NCS
Northeast Computer Systems, Inc.

INDEPENDENT REVIEW

OF THE

OPERATION, MANAGEMENT, AND EXPANSION OF THE VERMONT HEALTH INFORMATION EXCHANGE (VHIE) NETWORK

For the
State of Vermont
Department of Information & Innovation (DII)
And
Department of Vermont Health Access (DHVA)

Submitted to the
State of Vermont, Office of the CIO
by:

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December 10, 2015

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

1.1 COST SUMMARY

IT Activity Lifecycle:	1 year (FY2016)
Total Lifecycle Costs:	$4,965,693.20[1]
Total Implementation Costs:	--
New Annual Operating Costs:	$4,965,693.20
Difference Between Current and New Operating Costs:	$ 183,904.29[2]
Funding Source(s) and Percentage Breakdown if Multiple Sources:	Global Commitment (Fed) 55% HIT Fund (State) 45%

1.2 DISPOSITION OF INDEPENDENT REVIEW DELIVERABLES

Deliverable	Highlights from the Review *Include explanations of any significant concerns*
Acquisition Cost Assessment	An "apples-to-apples" comparison of HIE costs between states may not be feasible. However, comparative figures show that: • **In a strict "bottom-line" comparison to 2 other similar state HIEs, Vermont's cost is clearly appropriate**, at $6,914,060, slightly below the average of $6,966,442. • **In a comparison of per-capita cost, Vermont's cost at $10.40 is quite high**, compared to Delaware's $7.95 and Maine's $4.92. However, if per-capita cost is inversely related to population, the cost may be in line. • A comparison of HIE funding for 8 State HIEs does seem to show an inverse relationship of cost and population, with Vermont conforming to the curve.

[1] For accuracy of comparison to previous cost, State personnel and Independent Review costs are not included in this figure. See Attachment F, Acquisition Cost Spreadsheet.

[2] FY 2015 amount of VITL O&M grant was $4,781,788.91. Current grant $4,965,693.20 - $4,781,788.91 = $183,904.29. FY 2015 grant amount supplied by DVHA.

Technology Architecture Review	Viewed in more detail from the perspective of Vermont Information Technology Leaders, Inc. (VITL), the operators of the network and grant subrecipient, VHIE exhibits characteristics favored by the IT Strategic Plan. The VITL operation has two major "sides." One side is the HIE platform and database itself, hosted and provided by primary vendor Medicity.[3] The other side is the population data analysis side, developed by VITL and hosted by RackSpace.[4] Both "sides" employ best practices for reliability and security, taking advantage of specialist resources maintained by these providers, and preventing the duplication of cost, effort, and capital at the State level.
Implementation Plan Assessment	The present grant concerns support for VITL core operations, VHIE itself, data quality activities, existing interfaces, new interfaces, continued support (and reimbursement) for provider interface development and primary care provider technical assistance, and related policy and HIE evaluation efforts, including accountability for grant funding. The project is well-managed according to PMBOK principles on both State and VITL sides. Frequent meetings and certain mutual access to project management information assures good coordination between State and VITL. The grant document spells out activities, deliverables, report deadlines, and responsibilities in a detailed manner sufficient for timely execution.
Cost Analysis and Model for Benefit Analysis	Although computing the benefits of HIEs in general, and of VHIE in particular, will require substantial research and analysis before generalized statements can be made, it is quite clear that national HIT policy and the Vermont HIT plan as part of healthcare reform policy depend on the efficient functioning of a vibrant HIE (*see Section 8 and source documents in Section 3.2 for details*). Healthcare reform efforts nationwide are betting heavily on the usefulness of HIEs in transforming healthcare, and we see no evidence to the contrary. The present grant seems a reasonable investment for the potential of a very significant return over time.

[3] VITL Chief Technology Officer, Systems Administrator, *Personal Interview* (July 17, 2015).

[4] *Ibid.*

Impact Analysis on Net Operating Costs	From 2011 – 2014, the State's Cooperative Agreement Grant from the Office of the National Coordinator (ONC), matched 90/10 with the HIT Fund, was the primary source of State funding for VITL through a grant agreement between DVHA and VITL. Since 2014, the State has used Global Commitment funding for some VHIE expenses at a match rate of 55/45 and Federal HITECH funding through a CMS fair share formula at an average match rate of roughly 75/25.. The State's current best information indicates that these federal funding sources will continue to be available for the next 5 years or more.

1.3 IDENTIFIED HIGH IMPACT &/OR HIGH LIKELIHOOD OF OCCURRENCE RISKS

NOTE: Throughout the narrative text of this document, **Risks and Issues are identified by bold red text**, and an accompanying tag (**_RISK_ID# _0_**) provides the Risk or Issue ID to reference the risk, response, and reference in the Risk Register. The following table lists the risks identified as having high impact and/or high likelihood (probability) of occurrence. Please see the **Risk & Issues Register, in Section 7.2**, for details.

Impact:	Assessment of severity of negative effect, scale of **1 – 10**, from least to most severe
Probability:	Assessment of likelihood of risk occurring, scale of **1 – 9**, from least to most likely
Risk Rating:	An assessment of risk significance, based on multiplication of **(impact X probability ratings)** (*see below*). • **1-30 = low** • **31-60 = moderate** • **61 – 90 = high**

IDENTIFIED HIGH IMPACT &/OR HIGH LIKELIHOOD OF OCCURRENCE RISKS IN THIS PROJECT

(note that rating totals are generally low; only one risk rises to moderate, and that risk has both positive/negative possible outcomes):

Risk Description	RISK RATING IMPACT/ PROB	State's Planned Risk Response	Reviewer's Assessment of Planned Response
Model for evaluation of program effectiveness is not yet well developed.	**24 8/3**	**mitigate**	**concur**
VITL does not have an established comprehensive data governance council with process.	**30 10/3**	**mitigate**	**concur**
Tension between State and VITL could result in delay **on performance of grant activities,** yet also may lead to creative solutions **to problems.**	**35 7/5**	**accept**	**concur**
The activities and deliverables itemized in the grant do not correspond on a one-to-one line item basis with the grant's budget category totals.	**27 3/9**	**mitigate**	**concur**

1.4 OTHER KEY ISSUES

none

1.5 RECOMMENDATION

We recommend without reservation that the State continue operation, management, and expansion of the VHIE network as planned, with additional attention to development of a process, within or without the grant, for the possibility of technology review as allowed by Act 54 of 1015.

1.6 CERTIFICATION

I hereby certify that this Independent Review Report represents a true, independent, unbiased and thorough assessment of this technology project/activity and proposed vendor(s).

E-SIGNED by Paul Garstki on 2015-12-15 23:17:57 GMT

Signature

December 15, 2015

Date

1.7 REPORT ACCEPTANCE

The electronic signature below represent the acceptance of this document as the final completed Independent Review Report.

E-SIGNED by Richard Boes on 2015-12-16 13:49:50 GMT

State of Vermont Chief Information Officer

December 16, 2015

Date

2. SCOPE OF THIS INDEPENDENT REVIEW

2.1 IN-SCOPE

The scope of this document is fulfilling the requirements of Vermont Statute, Title 3, Chapter 45, §2222(g):

The Secretary of Administration shall obtain independent expert review of any recommendation for any information technology initiated after July 1, 1996, as information technology activity is defined by subdivision (a)(10), when its total cost is $1,000,000 or greater or when required by the State Chief Information Officer.

The independent review report includes:

- An acquisition cost assessment
- A technology architecture review
- An implementation plan assessment (which includes a Risk Analysis)
- A cost analysis and model for benefit analysis; and
- An impact analysis on net operating costs for the Agency carrying out the activity

2.2 OUT-OF-SCOPE

- A separate deliverable contracted as part of this Independent Review may be procurement negotiation advisory services, but documentation related to those services are not part of this report.
- Total State-supplied funding for Vermont Information Technology Leaders, Inc. in FY2016 is contained in 3 agreements: contract #28155, grant #: 03410-1275-14, and grant #:03410-256-16. **The present report reviews only State of Vermont Grant Agreement #:03410-256-16 for Vermont Information Technology Leaders, Inc. , commonly referred to as 2016 OPERATION & MAINTENANCE (O&M) grant.** For purposes of explanation, clarity, and analysis, activities contained in other agreements may be referenced in the report below, but no review or evaluation of those other agreements is expressed or implied.

3. SOURCES OF INFORMATION

3.1 INDEPENDENT REVIEW PARTICIPANTS

Name	Title	Employer	Topic(s)
Susan Barrett	Executive Director	Green Mountain Care Board	GMCB oversight
Jon Brown	HIE Project Manager	Department of Vermont Health Access	Project Mgt.
John Evans	Chief Executive Officer	Vermont Information Technology Leaders, Inc.	Costs and Benefits
Michael Gagnon	Chief Technology Officer	Vermont Information Technology Leaders, Inc.	VITL Technology
Jack Green	Acting Vermont Chief Information Security Officer	Department of Information and Innovation	Security
Tim Holland	Oversight Project Manager	Department of Information and Innovation	PM Oversight
Georgia Maheras	Deputy Director of Healthcare Reform for Payment and Delivery System Reform Director, Vermont Healthcare Innovation Project	Agency of Administration	General Issues, Funding
Steven Maier	HIE Business Lead/ State HIT Coordinator	Department of Vermont Health Access	General Issues
Larry Sandage	HIE Program Manager	Department of Vermont Health Access	General Issues, Funding
Lauri Scharf	Systems Administrator	Vermont Information Technology Leaders, Inc.	VITL Technology
William Sipsey	Enterprise Architect	Department of Information and Innovation	Enterprise Architecture

3.2 INDEPENDENT REVIEW DOCUMENTATION

The following documents were used in the process and preparation of this Independent Review

Document	Source
State of Vermont, Department of Information and Innovation, *HIE Program Charter*, Oct. 21, 2014.	State Of Vermont
State of Vermont, *IT Activity Business Case & Cost Analysis: Health Information Exchange (HIE),* Oct. 14, 2014.	State Of Vermont
Vermont State Agency of Human Services, Department of Health Access, Division of Healthcare Reform, *Vermont Health Information Technology Plan (VHITP),* October 26, 2010.	State Of Vermont
Vermont Agency of Human Services, Department of Vermont Health Access, *Budget Document, State Fiscal Year 2016*, 2015.	State Of Vermont
Vermont Agency of Human Services, Health Information Exchange Program, *Post-Scope Baseline Project Status Report (PSR)*, Weekly, July – September, 2015	State Of Vermont
State Of Vermont, *Standard Grant Agreement, Vermont Information Technology Leaders, Inc., GRANT #: 3410-256-16*, Department Of Vermont Health Access, July 1, 2015.	State Of Vermont
State Of Vermont, *Standard Grant Agreement, Vermont Information Technology Leaders, Inc., GRANT #: 03410-1275-14*, Department Of Vermont Health Access, July 11, 2015.	State Of Vermont
State of Vermont, *Contract For Personal Services, Vermont Information Technology Leaders, Inc., CONTRACT #28155*, Department Of Vermont Health Access, March 12, 2015.	State Of Vermont
State of Vermont Green Mountain Care Board, *In re: Criteria for Creating or Maintaining Connectivity) to the Vermont Health Information Exchange (VHIE)*, February 27, 2015.	State Of Vermont
Justin Johnson, Secretary, Vermont Agency of Administration, *Re: Health IT-Fund Annual Report per 32 V.S.A. § 10301(g),* Memorandum to: Legislative Joint Fiscal Committee, September 2, 2015.	State Of Vermont
Robin J. Lunge, JD, Director of Healthcare Reform, *Strategic Plan for Vermont Health Reform, 2012 –2014*, Vermont Agency of Administration, July, 2012.	State Of Vermont
Vermont Information Technology Leaders, Inc., *A Year of Informing Healthcare Decisions, 2014 Annual Report*, January 15, 2015.	VITL
Vermont Information Technology Leaders, Inc., *2013 Annual Report*, January 15, 2014.	VITL
Vermont Information Technology Leaders, Inc., *VITL Business Associate Agreement*, Revised: 7/10/2014.	VITL

