper both immersed in mineral oil and in FR3 fluid, as in Annex B of IEEE C57.154 or in Annex C IEC 60076-14. The degradation rate of thermally upgraded kraft paper immersed in FR3 fluid is either reduced by 7.4x or the temperature can be increased by 20°C. Any balance in between leads to relevant benefits, including:

- Higher thermal class of cellulose insulation allows increasing average winding and hotspot temperature limits without sacrificing paper life.
- Higher thermal class of liquid insulation allows increasing average winding and hotspot temperature limits without sacrificing paper life.
- Improved transformer reliability as, in a sealed unit, moisture content remains relatively constant through the years, preserving the dielectric capacity.
- No transformer outages from drying the insulation
- Extended capability and lifespan

APPLICATIONS

New Transformers

Distribution and Power class transformers filled with FR3 fluid for indoor, submersible and outdoor applications are available from manufacturers worldwide.

For indoor applications, FR3 fluid-filled transformers provide the proven technical and performance advantages of liquid-filled designs over dry types as well as a lower total life cycle cost when compared to all other transformer types.

Many types of FR3 fluid-filled transformers are in service: polemounted, pad-mounted, networks, reactors, small, medium and large substations, transmission substations, and generator step-ups. FR3 fluid-filled transformers are accepted in both industry and government. Contact Cargill for a copy of the FR3 Fluid User's List, Bulletin B110.

Retrofilling Transformers

FR3 fluid is especially suited for upgrading the environmental and fire safety of mineral oil-filled transformers. It is miscible with mineral oil, high molecular weight hydrocarbons and other ester fluids. FR3 fluid is not miscible with silicone and should not be applied in transformers previously containing silicone. FR3 fluid can also be used in PCB (Askarel) replacement initiatives.

Additional advantages of retrofilling with FR3 fluid include high dielectric strength, better match of dielectric constant to Kraft paper insulation, excellent lubricity, material compatibility, and a coefficient of expansion similar to conventional transformer oil. FR3 fluid has superior resistance to coking and sludge formation when compared to conventional transformer oil. In addition to passing the Power Factor Valued Oxidation (PFVO) test, Doble Laboratories' Sludge-Free Life tests resulted in no measurable sludge. The fluid also acts as a drying agent for transformer insulation that has become wet from aging, extending the useful life of the transformer insulation system.

Switching Devices

With excellent dielectric strength retention (Figure 5), lubricity, and gassing tendencies, FR3 fluid is an excellent switching medium at normal operating temperatures. Proven applications include new and retrofilled sectionalizing switches and transformers with load break accessories such as Bay-O-Net and current-limiting fusing, on-off and four position switches, and Vacuum Fault Interruption protection devices.

Accelerated life tests confirm stationary contacts are most stable in FR3 fluid¹⁰. In coking tests, FR3 fluid produced less than 1/20th of the deposits that were produced in conventional mineral oil.

Due to the low temperature viscosity difference of FR3 fluid compared to conventional transformer oil, the equipment manufacturer should verify applications at low ambient temperatures.

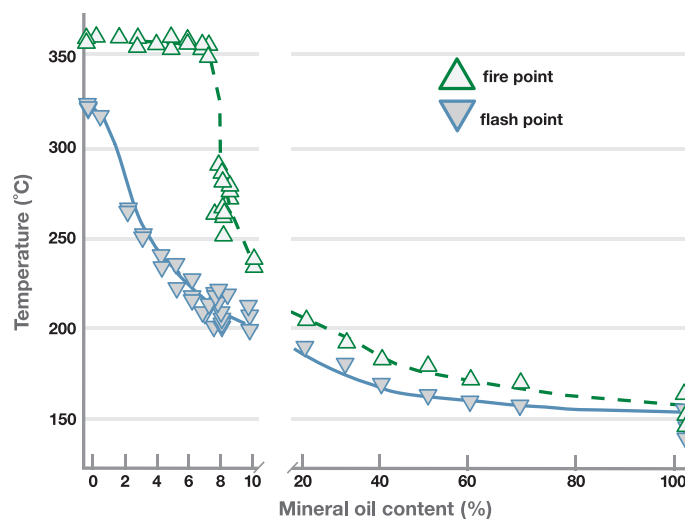


Figure 4
FR3 fluid Flash & Fire Point Variation with Conventional Transformer Oil Content.

