Tri-Valley Transit Addison County Community Transportation Center

BUS STORAGE ADDITION FEASIBILITY STUDY

June 27, 2022



Project Team:

Architect: Black River Design, Architects (Jim Drummond, Partner and Polly Wheeler, Project Manager) Civil Engineer: VHB (Peter Smiar, Dir. of Land Development) Mechanical and Electrical Engineer: Pearson and Associates (Alan Gould, P.E. and David Anderson, P.E.)

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EXECUTIVE SUMMARY

Black River Design Architects, in partnership with the Community Transportation Association of America (CTAA), was commissioned in the spring of 2022 by Tri-Valley Transit to study the site of their Middlebury facility to assess the feasibility of a bus storage addition. The objective was to develop a conceptual design for the site and building that would house as many buses as possible inside a conditioned space and establish a conceptual project cost/budget that could be used for fundraising and scheduling.

This report therefore looks at the existing facility and site to study the physical limitations to expansion including available developable area on the site, vehicular circulation, the design of the existing building including its form and the capacity of its existing mechanical and electrical systems for expansion.



Above: An aerial view of the site. The existing TVT building is to the north, structures to the south belong to the Vermont Agency of Transportation.



BACKGROUND AND DESCRIPTION OF EXISTING ACCTC FACILITY

The existing facility is located on Creek Road, south of the village of Middlebury. Consisting of a two story 5,400 sf administrative wing and a double bay, 6,880 sf bus maintenance wing plus a single bay bus wash. The facility was designed by Black River Design Architects in 2011 and constructed in 2012.

The lot is shared with a Vermont Agency of Transportation equipment maintenance facility to the south. To the east, just beyond the gravel paved area, the land is classified as class II wetland and also has a stormwater detention pond. The property is bordered by suburban residential lots to the east and north.

The RFP gives this overview of TVT:

Tri-Valley Transit (TVT) provides public transportation services to the communities of Addison, Orange and Northern Windsor Counties in central Vermont. System hubs are located in Middlebury, Randolph and Bradford. TVT is a 501(c)3 which derives 80% of its operating/administrative funding and 90% of capital investment from government grants.

- Middlebury-based shuttle buses and paratransit rides operate from the Addison County Community Transportation Center located at 297 Creek Road.
 - *Phase I.a* of the ACCTC project was completed in 2013 and provided administrative space, bus maintenance bays, bus wash with automatic vehicle wash system fed by a rain/snow melt water collection system. The facility incorporates numerous eco-friendly features for which it has won awards.
 - *Phase I.b* was completed in 2014/15. Added a solar panel array which provides up to 80% of the ACCTC's current electricity requirements.



Above: The TVT Middlebury site from a 2012 report.

CODE REVIEW

A preliminary code review found no major constraints on the proposed addition. A 1 hr fire seperation may be required to between addition and new.

Per IBC:

- Construction type is 2B.
- Building is fully sprinkled.
- Business occupancy allowable area is 69,000 sf (office wing)
- Storage occupancy S-1 allowable area is 52,500 sf (existing maintenance bays)
- Storage occupancy S-2 allowable area is 78,000 sf (proposed storage bays)
- Total existing sf: 5,470 business + 6,880 S-1 + 6,300 max S-2 = 18,650 sf
- Overall area will easily be within IBC area limits.
- 1-hour separation is needed separating S-1 and S-2 uses. Designating the addition S-1 use (more stringent) would not require separation.

BUS FLEET AND OPERATIONAL NEEDS

The RFP for this study describes the current need as an "expansion to the existing Addison County Community Transportation Center (ACCTC) to provide ... covered bus storage for the security and weather protection of the fleet."

The program driver, described in the RFP is the need for covered, semi-conditioned space for bus storage. The buses are easier to start and waste less fuel warming up if stored in a semi-conditioned space at night. In addition there is a labor savings from the reduced labor cost for the time that would otherwise be spent clearing snow off the buses.