Vermont Information Technology Leaders, Inc., *Information Privacy and Security Management Process*, Oct. 31, 2013.	VITL
Vermont Information Technology Leaders, Inc., *Information System User Policy*, Oct. 31, 2013.	VITL
Vermont Information Technology Leaders, Inc., *Information System Access Control Policy*, Oct. 31, 2013.	VITL
Vermont Information Technology Leaders, Inc., *Financial Statements and Supplementary Information, June 30, 2014 and 2013*, September 8, 2014.	VITL
Dulluh, Ubri, and Hovey, *CASE STUDY REPORT, The State HIE Program Four Years Later: Key Findings on Grantees' Experiences from a Six-State Review*, NORC at the University of Chicago, December, 2014.	NORC
National Governors Association Center for Best Practices State Alliance for e-Health, *Sustaining State Health Information Exchange: A State Toolkit*, March, 2001	NGAC
Jacqueline DiChiara, *Improved ACO Participation Saves $240M, Says CMS Final Rule*, RevCycleIntelligence, http://revcycleintelligence.com/news/improved-aco-participation-saves-240m-says-cms-final-rule, retrieved Aug. 1, 2015.	RevCycleIntelligence
Maine HealthInfoNet, *HealthInfoNet Annual Report, 2014*, July 23, 2015.	HealthInfoNet
The Office of the National Coordinator for Health Information Technology (ONC), Office of the Secretary, United States Department of Health and Human Services, *Federal Health IT Strategic Plan, 2015-2020*, 2015.	US Dept. of Health and Human Services
Delaware Health Information Network, DHIN*: Leading Through Innovation, Annual Report 2014*, 2015.	DHIN
Niam, Yaraghi, *The Benefits Of Health Information Exchange Platforms: Measuring The Returns On A Half A Billion Dollar Investment*, Center for Technology Innovation at Brookings, May, 2015.	Brookings Institution
Southern California Evidence-based Practice Center, *Costs and Benefits of Health Information Technology*, Agency for Healthcare Research and Quality, April, 2006.	US Dept. of Health and Human Services
Health Data Archiver, *Health Data Volumes Skyrocket, Legacy Data Archives On The Rise*, http://www.healthdataarchiver.com/health-data-volumes-skyrocket-legacy-data-archives-rise-hie/ , retrieved November 11, 2015.	Health Data Archiver
HIETexas, THSA Releases Information on Interface Development Services for Texas HIEs, http://hietexas.org/news-archive/332-thsa-releases-information-on-interface-development-services-for-texas-hies September 17, 2015, retrieved November 15, 2015.	HIETexas

4. PROJECT INFORMATION

4.1 HISTORICAL BACKGROUND

The grant under review is at base an Operation and Maintenance (O&M) grant for one fiscal year (2016) of continued operation of the Vermont Health Information Exchange (VHIE). In 2009, the legislature designated the not-for-profit corporation Vermont Information Technology Leaders (VITL) as the sole operator of the nascent health information exchange (HIE)[5]. As the creation, development, and implementation of HIEs in Vermont and throughout the nation were expected to be funded initially by time-limited competitive federal grants, combined with State and regional fund sources, Vermont elected to employ a model known as "SDE-like,[6]" employing a "Single Designated Entitiy" (SDE) in the form of VITL, but receiving federal grant funds directly, and disbursing the funds as grants to VITL as VITL.

The method of implementing a state-wide HIE rests entirely at the state level, although the federal government -- especially through the HITECH Act – has provided incentive in the form of funding. The structure of the healthcare delivery and payment systems varies widely from state to state, and this fact, along with political imperatives, results in a variety of HIE implementation models. For example, some states have one or more commercial hospital systems, each of which may host its own internal HIE; and some states have a large number of payers. These realities may lead a given state to opt in favor of a "federated" HIE, facilitating connections between a number of sub-systems, or a centralized, single database, or a "hybrid" system. The database may be created by a commercial HIE developer, by internal state resources, or by a selected mix of vendors. For these and other reasons, there exists simply no single model to hold out as a "typical" state HIE.

18 V.S.A. § 9352(c) reads:

> *Health information exchange operation. VITL shall be designated in the Health Information Technology Plan pursuant to section 9351 of this title to operate the exclusive statewide health information exchange network for this State. The Secretary of Administration or designee shall enter into procurement grant agreements with VITL pursuant to 8 V.S.A. § 4089k. Nothing in this chapter shall impede local community providers from the exchange of electronic medical data.*

Vermont Information Technology Leaders, Inc., (VITL) is a non-profit, 501(c)(3) Vermont corporation[7]. The statutory designation of VITL, from which the above is extracted, along with Act 54 of 2015, defines

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[5] 18 V.S.A. § 9352(c)

[6] Dulluh, Ubri, and Hovey, *CASE STUDY REPORT, The State HIE Program Four Years Later: Key Findings on Grantees' Experiences from a Six-State Review*, NORC at the University of Chicago, p. 5 (December, 2014).

[7] Vermont Information Technology Leaders, Inc., *A Year of Informing Healthcare Decisions, 2014 Annual Report*, p.21 (January 15, 2015).

a governing board for VITL that includes significant stakeholders in the statewide HIE enterprise, including representatives of government, healthcare providers, healthcare payers, and private enterprise, to facilitate early and extensive statewide development and adoption of VHIE (while explicitly not "impeding" non-VHIE exchange of data between providers). VITL is not a part of State government.

State government provides the largest portion of VITL funding (through direct State funds and pass-through of federal funding)[8]. VITL also receives direct federal funding, program service fees, and conference revenue[9].

Vermont's healthcare landscape has some characteristics which may favor strong adoption of HIE connection by providers. Among these characteristics (but not exclusively) are: low competition among hospitals; low population density; early legislative and administrative support for an HIE, with the creation of the Blueprint and designation of VITL. Additionally, decisions taken early on -- such as the inclusive stakeholder model of the VITL board, support for vibrant Accountable Care Organizations (ACOs), inclusion of the Regional Extension Center (REC) in VITL, and a connectivity incentives for providers -- established a supportive backdrop to the HIE. As a result, although the HIE is statutorily operated exclusively by VITL, the function of the HIE is explicitly "plugged in" to the statewide health reform effort.

In light of the national and Vermont HIE landscape, VHIE can be fairly characterized in a number of ways. VHIE is considered to be a "hybrid centralized" system, consolidating all specifically HIE data in a single database system, but federating some parts of the total information network (VHIEN)[10]. Although the HIE database and platform itself are designed (with direction and collaboration from VITL) and hosted by the HIE vendor, Medicity, VITL's entire HIE operation comprises two "sides," one side being the Medicity platform, and the other side housing related VHIEN programs -- such as terminology services, clinical data warehouse, and data quality services -- hosted at RackSpace[11],[12] (see Attachment D). VITL also maintains a secure development and accounting network in its Burlington, VT, location.

Through funding provided by the American Recovery and Reinvestment Act (ARRA), VITL was designated by the State of Vermont as the REC, with responsibility to assist primary care providers in the adoption and meaningful use of electronic health records[13]. With the recent sunset of ARRA REC funding, the

[8] *Ibid.,* p.21.

[9] Vermont Information Technology Leaders, Inc., *Financial Statements and Supplementary Information, June 30, 2014 and 2013*, p. 4 (September 8, 2014).

[10] *Ibid.*

[11] VITL Chief Technology Officer, Systems Administrator, *Personal Interview* (August 17, 2015).

[12] VITL Systems Administrator, *Diagram of VITL Network Connections,* via Email (August 24, 2015).

[13] VITL Chief Technology Officer, Systems Administrator, *Personal Interview* (August 17, 2015).

State decided to continue VITL's role in this function[14]. As a result, VITL can directly assist and inform primary care providers in their connections and use of Electronic Health Record (EHR) and HIE technologies. This close integration, while not unique to Vermont, likely contributes to efficiency and rapid growth of HIE connection and use.

As anticipated, early funding for VHIE (through or from the State) was initially about 90% federal, with about 10% from the Health IT-fund, *32 V.S.A. § 10301(2*). (The Healthcare Claims Tax *, 32 V.S.A. § 10402*, imposes an approximately 1% tax on Vermont health insurance paid claims, and deposits one-fifth of this tax into the Health-IT fund.) Beginning around 2010, the federal HITECH Act, through the State HIE Program, provided a large portion of State-controlled funding. Prior to 2013, during the period which might be considered the "start-up" period for VHIE, the State granted funds to VITL in a "block grant-like" form, defining implementation activities and setting general targets for interface creation between VHIE and provider organizations. Starting in 2013, the State began to structure the grant more specifically, in 2014 settling on a combination of contract (for specific activities) and grants (for continuing projects and operation & maintenance). Currently, one contract and two grants are in force. The grants and contract are largely divided along funding source lines, leading to the "Subrecipient" designation of VITL in the current grant[15].

Early in 2015, the legislature enacted Act 54. Among other changes, Act 54 sets out some specific modifications to the relationship between VITL and State government. Especially relevant items for the present review include (1) assigning VITL budget oversight and approval (of State-funded initiatives, including Federal pass-through funding) to the Green Mountain Care Board; and (2) empowering the Secretary of Administration to request a review by the Department of Information and Innovation (DII) of VITL's HIE network architecture and security (partially the impetus for the present independent review). Some implications of these changes are discussed further below in this review.

This review concerns State of Vermont grant #: 03410-256-16, commonly called the Operation & Maintenance (O&M) grant. The grant specifically lists activities in two major areas – Base Activities and Public Health Considerations -- and a list of reporting deliverables. This division exists for clarity and convenience. Attachment A, Section 4.2.1 specifies that the "Public Health Considerations" shall be performed as part of the Base Activities. Responsibilities of both State and VITL (as Subrecipient) are spelled out in the grant.

[14] *Ibid.*

[15] *See:* State Of Vermont, *Standard Grant Agreement, Vermont Information Technology Leaders, Inc., GRANT #: 3410-256-16*, Department Of Vermont Health Access (July 1, 2015).

4.2 PROJECT GOAL

The O&M grant supports one year of continued operation and maintenance of the HIE program, while continuing the State process of clarifying and increasing accountability of funding lines and sub-projects within the HIE enterprise. The grant itself introduces the Scope of Work with the following explanation:

> *Pursuant to 18 V.S.A. § 9352, the State is awarding this grant agreement to the Subrecipient in order for the Subrecipient to operate the Vermont Health Information Exchange (VHIE) network, the exclusive statewide health information exchange network for this State. This grant supports the operation and expansion of VHIE and related products and services. The Subrecipient shall conduct the business of this agreement in coordination and collaboration with the State and its other contractors. The parties have entered into this agreement so that health information is available to Healthcare Organizations from VHIE at the point of care. It is the intent of this agreement that the information available through VHIE at the point of care will allow for measurement and improvement of healthcare outcomes over time, and that the information is up to date, accurate, and can be shared with patients and providers as necessary and appropriate. This grant agreement supports Subrecipient's maintenance and operations expenses, of State Fiscal Year 2016, for months during which progress is demonstrated through the deliverables set forth in Section 8 of this agreement*[16].

4.3 PROJECT SCOPE

IN-SCOPE

In **Attachment A, Scope of Work Performed**, the grant sets out the following[17]:

- **State Responsibilities:** 8 major and 4 sub- responsibilities, identifying information, meetings, timelines and methodologies, and personnel required for the performance of grant activities

- **Subrecipient Responsibilities:** 17 responsibilities ensuring that VITL continues to maintain all reporting, licensing, security, technology, reporting, and funding cost allocation capacities required for the performance of grant activities.

Requirements: The requirements comprise 2 lists of Activities:

- **Base Activities:** These activities cover operation, maintenance, monitoring, evaluation, and reporting of the basic HIE operation:
    - Maintenance, management, and deployment of base operations
        - Infrastructure

[16] *Ibid.*, p. 4 of 41.

[17] *Ibid.*, pp. 7-11 of 41.