Other applications

The inherent safety and performance properties of FR3 fluid have led to its application in electrical equipment other than transformers, including industrial electromagnets, superconducting motors, klystron modulators, transformer/rectifier sets, and heat transfer applications. FR3 fluid has excellent lubricity, an important characteristic for application in equipment with moving parts. High voltage bushing applications also appear promising due to the fluid's excellent ability to minimize insulating paper degradation and its low gassing tendency value of approximately -79 $\mu\text{l}/\text{min}$.

NOTE: The suitability of each application of FR3 fluid is the responsibility of the user. Contact Cargill for application guidelines.

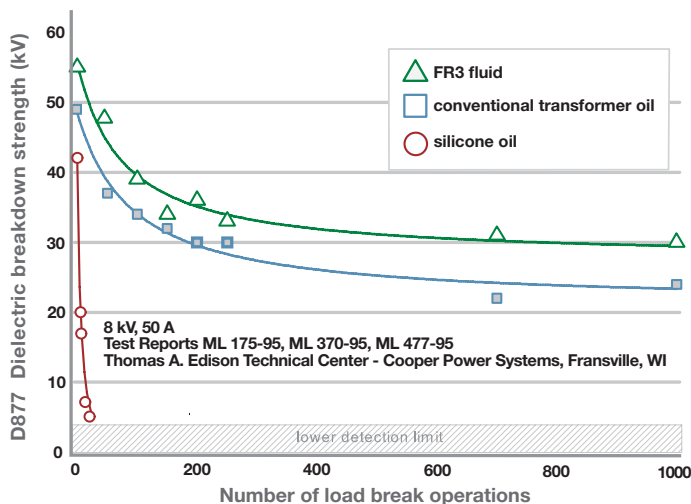


Figure 5
Fluid loadbreak dielectric strength retention comparison.

STORAGE AND HANDLING

Similar meticulous procedures for storing and handling conventional transformer mineral oil should be followed with FR3 fluid. To help maintain the extremely low percent moisture saturation at time of fluid manufacture, exposure time to air should be minimized. Drum and tote storage should be indoors or outdoors protected from the elements, including sunlight. Refer to the Cargill FR3 Fluid Storage and Handling Guide S10.



Figure 6
Prior to shipment, FR3 fluid undergoes extensive quality assurance testing. The facilities producing FR3 fluid are ISO 9001 Certified.

NOTE: To maintain the optimal fluid properties for its intended use as an electrical insulating fluid, exposure to oxygen, moisture, and other contaminants must be minimized. Except for short storage periods, material that has been immersed in FR3 fluid should not be exposed to air. Thin films of natural esters tend to polymerize much faster than conventional transformer oil. For equipment drained of FR3 fluid, it is recommended that the equipment be placed in an inert gas environment, be re-immersed in fluid, or rinsed with mineral oil. Where the transformer power factor is a concern, hot air drying is an unacceptable process for assemblies already impregnated with a natural ester fluid. For impregnated assemblies that require additional drying, method of drying that does not expose the impregnated insulation to air is required to avoid excessive oxidation of the dielectric fluid.

FLUID MAINTENANCE

Periodic preventive maintenance tests for FR3 fluid-filled equipment should follow the same schedule used for transformers filled with conventional transformer oil. Key tests on fluid samples include:

1. Dielectric Strength: The IEEE C57.147 minimum acceptable ASTM D1816, 2mm gap limits for continued use of service-aged FR3 fluid are 40 kV (≤ 69 kV), 47 kV ($69 \leq \text{kV} < 230$), and 50 kV (≥ 230 kV).
2. Flash Point and Fire Point. Small amounts of mineral oil will not significantly reduce the fire point of FR3 fluid. Contamination above 7% may lower the fire point below 300°C. If contamination is suspected the flash and fire points should be measured.
3. Dissolved gas analysis of FR3 fluid is particularly useful for high value equipment or equipment servicing critical loads.
4. Color and appearance, dissipation factor, acid number, resistivity, viscosity, and interfacial tension are indicators of possible fluid contamination or unusual degradation.

For fluid that cannot be reconditioned, disposal options include selling to lube oil recyclers, rendering companies, or providers of fuel for industrial boilers and furnaces. Used fluid uncontaminated by controlled hazardous materials does not fall under the jurisdiction of the Federal Used Oil Regulation (CFR Title 40 Part 279).

FUNCTIONAL SPECIFICATION FOR NEW CARGILL FR3 NATURAL ESTER LESS-FLAMMABLE TRANSFORMER DIELECTRIC COOLANT

1.0 Scope

1.1. This specification describes a non-toxic (in acute aquatic¹¹, and oral toxicity¹² tests), biodegradable¹³, fire resistant, bio-based¹⁴ natural ester dielectric fluid. It is intended for use in electrical equipment as an environmentally preferred, less flammable insulating and cooling medium.