The RFP elaborates on the request, adding:

- maximized facility space for covered, heated fleet parking. Project must preserve exterior lot circulation so buses can still drive around the building.
- maximized rooftop solar array
- required on site parking per zoning regulations for employees and visitors, including accessible spots

Inventory of Current Bus Fleet

- 25 foot buses: four
- 30 foot buses: nine. One additional 30 foot bus anticipated.
- 33 foot buses: five
- 20 foot vans: one. One additional 20 foot van anticipated.

Proposed Garage Addition

The proposed addition in this report is a four bay, 6,300 square foot bus storage garage, added to the east wall of the existing bus wash bay. The addition will be shifted in the north-south direction to maintain the site vehicular circulation and in order not to expand the paved area for this activity further into the wetland buffer. The addition can also be shorter in height than the existing garage since the existing garage is designed to accommodate vehicle lifts for servicing vehicles whereas the addition is solely for vehicle storage.

Site Constraints Impacting the Plan of the Addition

Site constraints, including that of the space between the existing building and the wetland buffer, near the eastern boundary of the existing paved area, limit the size of the addition. Buses need to be able to circulate all the way around the building, as they currently do, but the boundary of paved area cannot be expanded east into the wetland. Therefore the proposed addition cannot be wider than the four bay design shown in this report. Furthermore, as discussed in meetings with staff, there is a need for surface bus parking space along the eastern paved boundary as the fleet size exceeds the capacity of the bus barn that will fit on the site. The site plan included in this report shows that the current fleet size can be stored using both the new storage garage and the paved area just outside to the east. The site plan reduces the existing number of parking stalls for cars by one stall to accommodate a relocation of the dumpster. The reduction does not have a zoning impact since the existing parking count is in excess of the zoning requirement and the addition does not increase the occupied area of the building or the number of employees. This parking space can be kept if the dumpster is eliminated, and trash is stored inside the building

For more information about the site refer to the engineer's site memo in this report.

Mechanical Systems Upgrades for Proposed Addition

The existing building is heated by biomass pellet boilers with propane boilers as backup. The boilers supply hot water to radiant tubing in the concrete slab floors of the vehicle maintenance and bus wash bays. Rooftop Energy Recovery Ventilation Units (ERVs) provide fresh air while transferring warmth from the exhaust to the fresh air being supplied. The current system is near its capacity so additional heating capacity must be added. This report proposes installing additional pellet boilers to supply heat to the addition. The new boilers will be installed in the mechanical mezzanine storage area. The propane boilers could be removed as pellet boilers have proven to be reliable in 10 years of building operation. There is the opportunity with this addition to eliminate the use of fossil fuels in this building. The additional pellet boilers will provide operational flexibility including a backup capacity should one of the boilers need to be taken off line for service. It should be noted that the addition will be heated at a lower temperature than the existing maintenance bays which are occupied by personnel. The heating season will likely be shorter for the storage bays as well.

Electrical Systems Upgrades for Addition: Nearly Net Zero Capable

The existing electrical system operates at approximately 50% of capacity. Therefore the existing service is adequate to supply the addition for lighting, heating and plug loads. However the system is not capable of handling the increased load that will be required for charging electric buses. To meet that requirement, this report recommends a dedicated 3-phase service for bus charging.

This report proposes two other significant changes/additions to the electrical system: increased rooftop solar collectors and a new diesel generator. The generator will be sized to maintain the plug loads and lighting and heating in the buildings during a service interruption. With the additional electricity generated by the new solar panels, the buildings, exclusive of bus charging loads, will be capable of near net zero operation.

For information about mechanical and electrical systems see the engineer's report in the appendix.

SITE CONSTRAINTS AND PERMIT MATRIX

To assist Tri-Valley Transit with planning and scoping efforts associated with the proposed addition to the east side of the existing building and revised parking configuration at its facility along Creek Road, in Middlebury (the "Project"), VHB has prepared the accompanying permit matrix to identify land use permit approvals which are expected to be required for the Project

Project Permitting Summary

The Project is not expected to require extensive land use permitting due to the fact that the proposed building addition was already depicted conceptually on the original permit plans for the facility and the supporting utility infrastructure appears to have been designed to accommodate the expanded building footprint. The accompanying matrix is organized by the regulatory agency and associated permit program, and provides guidance regarding applicability of each program at is relates to the Project.