        - Services
        - Data Management Services
    - Clinical Data Quality, including evaluation
    - Connectivity of HIE Infrastructure: Interface development
    - Baseline Connectivity Evaluation
    - Statewide eHealth Consulting
    - Connection to Healtheway [note: the "national HIE" effort, now called The Sequoia Project]
    - Awareness Efforts [note: this is an agreement, in compliance with Act 54 of 2015, not to use State funds for consumer advertising, marketing, etc., except as required by terms of a contract or grant]
    - Administer Interface Development Reimbursement Program
    - Quarterly Data Utilization Reporting

- **Public Health Considerations**: These activities ensure the continued linkage of VITL's core activities with specific healthcare reform priorities at the State level
    - Collaboration with VDH to support HCOs and ACOs in meaningful use and other public health initiatives
    - Support for immunization messaging and validation
    - Monthly meetings with DVH and DVHA representatives
    - Outline a plan to transmit patient data from HCOs to Vermont Cancer Registry
    - Outline a plan to support automatic immunization acknowledgments to provider organizations

We note that some of the activities above, particularly the planning activities, seem outside the strict definition of an O&M grant. However, they appear to be so closely related to routine platform functions of an HIE that we have no problem with their inclusion other than to point out the difference. The present review scope includes expansion of the network, and hence these planning activities.

- **A review of VITL's cost allocation methodology**. [This is discussed below in **Section 9. Impact Analysis on Net Operating Costs**]

- **An Independent Review** (this present review).

- **Definition of Teams and Processes for Management and Governance (of the grant activities).** This section is divided into two subsections:
    - Sprint Management Team -- managing eHealth Specialist work related to Blueprint data quality efforts
    - Executive Management Team -- overseeing grant activities.

- **Reporting Requirements and Deliverables** (see below, major Deliverables)

- **A Change Management Process**
  Standard and appropriate grant change management process applying to both State and VITL

- **A Dispute Resolution Process**
  Standard and appropriate grant dispute resolution process applying to both State and VITL

- **A Section on statements and processes ensuring appropriate use of federal monies**
  Standard state grant/contract language

- **Notices to the Parties under This Agreement**
  Standard state grant/contract language

- **State Monitoring of Contract**
  Standard state grant/contract language

OUT-OF-SCOPE

- Any activities, projects, operations, or deliverables not identified in the grant Scope of Work (grant Attachment A) are out-of-scope for the grant.

4.3.1 MAJOR DELIVERABLES

The grant deliverables -- as specific products expected to be delivered on a defined schedule -- are contained primarily in the grant Attachment A Section 8, Reporting Requirements and Deliverables, as follows:

Projects		Deliverable	Report Due Date or Report Frequency
Base Activities			
	3.13 Subrecipient's Security Plan	Subrecipient shall provide the State the Subrecipient's current Security Plan	10/31/15
	4.1.2 Baseline Data Quality Evaluation	Subrecipient shall conduct a baseline evaluation of the clinical data quality contained in VHIE according to the methodology provided by the State in Section 2.6 of this agreement	90 calendar days following receipt of the methodology detailed in Section 2.6
	4.1.2.1.2 Fiscal Year Data Quality Status	Subrecipient will provide a final SFY16 report on the status of quality of the clinical healthcare data transmitted, stored, and accessed within the Subrecipient's infrastructure	6/30/16
	4.1.4 Baseline Connectivity Evaluation	Subrecipient shall conduct a baseline evaluation of connectivity to the Vermont Healthcare Organizations	9/15/15
	4.1.4 Fiscal Year Connectivity Status	Subrecipient shall conduct a final SFY16 report of connectivity to the Vermont Healthcare Organizations	6/30/16
	4.1.4 Connectivity of HIE infrastructure	Provide report on number, site, and interface types: • In progress • Completed	Mid-month

Projects		Deliverable	Report Due Date or Report Frequency
	4.1.4 Connectivity of HIE infrastructure	Final annual report on work completed in SFY16. Report shall define how the scope work defined in section 4.1 above was completed and shall be accompanied by any supporting documentation.	6/30/16
	4.1.5 Statewide eHealth Specialist Consulting – Data Quality Initiatives	• Provide report on the identity, number, assigned resources, and status of Sprint projects in progress • Attachment of Pipeline Report to Progress Report	Mid-Month
	4.1.9 Quarterly Data Utilization Reporting	Subrecipient shall report quarterly on the operational measurements of clinical healthcare data transmitted, stored, and accessed within the Subrecipient's infrastructure	Quarterly

5. ACQUISITION COST ASSESSMENT

Acquisition Costs	Cost	Comments
Hardware Costs	$290,479.85	
Software Costs	$785,268.74	
Implementation Services	$756,541.24	
System Integration Costs	$409,813.37	
Professional Services VITL (e.g. Project Management, Technical, Training, etc.)	$2,723,590.00	
Professional Services State	$227,951.00	
Independent Review	$16,750.00	
Total Acquisition Costs	**$5,210,394.60**	

For breakdown of above figures, see **Attachment F, Acquisition Cost Spreadsheet**

5.1 COST VALIDATION:

State business and project personnel reviewed for us the process of grant funding for this grant, both in the context of historical funding and specifically for FY2016. Initial grant estimates originated with the State, although determined in light of VITL-supplied budget estimates. Agency of Administration and DVHA worked closely with the Governor's Office and Legislature to refine and adjust grant amount throughout the grant budget and overall State budget development process. The State also employed frequent consultation with VITL.

During this review, we elicited State estimates of State personnel required for this grant. These estimates are shown in Attachment G, State Project Personnel. When an exact cost for any individual is not known we used a standard $55/hr rate. We add the total figure, and the actual Independent Review cost, to the Total Acquisition Costs above, although these amounts are naturally not included in the grant, as they do not go to VITL.

5.2 COST COMPARISON:

This review concerns the FY16 O&M grant for VITL/VHIE operation. However, the separation of functions and costs among contract and grants, while logical and useful for purposes of funding and accountability, creates difficulties for evaluating the costs against those of other states, who do not necessarily use comparable categories. For this reason, the following comparisons use the expenses and funding of VHIE/VITL as a whole, and not just of the O&M grant. We believe this results in a more useful comparison.

Comparing the cost of Vermont's VHIE to other state HIE's is not a simple matter. For one thing, there are few state HIE's as well developed as Vermont's. For another, Vermont has chosen a path of aggressively timed and functionally far-reaching healthcare reform, the HIT portion of which depends upon early and extensive employment of a near-universal HIE, while other states may choose a different approach.

Probably all existing state HIE's may be said to be still in a development stage. As new functions are brought online, implementation costs incur, while other functions mature and settle into operation/maintenance cost modes. The different models of HIE purpose, participation, and funding, mentioned above, complicate our comparison. Nonetheless, we can gain a certain amount of insight into comparative costs by looking at a recently published report of annual expense for a number of state HIE's. All these states, like Vermont, participated in the Federal HITECH program State Health Information Exchange Cooperative Agreement Program.

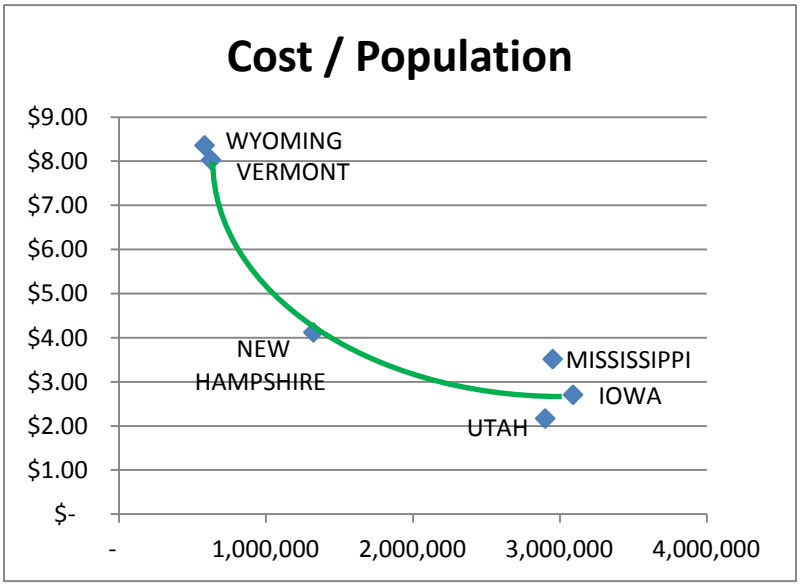
The recent (December, 2014) NORC comparative study of six state HIEs[18] -- including Vermont's VHIE -- includes information used to create the following table. The funding shown is the grant amount received from the Federal HITECH program. The amount shown is not the full cost of an HIE, but may be assumed to be a significant portion of the start-up, or acquisition cost.

State	Population	HITECH funding	Cost / Population
IOWA	3,090,416	$ 8,375,000	$ 2.71
MISSISSIPPI	2,951,996	$ 10,387,000	$ 3.52
UTAH	2,900,872	$ 6,296,705	$ 2.17
NEW HAMPSHIRE	1,323,459	$ 5,457,856	$ 4.12
VERMONT	626,630	$ 5,034,328	$ 8.03
WYOMING	582,658	$ 4,873,000	$ 8.36

[18] Dulluh, Ubri, and Hovey, *CASE STUDY REPORT, The State HIE Program Four Years Later: Key Findings on Grantees' Experiences from a Six-State Review*, NORC at the University of Chicago, Appendix A (December, 2014).

NOTE: The above figures, including VITL's, are taken from the NORC report and should not be assumed to represent financial statements or audits, either for VITL or any of the other entities. They are used here because they were gathered by the NORC study and are thought to represent comparable figures taken at a comparable timeframe. Since the study was conducted in 2014, it does not reflect the current grant cost.

Obviously, no simple comparison is apparent. On a straightforward cost/population basis, Vermont's HIE seems to be expensive (acknowledging the significant unknowns, as described above). However, we have noticed that a closer look shows that there may be an inverse relationship between cost and population size, as demonstrated graphically below. Of course, this sample of 6 is very small; yet we may be seeing the result of an economy of scale.



Various interpretations may apply: Larger states may get better offers from HIE hosting and developer firms. Or, larger states may have more existing internal technical resources that the HIE may draw upon, not reflected in these simple totals.

Since participants in this federal funding self-select, and as the sample is small, forces other than economy of scale may be in play. The NORC study attempts to catalogue several features of each state's healthcare "landscape" and market forces (such as prevalence of hospital competition), to conclude that low hospital competition results in a more "active" HIE (by metrics -- mostly counting interfaces -- defined in the study), but states no conclusions about the effect of these realities on baseline costs[19].

[19] *Ibid.*, p. 6.

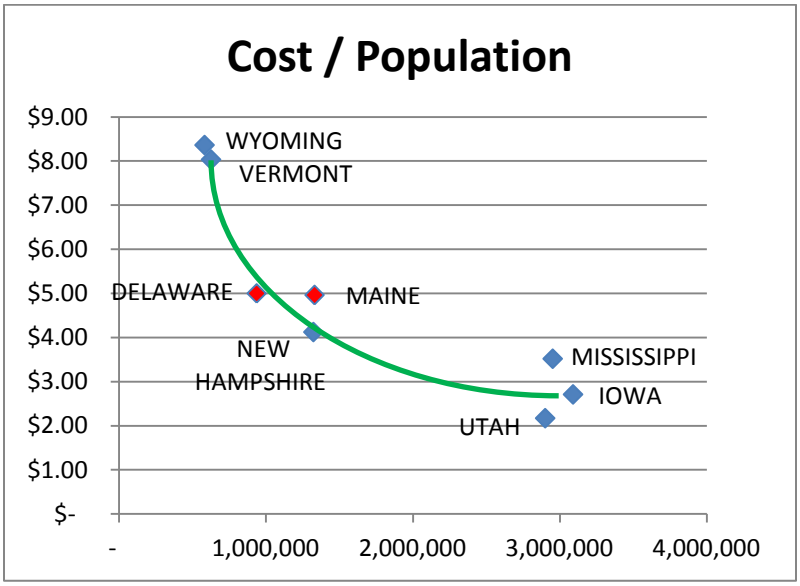
Whatever the reason, it does seem from this simple comparison that Vermont's HIE costs are not out of line.

We asked both State and VITL representatives to select a state HIE which might be held to be comparable to Vermont's VHIE (not specifically in terms of cost, but rather holistically). A State participant suggested Maine's Health Infonet (HINFONET) as comparable[20], and VITL suggested Delaware's Delaware Health Information Network (DHIN)[21]. Both suggestions are good and reasonable. DHIN is particularly similar in terms of governance structure and primary platform vendor (Medicity), as well as small population. Neither resembles Vermont in terms of sustainability model (more of which below).