2.0 Requirements

2.1 Fluid Manufacturer

Fluid manufacturer shall have a minimum of ten (10) years experience producing and testing dielectric coolants. Manufacturer upon request shall provide AC withstand and impulse withstand for both gap and creep from 3mm to 150mm.

2.2 Dielectric Coolant

The dielectric coolant shall be a biobased biodegradable, be FM Global Approved, UL® Classified as a less-flammable fluid. It shall meet the property limits listed below. The base fluid shall be 100% derived from seed oils. The dielectric coolant should have undergone accelerated aging studies via sealed tube and Lockie test methods, and have published its A & B factors.

2.3 Acceptable values for receipt of shipments of new FR3 fluid are shown in Table 1.

2.4 Environmental and Health Third Party Validations

The fluid shall have a US EPA Environmental Technology Verification (ETV) Statement published. The fluid shall meet the test limits shown in Table 2.

2.5 Packaging

The electrical insulating fluid shall be furnished in sealed vessels suitable for the purpose, including 5-gallon containers, 55-gallon drums, 330-gallon totes, or in bulk. Each vessel shall have tampering indicating devices.



3.0 Recommended Customer Receiving Quality Control

3.1 Inspection

Each lot received shall be visibly inspected for container integrity. Verify that tamper proof seals are intact and no leaks are visible.

3.2 Receiving Tests

Samples shall be taken from containers per ASTM D 923 Section 2.2, as follows:

Table 5
FR3 fluid lot size and containers sampled

Lot Size (gallons)	Number of Containers Sampled
600 or less	1
601-3000	2-6
3001 or more	6 minimum (10% of quantity of containers recommended)

When material will be combined for production, samples may be mixed together in equal proportions to create a composite sample for testing. Minimum tests required are dielectric strength and visual inspection. Dissipation factor test is highly recommended, although not essential.

4.0 Important information

4.1 Storage

Avoid storing drums and totes outdoors. Extreme temperature variations can stress the integrity of container protective seals. Exposure of totes to sunlight can cause fluid discoloration.

4.2 Intended Use

The use of electrical insulating and cooling fluid is generally dictated by the engineering design of the electrical apparatus. The electrical insulating fluid covered by this specification is intended for use as an insulating and cooling medium in electrical equipment.

4.3 Fluid Transfer

When transferring electrical insulating fluid from its original container, take care to prevent contamination with moisture, dust, and foreign matter. These impurities can cause deterioration of the dielectric strength and electrical performance.

4.4 Partial Containers

Provide nitrogen blanket for partially filled containers, and properly seal to prevent contamination.

REFERENCES AND FOOTNOTES

¹ Per OPPTS 835.3110

² Per OECD 203, Method B

³ Per OECD 420

⁴ Less-flammable transformer fluids, Approval guide – Electrical equipment, FM Approvals, FM Global, Norwood, MA, USA

⁵ EOVK.MH10678, Transformer fluids, UL Listed and Classical Products, Underwriters Laboratories, Northbrook, IL, USA EOUV.MH10678, Dielectric mediums, UL Listed and Classified Products, Underwriters Laboratories, Northbrook, IL, USA

⁶ National Electric Code, NFPA 70, National Fire Protection Association, Quincy, MA, USA

⁷ Transformers, 5-4, Property Loss Prevention Sheets, FM Global, Norwood, MA, USA

⁸ TSR IS-PG-047-1920, "Biodegradation of FR3 Fluid", Cargill technical report.

⁹ BEES, Version 4.0e, Building and Fire Research Laboratory, National Institute of Standards and Technology, August 2007, <http://www.bfrl.nist.gov/oea/software/bees/>

¹⁰ P.J. Hopkinson, L. Dix, "Tapchangers for De-energized Operation in Natural Ester Fluid, Mineral Oil, and Silicone" IEEE/PES Transmission & Distribution Conference & Exposition, July 26-30, 2009, Calgary, Canada

¹¹ Per OECD 203, Method B

¹² Per OECD 420

¹³ Per US EPA OPPTS 835.3110 and US EPA OPPTS 835.8110 (ii)

¹⁴ Per USDA Biopreferred minimum biobased content for Fluid-Filled Transformers - Vegetable Oil-Based

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ANSI® is a registered trademark of the American National Standards Institute