Federal Permits

No federal permitting or approvals are anticipated to be required because there are no proposed wetland impacts and the project is located outside of FEMA flood hazard areas and historic districts.

State of Vermont Permits

The Project will require a Vermont Department of Environmental Conservation ("DEC") Wastewater System and Potable Water Supply Permit ("WW Permit") for expansion of the building footprint. The current Project does not involve adding employees or changing uses but if such changes are proposed, those would be reflected in the permit application as well along with any changes in water and sewer design flow. The Project is connected to municipal water and sewer facilities so additional capacity, if needed, should not be an issue if such changes are desired. Note that the site plans submitted for the DEC WW Permit for the existing facility depicted the TVT as being subdivided from the larger VTrans parcel. It is not clear at this time if this subdivision ever formally took place, and the subdivision is not represented in available tax maps.

As currently presented, the Project does not result in expansion of impervious surface. It should be noted that the addition of any impervious surface at the site including such minor expansions as transformer pads and mechanical or dumpsters pads or expanded gravel drive lanes will trigger the requirement to amend the existing DEC operational stormwater permit for the facility. Any such expansion could likely utilize the existing stormwater pond for treatment of runoff, but an analysis of the pond and full amendment would be required by DEC. Under the current DEC stormwater program workload at the time of writing, operational stormwater permit amendments are experiencing review times in the 6 to 8 month range.

Local Zoning

The Project is located in the Village Residential Commercial Zone (VRC) as established in the Middlebury, VT Zoning and Subdivision Regulations, effective March 21, 2018. The use table contained in Section 610 of the Bylaw does not specifically identify transit facilities as a use, however business office and motor vehicle service stations are related uses and those uses require Conditional Use Review by the administrative officer. Given the Project is simply an expansion of an existing facility, no local issues related to the Project use is anticipated and review is expected to consist of review building elevations, parking and circulation, and any lighting or mechanical equipment changes.

Section 540 of the Bylaw appears to allow for the administrative officer to exempt projects from Development Review Board review on a case-by-case basis. Further coordination with the Middlebury zoning office would be required to understand what level of review the Project would experience at the local level.

Permit Matrix Tri-Valley Transit Facility Addition 341 Creek Road, Middlebury, Vermont Prepared by: VHB Date: (5-27-2022)

<u> </u>
Yes
Potential
Not anticipated
No
Not Applicable

	Permit, Review or Approval		Agency
Federal			
U.S. Army Corps of Engineers (USACE)	Clean Water Act (CWA) Section 404 General Permit (GP) or Individual Permit (IP, depending on total impact area)		Not required. No impacts are proposed to the Class II wetland to the east.
U.S. Fish and Wildlife Service (USFWS)	Threatened and Endangered Species Takings Permit		 If tree-clearing is required, it is assumed that it will occur outside of April 15 – October 31 in order to eared bat (<i>Myotis septentrionalis</i>). USFWS consultation under Section 7 of the Endangered Species A the Project proposes to cut or clear any trees. Based on a review of the USFWS Information for Planning and Consultation (IPaC) database, there a present in the project area.
Federal Emergency Management Agency (FEMA)	National Flood Insurance Program (No-Rise Certification)		The project site is not located within a Special Flood Hazard Area (SFHA).
Advisory Council on Historic Preservation (ACHP), Vermont Division for Historic Resources (VDHP)	Section 106 of the National Historic Preservation Act		VDHP acts as the State Historic Preservation Office administering Section 106. Section 106 is trigge TVT building is not historic, and the proposed rear addition is not expected to adversely impact any
State of Vermont			
Vermont Natural Resources Board, District #9 Environmental Commission	Act 250 Land Use Permit		No Act 250 Land Use Permit was found for the project parcel using online resources. Because parce trigger Act 250 jurisdiction.
Vermont Agency of Transportation	Section 1111 Access Permit	0	Required only if additional generated PM peak hour trips exceed 75 trips. If >75 trips, a traffic study
Vermont Department of Environmental Conservation (DEC) Wetlands Program	Vermont Wetland Permit (VWP)		A Vermont Wetland DEC Permit (Project # 2012-080) was issued for the original facility development the existing facility. No permit is required provided there is no expansion into the Class II wetland of zone is proposed.
VT DEC Stormwater Section	Construction General Permit (GP 3-9020) (Low Risk Authorization)	0	Coverage under this permit is not expected to be required because the Project will likely result in le construction phase. If required, Appendix A of General Permit 3-9020 establishes a risk scoring prot the associated permitting tiers available under the General Permit. If permit coverage were to be tribute low-risk category of the General Permit