As HITECH funding has ended, we construct the following table using the HITECH grant funding for these HIEs.

State	Population	HITECH funding	Cost / Population
DELAWARE	935,614	$ 4,680,284	$ 5.00
MAINE	1,330,000	$ 6,599,401	$ 4.96

If we plot these on the graph already derived above, we can see a reasonably consistent result:



Using this limited data, then, Vermont's HIE cost seems to be roughly consistent with that of other states.

[20] Director, Vermont Healthcare Innovation Project, *Personal Interview* (August 3, 2015).

[21] VITL Chief Technology Officer, *Personal Interview* (August 17, 2015).

To compare the annual ongoing cost to State resources of HIEs, we might usefully compute a per-capita cost of State funds only. VITL receives funding from a number of sources: State, Federal (direct and State pass-through), program service fees, and annual conference income. In FY2014, non-federal funding accounted for $3,304,951 of VITL's support in 2014[22]. Taking Vermont's population as 626,630, the per-capita cost was **$5.27**. In comparison, Delaware's DHIN, with expenses of $7,440,227 for the same period (FY2014), and federal funding of $1,804,870, has a non-federally funded per-capita cost of **$6.02**. (DE pop 935,614)[23]. (Maine's current funding model does not allow a direct comparison in this manner.)

Non-federal, State-supplied funds accounted for $3,202,054 of VITL's support in 2014[24]. Taking Vermont's population as 626,630, the per-capita cost to State-funds only was **$5.11.**

If we include all State and Federal funding in VITL's support, for a total of $6,521,243, the per-capita cost is **$10.40**. But, when including federal funding, we should also be aware that individuals who receive healthcare in Vermont do not all reside here. The number of discrete persons in the Master Person Index (MPI) -- currently about 1.6 million -- includes individuals who receive care in Vermont but do not reside here as well as residents. This total may be proportionately higher than that of some other States, as a factor of geography and the proximity of healthcare facilities to the borders of neighboring states. Taking the figure of 1.6 million as an denominator when including all State *and* Federal funding, the per-capita cost for VHIE is **$4.08**[25].

Finally, taking as a point of comparison the total ***expense*** of operating an HIE, for our 3 comparison states, we derive the following information:

State	Population	2014 Total Expense	Per-capita Expense
DELAWARE	935,614	$ 7,440,227	$ 7.95
MAINE	1,330,000	$ 6,545,039	$ 4.92
VERMONT	626,030	$ 6,914,060	$ 11.04

It is important to keep in mind that this sample is very small. The "bottom line" cost for all three States are not greatly differing, with an average cost of $6,966,442. . As a per-capita function, the graph from this table (below) shows a similar inverse relationship of population and expense as our graphs above, with Vermont's cost quite high in comparison to the others.

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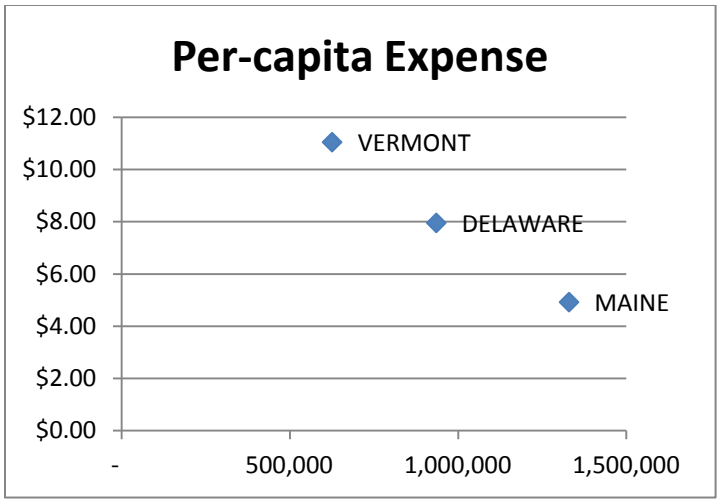
[22] Vermont Information Technology Leaders, Inc., *A Year of Informing Healthcare Decisions, 2014 Annual Report*, p. 21 (January 15, 2015).

[23] Delaware Health Information Network, *DHIN: Leading Through Innovation, Annual Report 2014*, p. 49 (2015).

[24] Vermont Information Technology Leaders, Inc., *A Year of Informing Healthcare Decisions, 2014 Annual Report*, p. 21 (January 15, 2015).

[25] VITL CEO, *Email response to questions* (August 25, 2015).



5.3 COST ASSESSMENT:

An "apples-to-apples" comparison of HIE costs between states may not be feasible, for several reasons:

- **HIEs are implemented with different objectives and timelines in different States. HIE operation is a manifestation of each State's healthcare policy objectives.**
- **HIEs in general are not fully matured, but in the process of development. Therefore, target objectives, even if similar, may not be reached in the same order, affecting the way cost is distributed year by year.**
- **Federated models in States which have a number of privately owned HIEs (such as hospital system HIEs) may not reflect the true cost of a State HIE.**
- **Differing models of sustainability complicate determination of actual costs.**

With this in mind (and acknowledging the small sample size), we may look at the above comparative data in a number of ways to draw these conclusions:

- **In a strict "bottom-line" comparison to 2 other similar state HIEs, Vermont's cost is clearly appropriate, at $6,914,060, slightly below the average of $6,966,442.**
- **In a comparison of per-capita cost, Vermont's cost at $10.40 is quite high, compared to Delaware's $7.95 and Maine's $4.92. However, if per-capita cost is inversely related to population, the cost may be in line.**
- **A comparison of HIE funding for 8 State HIEs (above) does seem to show an inverse relationship of cost and population, with Vermont conforming to the curve.**

6. TECHNOLOGY ARCHITECTURE REVIEW

6.1 ARCHITECTURE OVERVIEW

The Vermont HIE may be considered a key component of the State HIT data system. As the central collection point and exchange mechanism of clinical data, and a major source of historical clinical data for analysis and healthcare reform efforts, it serves two closely related but conceptually distinct functions: (1) The HIE facilitates the efficient and timely exchange of "live" clinical information associated with patients, to afford improved healthcare costs and outcomes at the provider/patient level; (2) The HIE serves as an essential source of aggregate and historical clinical data, to inform healthcare data analysis (i.e., "analytics"), for purposes of improving healthcare costs and outcomes at the population level (e.g., Statewide, ACO, provider, FQHC, nationwide).

The HIE does not stand alone in its data role: other significant databases -- the VHCURES All Payer Claims Database; smaller, non-state-wide HIE's; the blueprint Clinical Registry -- contribute to the overall Vermont HIT data landscape as well. Without providers and payers supplying primary data to the system, there would be no data to use. The diagram in **Attachment A** shows a high-level view of the intended interconnectivity of data sources, databases, and data users in the Vermont HIT vision (not all connections have yet been implemented; some connections will require technical solutions to compatibility questions, some connections may require policy or privacy issues to be settled administratively and/or politically first, some are awaiting implementation at a later stage). Obviously, the flow and use of data is complex, most of the diagram concerns connections well outside the scope of the present grant and of VHIE.

Attachment B shows a schematic view of VHIE "eco-system." (Also extracted from the VHITP) This diagram shows more clearly the functional data exchange relationships between HIE, State government, healthcare providers, and payers.

The present grant concerns support for VITL core operations, VHIE itself, data quality activities, existing interfaces, new interfaces, continued support (and reimbursement) for provider interface development and primary care provider technical assistance, and related policy and HIE evaluation efforts, including accountability for grant funding.

In order to achieve the functions and relationships described above, VITL physically implements VHIE and associated VITL functions as three interconnected systems (**Attachments C and D**):

- VHIE platform itself,
    - Software As A Service (SaaS) provided since 2013 by Medicity
- VITL data use system, used for data quality services, clinical data warehouse, analytics, Docsite, terminology mapping, Blueprint Clinical Registry connection, and related functions
    - Hosted in 2 Rackspace Data Centers
- VITL Office Network, used for development work, including interface development, Accounting, and other VITL internal functions

- Situated in a physically and logically secure environment at VITL's Burlington, VT, location

The data sources and destinations that connect to VHIE use secure circuits (e.g., VPN) over public networks.

The HIE term "interface" refers not to a physical connection but to a higher level logical software transfer mechanism to ensure that a data source -- which may for example be a provider's EHR system -- can send data to a destination -- which may for example be VHIE -- in a format that will be correctly received without any loss, misplacement, or misinterpretation of data. Each type of data (e.g., lab result, Continuity of Care Document), moving from data source to destination (e.g., a provider to VHIE), comprises an interface. Data moving in the other direction (e.g., from VHIE to provider) is a separate interface. In 2015, VITL reports a total of 91 hospital interfaces and 746 non-hospital interfaces (primary care organizations, specialty care organizations, FQHCs, designated agencies, long term care services, home health agencies, and commercial labs)[26].

Interface development refers to the professional activity of creating the customized software linkage described above. This development takes place in at least 3 possible venues:

1. Commercial EHR vendors form the first choice for interface development. Ideally, a vendor will want to create the interface(s) between its product and VHIE, to improve functionality and EHR customer satisfaction. However, in fact the vendor may not have the capacity or willingness to respond quickly enough to meet the State's need.
2. Externally contracted developers may be engaged to create the interfaces. This has been the general approach for VHIE in the past.
3. Internal resources at VITL may create the interfaces. VITL informs us that this internal activity is increasing.

We note that the grant supports internal VITL development of interfaces. However, in internal projects, the State generally prefers to outsource development activity, for reasons of cost effectiveness, flexibility, and access to existing expertise. Strictly speaking, interface development might not be viewed as part of operations. (At least one state HIE (HIETexas) has published a list of HIE interface vendors as a result of a Request for Information issued this year.)[27] We do not here suggest that the approach funded by the present grant is either the right or wrong approach, but it is a topic that bears further discussion between State and VITL.

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[26] Vermont Information Technology Leaders, Inc., *A Year of Informing Healthcare Decisions, 2014 Annual Report*, p. 6 (January 15, 2015).

[27] HIETexas, *THSA Releases Information on Interface Development Services for Texas HIEs*, http://hietexas.org/news-archive/332-thsa-releases-information-on-interface-development-services-for-texas-hies September 17, 2015 (Retrieved November 15, 2015).

(It is worth pointing out that the clinical data in VHIE is not at this point linked to payer data residing in the VHCURES APCD. Such a linkage is desirable for analysis and planning purposes, and forms a part of the long-range plans of the State, the GMCB (for VHCURES), and VITL (for VHIE). This effort is not in-scope for the current grant.)

6.2 DATA STANDARDS

VHIE was designed from inception to strongly support and utilize national data standards for health information. This design decision supports robustness in the implemented system, but it is forward-looking as well: As described above, although VHIE is initially confined largely to the State of Vermont, the national vision -- as well as the regional vision from State and VITL -- sees VHIE as interconnecting with national infrastructure, such as the Sequoia Project, other HIT systems at the federal level, and other regional systems, such as New York's HIXNY[28]. The eHealth Exchange Testing Program of the Sequoia project tests compliance for Health Information Exchange (HIE) standards as required by the eHealth Exchange Coordinating Committee for connecting to the national eHealth Exchange network[29]. VHIE has been validated for this compliance, one of the first state HIE's to receive this acknowledgment of interoperability[30].

The need to keep Vermont's providers and HIE compliant with Meaningful Use requirements also drives the need for employment of national data standards. Impending Stage 3 Meaningful Use requirements will be stringent and extensive.

HIE data standards are commonly implemented as connectivity criteria. Connectivity criteria define the precise format and content of data messages sent from provider to HIE (and hence from HIE to other provider and/or data user). The overarching standard for such messages is called Health Level 7 (HL7), and is further subdivided into specific interface types. VITL currently defines interface specifications for the following HL7 message types[31]:

Interface Type	Interface Name
Patient Demographics	Admit/Discharge/Transfer (ADT)
Laboratory Results	Laboratory Results (ORU format)

[28] VITL Chief Technology Officer, *Personal Interview* (August 17, 2015).

[29] The Sequoia Project, *eHealth Exchange Testing Program,* http://sequoiaproject.org/ehealth-exchange/testing-overview/, (retrieved Sept. 30, 2015).

[30] VITL Chief Technology Officer, *Personal Interview* (August 17, 2015).

[31] VITL, *Network Specifications,* https://www.vitl.net/explore/network-specifications (retrieved Sep 5, 2015).

Pathology Results **Radiology Reports** **Transcribed Reports**	Textual Reports (ORU format) or Textual Reports (MDM format)
Immunizations	Immunization (VXU)
Continuity of Care Documents	Consolidated Clinical Document Architecture (C-CDA)

Under 18 V.S.A. § 9352(i)(2), Vermont Information Technology Leaders (VITL) must "establish criteria for creating or maintaining connectivity to the State's health information exchange network" and provide those criteria to the Green Mountain Care Board (the "Board") by March 1 each year.

While the concept of common connectivity criteria seems straightforward, in practice adherence to the criteria is fraught. Vermont providers employ at least 70 different EHR systems[32]. Many of those systems use subsets or supersets of standard messages, or entirely different formats. The grant activity called "interface development" refers to the implementation of software based "translators" which take data messages from the provider's EHR and convert them to a format which is (ideally) exactly compatible with the criteria of the HIE. Some EHR vendors are more amenable than others to providing interface development for their EHR products; some interface development must be taken on by VITL internally.

Even as development for a given interface completes successfully, there may often remain some question as to whether the right data is in the right place in the message and in the correct format (and there are many opportunities for variation: from the way a medical procedure is coded to the way a patient's address is entered, to the manner in which narrative data from a medical chart is formatted, interpreted, or displayed). The activity of data quality evaluation concerns the process of statistically sampling live data in the system, and evaluating its transit in the system from origination to use, to ensure that data is entering the system correctly, and that, when retrieved, it still retains its integrity, meaning, and usefulness.

VITL and DVHA (and all other participants in the HIT endeavor) are well aware of the challenges to data quality, as well as the potential benefits to both clinical practice and analytics from systematic data quality evaluation and improvement efforts. VITL already does extensive work in this area (on the "development" side of the infrastructure), and the State has chosen to focus on Data Quality as one of the 2 main evaluative areas for continued HIE operation and development. (**See 6. 3.G, *below***). The grant activities and deliverables include baseline clinical data evaluations and periodic reporting by VITL, as well as methodology provided as a State responsibility. In addition, grant-supported education and outreach efforts extend the data quality effort to providers, providing webinars and other channels to increase provider understanding and participation.

[32] State of Vermont Green Mountain Care Board, *Memorandum, In re: Criteria for Creating or Maintaining Connectivity) to the Vermont Health Information Exchange (VHIE)* (February 27, 2015).

6.3 STATE'S IT STRATEGIC PLAN

DESCRIBE HOW THE PROPOSED SOLUTION ALIGNS WITH EACH OF THE STATE'S IT STRATEGIC PRINCIPLES:

A. Leverage successes of others, learning best practices from outside Vermont.

The ideal model for a state or regional HIE is a work in progress, but most major characteristics are well understood nationally.[33] Several organizations,[34] as well as the Federal government,[35] represent forums for the discussion and sharing of design, implementation, usage, and connectivity information specific to HIEs. Both State and VITL participate actively in these information sharing activities.

Technically, a state HIE may be viewed as the employment of mature technologies (database design, data exchange formats, hosted solutions, secure data exchange networking) to support the development of a new use, the health information exchange itself. This development takes place in an economic and political environment which may be more or less incentivizing. Vermont, with a well-organized and active plan for healthcare transformation,[36] is often a leader in development.

The federal goal is an interconnected national HIE (The Sequoia Project eHealth Exchange, formerly Healtheway).[37] To this end, state HIEs, including VHIE, are currently working to ensure that such national connectivity is developed hand in hand with local and regional connectivity. As a result, there is additional incentive to share approaches.

B. Leverage shared services and cloud-based IT, taking advantage of IT economies of scale.

Viewed from the perspective of the internal State network, no part of VHIE infrastructure resides on the State network.[38] Because the legislatively mandated organizational structure of VHIE is a "given," it is easy to lose sight of the fact that it represents a conscious choice by the legislature (which could have

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[33] HealthIT.gov, *What is HIE?*, https://www.healthit.gov/providers-professionals/health-information-exchange/what-hie (retrieved August 30, 2015).

[34] See for example: Healthcare Information and Management Systems Society, www.himss.org (retrieved September 30, 2015).

[35] See for example: US Health Resources and Services Agency (HRSA), *Office of the National Coordinator for Health Information Technology (ONC)*, https://www.healthit.gov/ (retrieved August 30, 2015).

[36] *See:* Robin J. Lunge, JD, Director of Healthcare Reform, *Strategic Plan for Vermont Health Reform, 2012 –2014*, Vermont Agency of Administration, (July, 2012).

[37] The Sequoia Project, *eHealth Exchange History*, http://sequoiaproject.org/ehealth-exchange/about/history/ (retrieved September 30, 2015).

[38] Enterprise Architect, DII, *Personal Interview* (August 5, 2015).

chosen other models, as evidenced in other States.) The implementation chosen results in a nearly pure Software-As-A-Service (SaaS) model for the State, with VITL as the provider, well-aligned with strategic preference.

Viewed in more detail from the perspective of VITL's network, VHIE still exhibits characteristics favored by the IT Strategic Plan. The VITL operation has two major "sides," as described above. One side is the HIE platform and database itself, hosted and provided by primary vendor Medicity. The other side is the population data analysis side, developed by VITL and hosted by RackSpace. Both "sides" employ best practices for reliability and security, taking advantage of specialist resources maintained by these providers, and preventing the duplication of cost, effort, and capital at the State level.

C. Adapt the Vermont workforce to the evolving needs of state government.

As VHIE is operated by the independent organization VITL, State-supplied personnel are involved primarily in the effort to develop, monitor, and maintain the State portion of VHIE funding and support mechanism, i.e., contract and grants (such as the present O&M grant). Acknowledging that the fluid environment of a developing HIE may result in changing personnel needs over time, the State employs a mix of State personnel and independently contracted personnel to meet these needs. This seems to us to be appropriate and cost-effective for the task.

The in-state portion of the development and operation of VHIE requires personnel with general and specific technical knowledge of a high order. This means there could be challenges in replacing key competencies in a short timeframe in an organization such as VITL. However, this same challenge is faced by any operation within the State HIT infrastructure. Vermont has a small population base, but is known to have (in some geographic areas) a higher than usual proportion of skilled technical personnel. And yet, State government and associated HIT operations like VITL may not be able to offer compensation levels competitive to industry . We understand this to be a well-known issue in State IT planning.

D. Apply enterprise architecture principles to drive digital transformation based on business needs. Couple IT with business process optimization, to improve overall productivity and customer service

These directives apply to VHIE, but it is necessary first to point out that they operate in an explicitly planned and evolving Health IT framework. That framework (described in some detail in *Vermont Health Information Technology Plan (VHITP)*[39] and currently in an update process[40]) provides the immediate technical and policy context for VHIE. While that context is beyond the scope of this review, understanding its presence is crucial to understanding that the digital transformation driven by VHIE is dependent upon, and in turn is assumed by, other components of the framework.

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[39] *See:* Vermont State Agency of Human Services, Department of Health Access, Division of Healthcare Reform*, Vermont Health Information Technology Plan (VHITP),* (October 26, 2010).

[40] HIE Project Manager, *Email response to question* (August 19, 2015).

If we say, for example, that VHIE can greatly enhance clinical productivity and cost-effectiveness by automating the (consented) exchange of detailed and current medical information between providers, facilitating the business need to improve medical outcomes while controlling costs, we must say this with the understanding that VHIE is not a free-standing solution. It requires and assumes the existence of all of the other parts of the framework – the EHRs that providers employ, sufficient statewide broadband capabilities, policy drivers like Blueprint and GMCB, other databases, incentive programs to get providers and stakeholders onboard – just to identify a few of the interdependencies.

In order for the above to work within the State's HIT plan, we suggest it will be necessary to ensure that VITL's VHIE network architecture plan, or "vision," is congruent with the State's. By vision, we mean an explicit, high-level and comprehensive overview of VHIE network architecture as it relates to current and likely future needs, *as defined by the State's HIT plan*. At this time, the State's Enterprise Architect reports that the State does not have a clear and complete understanding of VITL's VHIE EA vision.[41] This is not to say that VITL does not *have* an EA vision for VHIE; rather, what is at issue here is a mutual and complete understanding of the linkages and dependencies between VHIE's EA context and the HIT vision as a whole, to minimize any developing risk or delay, as the entire HIT enterprise moves forward. This would likely require explicit and shared documentation and information on VITL's part, clear expectations on the part of the State, and mutual respect for both. Ideally, the newly revised VHITP would form the common point of reference for this exchange of information.

E. Optimize IT investments via sound Project Management

Both the State – in its management of the State portion of VITL funding via contract and grants – and VITL – in its management of VHIE and associated processes – employ skilled and competent project managers operating within broadly accepted, PMBOK-style project management guidelines. Both State and VITL maintain Sharepoint-hosted repositories for project management materials, records, and registers, and sometimes utilize mutual access to Sharepoint when appropriate. Frequent meetings, milestones, and checkpoints identified within and outside the grant ensure adequate monitoring of grant activity progress. Although State and VITL may, for their own purposes, emphasize different aspects of the project management process, there appears to be more than adequate compatibility between them.

F. Manage data commensurate with risk

VHIE holds data which may be considered as highly sensitive: historical and current Personal Health Information (PHI) of Vermont citizens, as well as that of non-citizens who consume healthcare services in the State; diagnoses, clinical notes, codes, and other work product of healthcare providers; laboratory tests; hospital records; etc.

The risk to this data arises in three forms:

[41] Enterprise Architect, DII, *Personal Interview* (August 5, 2015).

1. data loss – the unintentional, temporary or permanent, loss of data, for which the mitigation is redundancy, backup, and archiving.
2. data breach – the unauthorized theft of data, for which the mitigation is appropriate security (See **Section 6.5 Security**, *below*).
3. data misuse – the inappropriate use of data by third parties, for which the mitigation is *data stewardship* and the oversight mechanism is *data governance.*

Data governance for VHIE data, as well as other data in the overall State HIT system, is ultimately the responsibility of the State, which must protect individuals' privacy and is answerable for any breach.

VITL, given responsibility for operating VHIE, by extension has responsibility for *data stewardship*, which is to say, day-to-day responsibility for defining the data, documenting sources, monitoring data quality, remediation of data issues, and other data management tasks. Generally speaking, data stewardship is the *tactical* function of which data governance is the *strategic* function.

However, VITL's VHIE operation also, to an extent, overlaps the data governance function of the State, in that VITL manages certain kinds of third-party access – such as by ACOs – to (de-identified) medical data, for health policy research purposes, an acknowledged purpose for VHIE's existence. For these purposes, VITL maintains Data Use Agreements and associated policies. Access needs for which there are not clear policy guidelines go to the VITL board, which includes State representation.

Please see Section **6.5 Security**, *below,* for more about data governance.

G. Incorporate metrics to measure outcomes

During the development phases of HIE's, the number and types of interfaces provide a useful metric of success, since the objective is to connect as many providers as possible, focusing initially on the more obvious sources, such as hospitals, laboratories, and FQHC's. As an HIE matures, this metric probably becomes less useful, as this initial goal is achieved. **Thus, a risk to funding for continued operation could eventually develop in the absence of a well-developed model for evaluation of program effectiveness. _RISK_ID# _1_**

The State and VITL anticipate and prepare for this eventuality by defining expanded metrics for assessing effectiveness of VHIE in the healthcare policy and healthcare delivery environments. In general terms, the State has identified an interest in assessing 2 areas of HIE effectiveness:

- Connectivity
- Data Quality

Connectivity continues the interface metric, focusing on interface number, type, and site, while anticipating a focus on perhaps less obvious sites, such as small providers, long term care sites, public housing, human services providers, and so on.

Data Quality begins the process of evaluating the usefulness of collecting data in the larger context of improving healthcare outcomes and cost effectiveness. The data quality effort endeavors to assure that

data collected by VHIE is complete, accurate, and consistent, both for use at the point of care, and for use in data analytics serving the purposes of clinical improvement and healthcare reform efforts, as described above.