to avoid the summer roosting season of northern long-Act (ESA) will be triggered if a 404 GP is needed <u>and</u> if

are no other federally listed species known to be

ered only if federal action/authorization is required. The y adjacent historic resources.

el size is less than 10 acres, the project should not

ly would be required.

ent for Class II wetland buffer impacts at the east side of or its 50' buffer zone, or if a change of use of the buffer

ess than 1 acre of earth disturbance during the ocedure to determine a project's erosion risk score and riggered, it is expected that the Project would fall into

	Permit, Review or Approval		Agency
	Operational Phase Individual Stormwater Discharge Permit (GP 3-9050)	0	Not anticipated to be required if no expansion of impervious surface is proposed. The project site of discharge permit 6884-9015. Any expansion of impervious surface or redevelopment of greater that under VT DEC General Permit 3-9050. Coverage under this permit will require conformance with Ch 2017 Vermont Stormwater Management Manual and Rule.
VT DEC Drinking Water and Groundwater Protection Division	Wastewater System and Potable Water Supply Permit	•	This permit is required for a change in potable water supply or wastewater flows, change in numbe property boundary lines, or changes to the water and sewer service lines associated with the project provides coverage for the existing facility.
	Water Supply Construction Permit		This temporary permit is not expected to be required. This permit is typically triggered by installation extensions greater than 500-feet in length.
	Underground Injection Control Permit (UIC)		No floor drains proposed within the building.
VT DEC Watershed Management Division	CWA Section 401 Water Quality Certification		Not anticipated to be required because no wetland impacts are proposed.
VT DEC Rivers Program (River Management Subsection)	Stream Alteration Permit		No perennial stream features are present within the project area. No permit is required.
VT DEC Rivers Program (River Corridor and Floodplain Protection Subsection)	Flood Hazard and River Corridor Protection Rule (FHARC)		Project site is not within a VT DEC mapped River Corridor. Additionally, a FHARC Permit will not be designated SFHA are municipally regulated.
Municipal - Middlebury			
Planning and Zoning	Conditional Use Approval	•	Development is subject to Middlebury, VT Zoning and Subdivision Regulations, effective March 21, Review is triggered by Bylaw Section 510(I.)(D.) for alteration of a building Project Site is located within Village Res/Com (VRC) Zone in which business office and motor vehic Conditional Use Review via a Development Review Board Hearing Application will be required unle (Section 540)

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currently has coverage under existing DEC stormwater an 1/2 acre of impervious surface will require coverage hapter 22 of the Environmental Protection Rules and the

er of employees or use, change in building footprint or ect. Existing Permit #WW-9-1403 issued in 2012)

ion or relocation of a fire hydrant or for water main

e required for the project because the activities in FEMA-

, 2018 (latest revision).

cle service stations are Conditional Uses. ess exemption is granted by the administrative officer



PROPOSED SITE PLAN

PROPOSED SITE PLAN



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PROPOSED FIRST FLOOR PLAN

BLACK RIVER DESIGN, ARCHITECTS 12 © 2022. All rights reserved.



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PROPOSED ROOF PLAN

PROPOSED ELEVATIONS

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View from Creek Road showing addition towards the rear

View of Addition looking west

Bird's eye view of site, with addition, from the north east showing the direction of vehicular circulation. The addition design responds to site constraints including a wetland buffer and an existing storm water detention pond. Not shown: rooftop solar panels.