The current grant includes both Connectivity and Data Quality initiatives in the forms of State-supplied methodologies, baseline and continuing evaluations carried out by VITL, and periodic reports identified as deliverables. Data Quality efforts referenced by the grant also include data quality education for providers through webinars and FAQ documents, training for EHR usage and data collection to support State clinical and business quality data measures. These initiatives also include progress reports to be delivered from VITL to State.

In addition to the above, within the grant, the State has specified quarterly data utilization reports required of VITL. VITL must report quarterly on State-specified operational measurements of clinical health care data transmitted, stored, and accessed within VITL's infrastructure (i.e., within VHIE), using these metrics:

- Number of unique patient queries
- Number of results delivered
- Number of VITLAccess users
- Opt-in consent rate

These metrics are intended to begin the process of identifying outcomes as a result of VHIE operations.

In our opinion these initiatives and reports are appropriate and adequate for this early phase of implementation. The reporting frequency and designated report content seems to provide sufficient information for State analysis, without putting an undue burden on VITL's operation. As long as both State and VITL adhere reasonably close to the timeline for responsibilities and reports, we believe these deliverables will likely achieve their intended results.

6.4 SUSTAINABILITY

See **9. Impact Analysis On Net Operating Costs,** *below*.

6.5 SECURITY

VHIE contains personal and private healthcare records of many Vermont citizens, as well as of visitors to the State, and of citizens of neighboring States who employ healthcare services situated in Vermont. Regarding the sharing of PHI via VHIE (or other sharing pathways), Vermont is an "opt-in" State, meaning that individuals must explicitly agree to the sharing of their personal information among providers. (Statistically, most do agree.)

Once the providers, VHIE under VITL's operation, and State government have access to PHI, they are obligated under State and Federal law to employ sophisticated and explicit measures to protect it from unauthorized access and use[42]. All portions of State infrastructure HIT employ these strong measures for security and privacy of personal information, such as PHI and personal financial (tax) information.

As in State operations, VITL requires and enforces extensive and comprehensive privacy and security measures, hand in hand with reliability measures.

The primary vendor, Medicity, and the hosting vendor, RackSpace, both attest to extensive and adequate physical and logical security and reliability standards. Physical security at VITL's Burlington network is extensive and appropriate, and VITL employs third-party evaluation and penetration testing to maintain security confidence CynergisTek has conducted a vulnerability scan and phishing assessment[43]. A NIST 800-53 compliance update is anticipated later this year.

Every HIE must maintain sufficient data protection and privacy policies – data use policies (data governance policies), security policies, user policies, network access control policies – to cover providers, data users (whether State users, such as analysts, or non-State users, such as ACOs or providers), commercial users such as labs, or indeed any entity who "touches" PHI. We have reviewed VITL's policies and found them to be extensive, clear, comprehensive, and up-to-date. We do recognize a small **risk in the lack of a comprehensive data stewardship/governance *process*, in particular a data governance council, to manage ongoing data governance issues as they arise _RISK_ID# _2_** (currently, such issues go to the VITL board). VITL is aware of this lack, and is in the process of defining a data governance council. We concur that this is an adequate response.

Please see Section 6.10, 1 Act 54, Security, And System Architecture, below, for further statements about security.

6.6 DISASTER RECOVERY

The "live" side of VHIE is hosted by Medicity in Colorado and Utah. Medicity's data centers are SSAE-16 certified: best practice in healthcare and exceeds HIPAA standards[44]. Both Medicity and Rackspace provide extensive data recovery measures. The Security Plan required by the grant will define recovery for the whole VHIEN system.

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[42] The HIPAA Privacy Rule [45 C.F.R. Part 160, Part 162, and Part 164] covers protected health information in any medium while the HIPAA Security Rule [45 CFR Parts 160, 162, and 164] covers electronic protected health information.

[43] VITL Chief Technology Officer, Systems Administrator, *Personal Interview* (August 17, 2015).

[44] Vermont Information Technology Leaders, Inc., *2013 Annual Report*, 8 (January 15, 2015).

6.7 DATA RETENTION

Health information data in VHIE is intended to cover both current PHI (for clinical use) and historical information (for health data analytics, clinical improvement, policy development, etc.). VHIE is designed specifically for this use. VITL reports that "Clinical data is kept indefinitely since providers decide medical decisions from the data we provide," and "audit files are kept for 6 years."[45] As the former quote indicates, clinical data is currently kept "live," without an expiration date specified. As such, although redundancy and data backup ensures that clinical data will not be accidentally lost, there exists no plan for archiving clinical data. We do not identify this as an issue in the current grant, as long-term data archiving of clinical data represents a health policy issue as yet unresolved on a national or regional scale. Although it would seem at first glance that clinical data need only slightly outlive the individual it refers to, in fact the health policy research function of HIEs imply a very long term – indeed, "indefinite" – archival requirement. A recent industry report projects an overall volume of healthcare data of 2,314 exabytes by 2020.[46] We expect that all states with health data networks will need to address the archival questions in coming years. 1 V.S.A. § 317a, Disposition of public records, states "A custodian of public records shall not destroy, give away, sell, discard, or damage any record or records in his or her charge, unless specifically authorized by law or under a record schedule approved by the state archivist pursuant to 3 V.S.A. § 117(a)(5)." No general or Agency-specific record schedules are currently listed by the State as specifically applicable to VHIE. [47]

6.8 SERVICE LEVEL AGREEMENT

VITL maintains contractual service level agreements with both the primary VHIE provider, Medicity, and the VITL data use network hosting service, RackSpace.

Medicity assures response to network problems in a three-tier plan, briefly summarized as:

- Priority 1 (most serious, persistent inability to access clinical information)
    - Contact Client with problem report and begin resolution within 15 minutes during daytime and 30 minutes during night hours.
    - Report plan of action within 1 hour
    - Provide updates hourly
- Priority 2 (Performance less than optimum, product feature non-functional)
    - Contact Client to acknowledge report within 1 hour
    - Verify problem and provide plan of action within 4 hours

[45] VITL Chief Technology Officer, *Email* (October 15, 2015).

[46] Health Data Archiver, *Health Data Volumes Skyrocket, Legacy Data Archives On The Rise*, http://www.healthdataarchiver.com/health-data-volumes-skyrocket-legacy-data-archives-rise-hie/ (retrieved November 11, 2015).

[47] *See* Vermont Secretary of State, *Records retention*, https://www.sec.state.vt.us/archives-records/records-management/records-retention.aspx (retrieved October 21, 2015).

    - Provide updates hourly
- Priority 3 (Failure of system which does not have any effect on normal operations)
    - Contact Client, verify problem, and provide plan of action within 48 hours.
    - Provide updates at least once every 5 business days or at mutually agreed frequency.[48]

Rackspace guarantees:

- 100% Network uptime in a given month, excluding scheduled maintenance.
- 100% infrastructure functioning time in a given month, excluding scheduled maintenance.
- Replacement of any failed hardware/server component at no cost within one hour of problem identification.
- Credit is supplied for failure to meet these criteria at the rate of 5% of monthly fee for each 30 minutes of network or infrastructure downtime in a given month, and 5% of monthly fee per hour of hardware/server downtime beyond guaranteed time in a given month.[49]

These targets seem consistent with industry expectations and best practices. However, a better definition of remedies in written contractual form, including for example acceptable evidence of failure and a perhaps finer granularity or pro-rating of downtime, would be advisable.

6.9 SYSTEM INTEGRATION

IS THE DATA EXPORT REPORTING CAPABILITY OF THE PROPOSED SOLUTION CONSUMABLE BY THE STATE?

Under 18 V.S.A. § 9352(i)(2), Vermont Information Technology Leaders (VITL) must "establish criteria for creating or maintaining connectivity to the State's health information exchange network" and provide those criteria to the Green Mountain Care Board (the "Board") by March 1 each year. On February 27, 2015, the GMCB voted to accept the criteria presented to the board. Statement is available at http://www.gmcboard.vermont.gov/sites/gmcboard/files/GMCB_guidance_re_connectivity_criteria_w_App_A.pdf

WHAT DATA IS EXCHANGED AND WHAT SYSTEMS (STATE AND NON-STATE) WILL THE SOLUTION INTEGRATE/INTERFACE WITH?

Please create a visual depiction and include as Attachment 1 of this report.

See Attachments A, B, C, and D

[48] VITL Systems Administrator, *Email* (October 7, 2015).

[49] Rackspace, *The Rackspace SLA covers three components that support the availability of your web site:*, http://www.rackspace.com/managed-hosting-support/service-levels/managed-sla (retrieved October 21, 2015).

Will the solution be able to integrate with the State's Vision and financial systems (if applicable)?

N/A. VITL is a separate organization and not part of State government.

6.10 ACT 54, SECURITY, AND SYSTEM ARCHITECTURE

A "typical" Independent Review of a "typical" State IT project (i.e., contract + vendor) includes among other items assessments by the State Chief Information Security Officer (CISO) and a State Enterprise Architect on the security (including privacy), reliability, and architecture of the proposed system. Their roles in State administration require them to attest to the suitability of any IT systems employed by the State (including, for two examples, systems hosted on State premises as well as SaaS systems hosted by commercial vendors). In the process of the present review, we consulted these officers for their assessment of the current grant technology.

We note with emphasis that neither the State's Acting CISO nor Enterprise Architect identified VITL as failing to meet State-expected standards for security or network architecture planning. However, both expressed frustration caused by a perceived lack of the information they normally expect to have available to make the assessments their roles require of them. We believe this frustration stems at least in part from the unique nature of the State/VITL relationship and could be alleviated from a proper exchange of information and expectation, as described below.

Vermont Act 54 of 2015 § 9352(c)(2) enacts in part:

> *Notwithstanding any provision of 3 V.S.A. § 2222 or 2283b to the contrary, upon request of the Secretary of Administration, the Department of Information and Innovation shall review VITL's technology for security, privacy, and interoperability with State government information technology, consistent with the State's health information technology plan required by section 9351 of this title*

Unlike the GMCB oversight provision that precedes it in the Act, this provision for a DII review is not automatically invoked: it requires a request by the Secretary of Administration. The provision does not define conditions that might trigger such or review, nor define or limit the number or frequency of possible reviews.

The present grant includes ***Attachment A Section 6. Independent Review*** (which authorizes the present review). An Independent Review clause of this sort is usual in a vendor contract (of course, this is a grant, but similarities apply) for a cost total over the Independent Review threshold. However, Section 6 also states in part:

> *Subrecipient acknowledges and agrees that the State is entitled to have the Department of Information and Innovation review the Subrecipient's technology for security, privacy and interoperability with State government information technology, consistent with the State's health information plan required by Section 9351 of Title 18 and that in State fiscal year 2016*

this review shall be satisfied by obtaining an independent expert review of this Agreement and the services to be rendered hereunder…

We cannot evaluate whether this legally restricts the Secretary (who signs this grant) from requesting an additional Act 54 review during the span of the grant, but assuming hypothetically that it may not, we note that there is a small possibility that, if unexpected, **a requested technology review could cause a risk to the grant activities schedule** **_RISK_ID# _3_**. Our main reason for identifying this risk is that we find no existing definition of the process and respective responsibilities should such a review be requested. (Even if the current clause does bind the Secretary, we would think it useful to have a defined process for subsequent grants/years.) Although the current situation is stable, conditions and realities of large projects do sometimes change, and we fear that invoking this entitlement could be disruptive if the process were not defined in advance.

Our best recommendation would go further than setting out a process: we suggest that ensuring a more complete exchange of appropriate information between State and VITL on these technology matters before any such review process commenced could go far in obviating the need for such a review, or at least simplifying its execution. Such an exchange would imply responsibilities for both State and VITL, and in fact the present grant begins to implement this sort of process in the requirement of a VITL Security Plan. The risks defined below explain this suggestion further.

The relationship between State and VITL may be unique; it is certainly unusual. It is tempting in the context of an Independent Review to see VITL as one would see a commercial vendor for a State IT project RFP, but that view would be inaccurate. As sole HIE operator designee, VITL does not routinely need to list the kind of attestations and certifications that commercial vendors learn to supply in competitive response to State RFPs. This, of course, does not mean that VITL itself does not need or have those attestations itself, but it may mean that it needs to be explicitly asked for them. We therefore suggest a process in which the State defines to VITL its expectations for attestations, plans, and standards related to security and to network architecture, with a timeframe and report expectations for response.

The State DII has acquired a great deal of experience and understanding of large enterprise security and network architectural planning as ongoing, "live" processes of continual management. Sharing this expertise would benefit both State and VITL.

As mentioned, the present grant begins this process with the expectation of a Security Plan. Although clearly supportive of this requirement, the Acting CISO has pointed out that this expectation was drafted without his direct participation, and could be improved to include standards which more currently and accurately reflect State expectations of his office. Since much of VHIEN is implemented as a cloud solution, using the HIE provider Medicity and hosting services of Rackspace, a Security Plan would include, among other things, attestations from these cloud providers of security certifications and controls, such as a Statement on Standards for Attestation Engagements No. 16 (SSAE-16)audit attestation and a Service Organization Controls Level 2 (SOC-2) report . Additionally, evaluation of VITL's internal network and overall VHIEN operation might include a Plan Of Actions & Milestones (POA&M)

outline to revisit in quarterly meetings between State and VITL personnel. Adding such expectations into the definition of grant deliverables could be done through grant amendment or external meetings. We would add that a definition of the review and approval process of this report, whether or not included in the grant, would be useful for State personnel. Our understanding is that the Security Plan provided by VITL will go to the CISO office only, and after review and comment would be submitted to the CIO. **The lack in the grant of Security Plan specifications according to CISO requirements presents a small but real risk to the timeline of the grant activities _RISK_ID# _4_**, as it could result unnecessarily in a Security Plan which meets grant requirements but not CISO expectations, or an unnecessary scramble to produce certifications or attestations which could have been requested up front.

Similarly, but more seriously, the present grant does not set out any expectations for network architecture planning. The State Enterprise Architect routinely expects State projects to adhere to current TOGAF architectural planning standards. As described, VITL does conduct extensive work on connectivity criteria, employment of HIT standards, and other aspects of interoperability. However, the GMCB evaluates this planning. **The risk is that a requested Act 54 review of interoperability could result in grant timeline delay if DII State Enterprise Architectural expectations are not met _RISK_ID# _5_ ,** similar to the security plan risk identified above. We suggest as a possibility that, either for this or subsequent grants, the State and VITL develop the expectation of a Network Architecture Plan, mirroring the Security Plan expectation, and including VITL's existing plans and State architectural planning expectations. This may not be the only way to achieve the goal of information sharing; participation of the CIO in VITL network planning or other direct connections are alternatives.

7. ASSESSMENT OF IMPLEMENTATION PLAN

7.1THE REALITY OF THE IMPLEMENTATION TIMETABLE

The implementation timetable, as defined within the grant itself, and within the State SharePoint site used for project management, is carefully constructed, reasonable in its expectations, and reflective of past experience.

The deadlines and report dates listed in the deliverables section (*above*) and in the list of State and VITL responsibilities, clarify with adequate specificity the targets required for timely and efficient progress of the grant activities. We inquired into the status of various State responsibilities, and received the following status report as of September 3, 2015[50]:

Responsibilty (Section of grant Attach. A)	First due date	status
A.2.6.1 **Cost Allocation Methodology**	9/30/2015	In progress. Developing with our federal partners
A.2.6.2 **Denominators for connectivity evaluation**	9/30/2015	In progress
A.2.6.3 **Number and types of licensed HCOs**	Not indicated	Not begun
A.2.6.4 **Number, names, and electronic contact information of organizations in Blueprint PCMHs**	Not indicated	Not begun
A.5 **Identify 3rd party contract acct'ing expertise SOW for cost allocation methodology**	8/15/2015	Completed *Note: the activity of this SOW is now in progress, and expected to complete before its completion deadline of 11/15/2015*

7.2 READINESS OF IMPACTED DIVISIONS/ DEPARTMENTS TO PARTICIPATE IN THIS SOLUTION/PROJECT (CONSIDER CURRENT CULTURE, STAFF BUY-IN, ORGANIZATIONAL CHANGES NEEDED, AND LEADERSHIP READINESS).

The unique relationship between State and VITL, referenced several times above, results in a certain amount of tension evident in the statements of both State and VITL staff in many – though not all – of our interviews. We use the term "tension" very specifically; for tension can be disruptive or creative. In

[50] HIE Business Lead, *Email in response to questions* (September 3, 2015).

point of fact, we have seen more instances of the creative than the disruptive, even in situations where there may have been discomfort.

Although others may see it differently, this reviewer's interpretation of the tension is that it results from the interaction of two quite different organizational cultures. The State's culture is governmental and, strictly speaking, bureaucratic (not meant in a pejorative sense). As one State interviewee put it: "We're bureaucratic. We do things in an organized manner, step-by-step. It might take us a long time to do something, but in the end we do get it done, and we do it right." Put another way, the State emphasizes project management, risk analysis, frequent communication, collaboration, and team consensus. The organizational culture at VITL is more entrepreneurial: as a small corporation with a broad stakeholder board, VITL is opportunistic, forward looking, perhaps less risk-averse, creatively dispersed, corporately defensive, and collaborative (yes, we used that for both).

No one we interviewed expressed the opinion that the statutory designation of VITL's role is the wrong approach to VHIE. Taking this designation as a "given," many State and VITL personnel interviewed pondered the correct approaches that would most benefit the State's citizens and the objectives of healthcare reform, in the context of their own organizational interests. This is not to imply that the tension is all "sweetness and light." The frustrations expressed were real and explicit.

So, while **we identify this tension as a risk for the grant (and the enterprise as a whole), at the same time we must label it as one of those rare risks that can have outcomes both positive and/or negative. _RISK_ID# _6_**

Perhaps the most apparent recent use of this tension for creative purposes is the State's decision to statutorily place oversight and approval of VITL's budget (where it concerns State and Federal funds) under the purview of the GMCB. Both State and VITL personnel we spoke to broadly welcomed this change. For the State, the GMCB represents a body experienced organizational in budget oversight (through hospital budget approval, etc.) through good times and lean, and for VITL, the GMCB represents an organization that deeply understands the role, opportunities, and challenges of big data in the healthcare reform environment. The GMCB may be cast somewhat in the role of mediator, and participants seemed to be content with this.

The statutory role of DII, as one of the newest pieces of the State/VITL relationship, seemed to be the site of the most significant *expressed* tension, both for State and VITL. This is addressed in the Architecture section, *above*. Here again, we suspect that organizational cultural differences contribute to the tension, and here again, we think there is opportunity for creative resolution. This aspect of Act 54 has drawn less attention than the GMCB oversight – perhaps because budget oversight is scheduled, inevitable, and broadly apparent, while the technology review under Act 54 is prospective. We think the technology review deserves more focus, especially by State personnel, and holds a similar creative potential as the budget oversight process.

7.3 DO THE MILESTONES AND DELIVERABLES PROPOSED BY THE VENDOR PROVIDE ENOUGH DETAIL TO HOLD THEM ACCOUNTABLE FOR MEETING THE BUSINESS NEEDS IN THESE AREAS:

A. PROJECT MANAGEMENT

Yes, dates, deliverables, and deadlines in the grant align exactly with State project management Sharepoint register targets. These targets are sufficient and reasonable as described above.

B. TRAINING

In its original role as REC, and continuing with activities in this grant, including Sprint Management teams, Data Quality activities, and Meaningful Use activities, VITL is supported by the State in various aspects of training and education. This training is appropriately specifically aimed at providers, for onboarding and interface development.

C. TESTING

The data quality and connectivity requirements and reporting are well defined and appropriate.

D. DESIGN

N/A

E. CONVERSION (IF APPLICABLE)

N/A (…strictly speaking. Interface design, is, by a certain view, a conversion activity. But we take this item to mean conversion from an earlier system, which is not relevant here.)

F. IMPLEMENTATION PLANNING

Some activities, namely cost allocation methodology review and security plan reporting, may be considered implementation planning; they are well defined and have targeted reportables.

G. IMPLEMENTATION

General activities of the grant are defined in sufficient detail based on existing operations, and where appropriate are tied to deliverables and target dates.

7.4 DOES THE STATE HAVE A RESOURCE LINED UP TO BE THE PROJECT MANAGER ON THE PROJECT? IF SO, DOES THIS PERSON POSSESS THE SKILLS AND EXPERIENCE TO BE SUCCESSFUL IN THIS ROLE IN YOUR JUDGEMENT? PLEASE EXPLAIN.

Yes, the State has employed project managers (for the grant and for project oversight) with extensive experience specifically on VHIE and generally on Vermont HIT implementation. Both are experienced in PMBOK principles and application. The project team (Project Manager, Business Lead/State HIT Coordinator, Assoc. State HIT Coordinator, Program Manager, Business Analyst, and Grants Mgt. Specialist) have a deep understanding of Vermont HIT and healthcare reform efforts generally, and appear to work together closely, efficiently, and in the context of PMBOK principles generally.

7.2 RISK ASSESSMENT & RISK & ISSUES REGISTERS

The risks identified throughout this review are collected below, along with an assessment of their significance, a description of the State response and timing, and our evaluation of the State response.

RISK REGISTER - VHIE O&M GRANT 03410-256-16

The risks identified for this review are collected below, along with an assessment of their significance.

Interim Risk ID:	Identification number assigned to risk; This ID may change as the register is organized for the final review drafts
Risk Rating:	An assessment of risk significance, based on multiplication of **(impact X probability ratings)** (*see below*). • **1-30 = low** • **31-60 = moderate** • **61 – 90 = high**
Impact:	Assessment of severity of negative effect, scale of **1 – 10**, from least to most severe
Probability:	Assessment of likelihood of risk occurring, scale of **1 – 9**, from least to most likely
Description:	Description of the risk
Source:	Where the risk originates
Impact Description:	Impact of the risk on project, should the risk occur
State's Planned Response:	Decision to *avoid*, *mitigate*, or *accept* risk Detailed description of response to risk, in order to accomplish decision
Timing:	When the response should occur
Reviewer's Assessment:	Reviewers evaluation of the State's planned response

Risk ID: 1	Rating: 24 Impact: 8 Probability: 3
Description:	Model for evaluation of program effectiveness is not yet well developed.
Source:	State and VITL
Impact Description:	Funding risk if effectiveness cannot be measured
State's Planned Response:	**Accept**: The State and VITL are working together to evolve a usable quantitative and qualitative model for evaluating program effectiveness. The focus on data quality and connectivity, reflected in this grant, are seen as early steps in the evaluation project.
Timing:	Current going forward.
Reviewer's Assessment:	Concur. There is as yet no national model for evaluating HIE effectiveness. The State's planned response is in line with best practices as they are currently understood.

Risk ID: 2	Rating: 27 Impact: 9 Probability: 3
Description:	VITL does not have an established comprehensive data governance council with process.
Source:	VITL
Impact Description:	Possible grant funding, liability, and reputational risk to State if PHI data is used in an inappropriate manner.
State's Planned Response:	**Mitigate**: VITL has extensive written data governance policy, approved by the VITL board, and at this time the VITL board itself fills any emergent need for data governance decisions, but does not have an established data governance council with associated process defined. VITLE reports that the development of a council and associated process is underway. (One example of a Vermont model of data governance process, the GMCB Data Governance Program, is defined at http://www.gmcboard.vermont.gov/VHCURES/DataGov , with the council charter published at http://www.gmcboard.vermont.gov/sites/gmcboard/files/DataGovernance/GMCB_Data_Governance_Charter_%20v1.4.pdf)
Timing:	Grant period
Reviewer's Assessment:	Concur. Note that a similar policy development was undertaken by GMCB, and may be a potential model.

Risk ID: 3	Rating: 15 Impact: 5 Probability: 3
Description:	The review process which can be required under Act 54 of 2015 § 9352(c)(2) has not been defined.
Source:	State and VITL
Impact Description:	Possibility that Act 54 of 2015 § 9352(c)(2) requirements are not performed in a timely manner. (See following related risks)
State's Planned Response:	**Mitigate:** Clearly define the Act 54 review process in advance of an actual triggered review. Ideally, this would demonstrate the benefit to both State and VITL of sharing technical information, standards, and requirements. The definition must address issues such as "*Whose responsibility is this? Should it be defined by Sec. of Administration, or by CIO, with Sec. of Admin. approval?"*
Timing:	Current going forward
Reviewer's Assessment:	The State response is appropriate and practical as long as it continues to completion.