Bird's eye view of site, with addition, from the south.

3D VIEW OF PROPOSED

PROJECT COST

This feasibility study was written in 2022 during a period of construction cost instability and should be considered a snapshot in time. The costs shown are derived from a recently bid project with a price escalation factor. Future readers are advised to verify the escalation per year factors presented here before using these numbers for budgeting.

CONSTRUCTION AND SITE (Hard Costs)	
Construction Estimate (Base)	\$1,917,000
Solar array - rooftop	\$125,000
New electric service for bus charging	\$305,000
Backup generator	\$150,000
Mechanical upgrades	\$25 <i>,</i> 500
10% Contingency	\$249,700
Construction Subtotal	\$2,772,200

FEES (Soft Costs)	
Architect/Engineering Fee (8% or fixed basis)	\$221,776
A/E Fees Subtotal	\$221,776
Permit (and Testing) Fees	
State Building Permit (\$6.65/\$1000)	\$22,178
Zoning	\$515
Other Permits	\$1,000
Permit Fees Subtotal	\$23,693
Other Professional Fees	
Clerk of the Works/Owner's Representative*	\$65,000
Consultant Testing Services	\$5,000
Soil borings	\$5,000
HVAC Commissioning	\$5,000
Professional Fees Subtotal	\$80,000
Fees Contingency (10%)	\$32,547
Fees Subtotal	\$358,015
MISCELLANEOUS COSTS (Reimbursables)	
Bid Advertising*	\$500
Printing*	
Postage*	
Moving/Storage Expenses*	
Interim Financing*	
Builders Risk Insurance*	\$960
Subtotal	\$1,460
Miscellaneous Costs Contingency (10%)	\$146
Miscellaneous Costs Subtotal	\$1,606

OWNER PURCHASES	
Equipment*	
Subtotal	\$0
Owner Purchases Contingency (10%)	
Owner Purchases Subtotal	\$0
TOTAL PROJECT BUDGET	\$3,131,821
LONG DANICE DROJECT COST ESCALATION	
LONG RANGE PROJECT COST ESCALATION	
Inflation Multiplier (15% per year estimated)	
Inflation Multiplier (15% per year estimated) 2023	\$3,601,595
Inflation Multiplier (15% per year estimated) 2023 2024	\$3,601,595 \$4,141,834

*Indicates budget items to be finalized/determined by Owner

TVT Middlebury

5/27/22 (Rev 6/21/22)

Mechanical and Plumbing Assessment

Mechanical:

Existing boiler capacity Gas Boilers – 748MBH – Back up only, rarely ever used

Wood Pellet Boilers – 400MBH

Total Boiler capacity – 400MBH (Pellet Boilers only)

Existing heating Hot Water Loads

- ERV-1 210MBH Value needs to be verified, numbers in schedule do not appear complete
- ERV-2 40MBH Value needs to be verified, numbers in schedule do not appear complete.

UH-1-48.5MBH

Radiant Floor Office - 25.5MBH

Radiant Floor Garage – 119.5MBH

Total – 443MBH (based on information in mechanical schedules on previous design plans)

Looking at the pump GPM the connected load would be - 1,000MBH

Based on the pump GPM the connected load is close to the total boiler output of both the pellet and gas boilers.

Addition Mechanical:

Heating to be provided by radiant floor throughout bus storage bay.

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Ventilation and exhaust to be provided by a roof mounted energy recovery ventilation (ERU) with hot water coil. Hot water coil to temper the incoming air.

ERU to be controlled by space mounted CO and NO2 sensors and timer switch. Timer switch would allow for manual control of the system.

Addition estimated load – Based on a maximum addition of 5,000SF

Radiant Floor – 110MBH

ERV heating coil – 243MBH

Total added heating load – 353MBH

Additional boiler capacity will need to be added to the site to handle the additional load.

Would require two new wood pellet boilers connected to existing silo system.

Wood Pellet boilers to be installed on mezzanine level

Gas boilers should be removed if not in use which will provide space for the new pellet boilers.

New boiler controls to be incorporated into existing boiler controls

Plumbing:

New under slab piping for floor drains

Total of 6 new floor drains

Floor drains to match existing

Drain line to existing on the North side of the building.

Connect to existing 6" line to oil/water separator

Roof drains

2 new roof drains

Combined above grade and piped horizontally to West wall and then down to South wall

At South wall drop below slab and existing building.

Provide new hose bib on East side of building

Provide new hose bib, one each on North and South side of building

System has capacity to add these fixtures.

Compressed air – provide two (2) compressed air outlets in the addition.

Existing system should have capacity for the two additional outlets.

Existing water heater is an indirect water heater supplied by the boiler system. Remove water heater, pump and piping from boiler system and replace with air source heat pump water heater (119 gallon)

Opinion of Probably Cost:

- 1. New Addition HVAC and Plumbing \$35/SF x 5,000SF = \$175,000
- 2. Option 1 \$255,000
 - a. Remove existing gas boilers
 - b. Two (2) new pellet boilers, buffer tank, piping and pumps
 - i. The plan would be to use existing pellet silo for fuel
- 3. Option 2 \$240,000
 - a. Existing gas boiler to remain as back-up system to handle a portion of the building.
 - b. Two (2) new pellet boilers, buffer tank, piping and pumps
 - i. The plan would be to use existing pellet silo for fuel
- 4. Water heater replace indirect water heater with air source heat pump water heater \$10,500

TVT Middlebury

5/27/22

Electrical Assessment & Feasibility Study for new 5,000 SF Addition

Electrical:

Existing Electrical Service Capacity

600A 277/480V 3-phase Service – The existing service has a capacity of 400kW.

Based on information provided by GMP the existing service is approximately loaded 50%. Based on this the existing service is adequate to serve the proposed addition general receptacles, lighting, heating, and mechanical loads. The existing service is not adequate to serve electric bus charging.

In our experience, electric bus chargers have typically been 50kW DC Fast Charge and 125kW DC Fast Charge chargers. The 50kW chargers require an 80A, 480V, 3-phase feed and the 125kW chargers require a 200A, 480V, 3-phase feed. Based on these charger requirements we recommend providing a new dedicated 2000A, 480V, 3-phase service for electric bus charging. This new service can accommodate approximately (7) 50kW and (7) 125kW chargers. The approximate cost of this service and distribution to the chargers is **\$275,000**, this cost excludes the cost of the chargers, which are assumed to be provided by TVT.

Existing Fire Alarm

The existing fire alarm system has available capacity to serve new detectors and pull station in the addition, we recommend providing an additional NAC panel to the system to serve new annunciation devices, such as the required horns and strobes. The cost of these items is included in the overall cost of the addition presented by Black River Design.

Existing Tel/Data

The existing communications system has available capacity to serve any new tel/data in the new addition. One or two new tel/data drops and wifi access points are anticipated for the addition. The cost of these items is included in the overall cost of the addition presented by Black River Design.

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New Backup Generator

In order to provide backup power to the building we proposed providing an 80kW, 480V, 3-phase, diesel generator. The generator can serve convenience receptacles, lighting, building heat, overhead doors, communications, and other small miscellaneous loads designated by the owner. The distribution for this system would consist of the exterior generator, a 150A, 480V, 3-phase automatic transfer switch (ATS), and a 150A, 480V, 3-phase panelboard to provide power to 480V and 277V loads. A 75kVA step-down transformer and a 200A, 208V, 3-phase panelboard will be provided to power 120V and 208V loads. A new 150A feed from the existing main distribution panel to the ATS will be required. The approximate cost for this system is **\$150,000**.

New Addition Solar

The new addition can support approximately a 50kWDC PV solar rooftop array with an approximate yearly production of 55,000kWH. It is recommended that the new PV system be connected to the new bus charging electrical service. The approximate cost for this system **\$125,000**.