Risk ID: 4	Rating: Impact: Probability:	16 4 4
Description:	The lack in the grant of Security Plan specifications according to CISO requirements presents a small but real risk to the timeline of the grant activities. (State may not be able to **directly confirm** PHI protection with high degree of confidence as State does not directly control or monitor security/privacy measures for VHIE)	
Source:	State and VITL	
Impact Description:	Possibility that Act 54 of 2015 § 9352(c)(2) requirements are not performed *in a timely manner*. Note that we are not identifying a specific flaw in VITL's security plan or that of its vendors, but rather acknowledging that the State official responsible for confirming PHI protection would expect specific auditing, attestation, and periodic reporting to be in line with data protection guidelines for State government projects, *whether or not these are the same requirements VITL expects of itself and its vendors.* The negotiation and resources required between State and VITL in the event could affect the timely performance of activities in the grant. The State CISO must identify any cost or reputational risk to the State if any PHI is compromised, which could have a serious impact. However, the risk identified here, a timeline risk, is less serious and consequently has a lower impact rating.	
State's Planned Response:	**Mitigate:** Grant requires VITL to produce current security plan, with specific report components, detailed in Attachment A.3.13, which will be delivered to SOV CISO. *[However, this section of grant may not explicitly require VITL to meet standards representative of current best practices, such as NIST 800-53r4]* State will meet quarterly to check progress especially on any high or moderate risk items that may emerge in report.	
Timing:	Risk current. Report due by Oct 31, 2015.	
Reviewer's Assessment:	Concur. However, the roles of the CIO and CISO (and any other appropriate State personnel) in reviewing and accepting the required documentation should be defined.	

Risk ID: 5	Rating: 28 Impact: 4 Probability: 7
Description:	A requested Act 54 review of interoperability could result in grant timeline delay if DII State Enterprise Architectural expectations are not met. (State expects internal State network architecture to be TOGAF compliant, but VHIE is not internal to State network. State has no direct oversight of VHIE network architecture planning, and grant does not include review process or reference.)
Source:	State and VITL
Impact Description:	Possibility that Act 54 of 2015 § 9352(c)(2) requirements would not be performed in a timely manner. Note we are not identifying a specific flaw in VITL's network architecture plan or that of its vendors, but rather acknowledging that the State official responsible for confirming enterprise architecture compliance would expect specific standards (TOGAF compliance) to be in line with similar projects within State government, *whether or not these are the same requirements VITL expects of itself and its vendors.* The negotiation and resources required between State and VITL in the event could affect the timely performance of activities in the grant. Because the question of network architecture planning, unlike security planning, has not been addressed within the grant, we judge the probability to be higher than that of risk #5.
State's Planned Response:	**Mitigate:** Clearly define the Act 54 review process in advance of an actual triggered review. Ideally, this would demonstrate the benefit to both State and VITL of sharing technical information, standards, and requirements.
Timing:	Current going forward
Reviewer's Assessment:	The State response is appropriate and practical as long as it continues to completion. Possible additional mitigation is that (CIO and) SOV CISO review security standards required by grant A.3.13 and propose amendment to grant language. Same review for future grants.

Risk ID: 6	Rating: Impact: Probability:	35 7 5
Description:	Tension between State and VITL **could result in delay** on performance of grant activities, **yet also may lead to creative solutions** to problems.	
Source:	State and VITL	
Impact Description:	There appears to be some tension over matters of purview and process between some State Agency personnel and some VITL personnel . This tension, acknowledged by many participants, could potentially be disruptive *or creative* in effect.[51] Both State and VITL have a strong interest in avoiding delays in grant activities, lessening the likelihood of their occurrence, but the possibility exists. At the same time, positive response to this tension could result in improved program outcomes and creative solutions to problems.	
State's Planned Response:	**Accept/Mitigate**: The grant sets out significant deliverables, check-ins, and progress meetings to convey information in both directions between State Agency and VITL. Act 54 of 2015 sets out certain State oversight and/or review of certain VITL activities. These include budgetary oversight by the Green Mountain Care Board, and the possibility of review by DII of VITL's technology for security, privacy, and interoperability with State government information technology, if requested by the Secretary of Administration. Oversight and/or review could increase the flow of relevant information in both directions and lead to a clearer definition of roles and expectations.	
Timing:	Current and forward	
Reviewer's Assessment:	Implementation of these processes should provide clarity in the most important areas, if they continue to develop in detail. All participants expressed a strong interest in VHIE continuing to develop well and on schedule, even if they conveyed frustrations. Both State and VITL participants interviewed view GMCB oversight positively. The likelihood of serious problems seems small during	

[51] According to the 5th Edition of the PMBOK® Guide, project risk is "an uncertain event or condition that, if it occurs, has a ***positive or negative*** effect on one or more project objectives such as scope, schedule, cost, or quality." [emphasis added] The ideal response to risk decreases the negative effect and promotes the positive effect.

the grant period; this bodes well, as benefits may be minimal in the current grant period, but can set the stage for subsequent grants.

Risk ID: 7	Rating: 27 Impact: 3 Probability: 9
Description:	The activities and deliverables itemized in the grant do not correspond on a one-to-one line item basis with the grant's budget category totals.
Source:	State and VITL
Impact Description:	Budget risk, future planning risk, if costs for specific activities cannot be adequately assessed
State's Planned Response:	Current: **Accept** Future: **Mitigate** Grant requires VITL to engage "third party contracted accounting expertise to review the VITL's cost allocation methodology utilized under the VITL's current agreements with the State and other entities." -and- As enacted in Act 54 of 2015, the GMCB will annually review the budget and activities of VITL in a process not yet defined, but now in progress.
Timing:	Current going forward
Reviewer's Assessment:	Concur. These mitigations, especially the GMCB oversight process, are likely to move both State and VITL to a condition of mutual budget understanding and planning for future grant years; this will not be accomplished nor is it expected within the timeframe of the current grant. Mutual budget understanding will not necessarily result in assigning costs to activities *as they are itemized in the current grant*, but could ultimately achieve the same ends.

8. COST BENEFIT ANALYSIS

8.1 ANALYSIS

Here, as in the Cost Comparison in Section 5, *above*, we must at times consider VHIE as a whole, rather than attempting to identify benefits particular to an O&M grant that addresses just a portion of VHIE funding.

To further complicate matters, the quantitative measurement of HIE effectiveness is still in its infancy. Most studies that do exist are predictive in nature. A widely-quoted "internal study" by a major EHR provider purportedly claims that the current (non-electronic) method of information exchange accounts for approximately $17,160 of the expenses of a single-clinician practice. In fact, we were unable to acquire a copy of this study, and those that quoted the study seem to be quoting each other, rather than a primary source[52].

A 2006 meta-study by the Agency for Healthcare Research and Quality (AHRQ) on the costs and benefits of HIT (not specifically HIE) concluded that substantial benefits were predicted for adoption of HIT in clinical settings, but that benefits breakeven point varied from 3 to 13 years after implementation[53]. The studies reviewed included some conducted as much as 14 years earlier, when the technology available was much different than it is in 2015[54].

8.2 INTANGIBLE COSTS & BENEFITS:

BROOKINGS STUDY

One of the few quantitative studies available is a 2015 study from the Center for Technology Innovation at Brookings, entitled "The benefits of health information exchange platforms: Measuring the returns on

[52] See for example: Wikipedia, *Health Information Exchange,* https://en.wikipedia.org/wiki/Health_information_exchange (retrieved August 20, 2015);
FreedomPACS, *Three Business Challenges Every Medical Practice Needs to Know About*, http://www.freedompacs.net/wp-content/uploads/2012/05/FreedomPACS-trends.pdf (retrieved September 30, 2015); and
Merge Healthcare, *Merge Honeycomb™ The nation's largest medical image sharing network,* http://www.merge.com/MergeHealthcare/media/LandingPages/Merge_Honeycomb2.pdf (retrieved October 1, 2015).

[53] Southern California Evidence-based Practice Center, *Costs and Benefits of Health Information Technology*, Agency for Healthcare Research and Quality, p. v (April, 2006).

[54] *Ibid.,* p. 51-53.

a half a billion dollar investment.[55]" The study, while identifying the paucity of quantitative information mentioned above, reports the results of a controlled study of Emergency Departments (EDs) in Western New York State, where HIE participation is high.

The study's author proposes that the value of an HIE "is proportional to two conditions: (1) its volume of available medical data and (2) the extent to which its members access the available data.[56]"

The study concludes:

> "In this study, the above conditions are met: (1) it is done in a setting where there is a wealth of available medical data for each patient and (2) the database of HIE platform is being queried in 100 percent of patient encounters. In the first ED setting, querying RHIO's database is associated with respectively, a 25 percent and 26 percent reduction in the estimated number of laboratory tests and radiology examinations. In the second ED setting, querying RHIO's database is associated with a 47 percent reduction in the estimated number of radiology examinations.[57]"

If the author of the study is correct, then Vermont's VHIE approach would seem to be the right approach: early and widespread incentivized participation with an emphasis on getting patient data into the system early in the project, so that it can be used as soon as possible in clinical settings.

VITLACCESS

VITL's provider portal, VITLAccess, is considered by VITL to be "key to determining return on investment, justifying future funding, and understanding the value provided to healthcare reform initiatives." VITL anticipates that clinician use of VITLAccess will provide more informed care, higher quality, improved patient safety, and reduced cost[58]. This seems consistent with the conditions of the Brookings study.

GENERAL BENEFITS OF HEALTH INFORMATION EXCHANGES

HealthIT.gov identifies the following benefits to Health Information Exchanges[59] (without quantitative evidence, however):

- Provides a vehicle for improving quality and safety of patient care by reducing medication and medical errors

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[55] Niam, Yaraghi, *The Benefits Of Health Information Exchange Platforms: Measuring The Returns On A Half A Billion Dollar Investment*, Center for Technology Innovation at Brookings, (May, 2015).

[56] *Ibid.*, p. 2.

[57] Ibid., p.2.

[58] VITL CEO, *Email in response to questions* (August 25, 2015).

[59] HealthIT.gov, *HIE Benefits,* https://www.healthit.gov/providers-professionals/health-information-exchange/hie-benefits (retrieved August 30, 2015).

- Stimulates consumer education and patients' involvement in their own healthcare
- Increases efficiency by eliminating unnecessary paperwork
- Provides caregivers with clinical decision support tools for more effective care and treatment
- Eliminates redundant or unnecessary testing
- Improves public health reporting and monitoring
- Creates a potential loop for feedback between health-related research and actual practice
- Facilitates efficient deployment of emerging technology and healthcare services
- Provides the backbone of technical infrastructure for leverage by national and State-level initiatives
- Provides a basic level of interoperability among electronic health records (EHRs) maintained by individual physicians and organizations

ACCOUNTABLE CARE ORGANIZATIONS

Some of the benefits of VHIE are realized through the participation of providers in Accountable Care Organizations (ACOs). ACOs are voluntary groups of providers who collaborate in providing coordinated care to Medicare patients, with the cooperation of the Centers for Medicare and Medicaid Services (CMS). When an ACO delivers quality evidence-based, coordinated care with associated cost savings, the ACO participants share in the savings it achieved (the "upside"; there can also be a "downside"). VITL receives some of its non-State funding from an ACO that benefits from the use of VHIE services. ACOs typically rely on shared clinical data to plan and then assess care initiatives. Using and interpreting this data may involve both VHIE and Blueprint. CMS predicts the cumulative average of ACO shared savings payments from 2016 through 2018, combined with average aggregate start-up investment and continuous operating costs of $822 million, will yield a net private benefit of $278 million. Successful Vermont ACOs would participate in this benefit[60].

INITIAL PROJECT OBJECTIVE BENEFITS

In the planning phase of this grant, during development of the IT ABC form, State planners identified a number of benefits which identify the State's main objectives for the VHIE network. The following excerpt lists these objectives:

This Program will

- *improve care management,*

[60] Jacqueline DiChiara, *Improved ACO Participation Saves $240M, Says CMS Final Rule*, RevCycleIntelligence, http://revcycleintelligence.com/news/improved-aco-participation-saves-240m-says-cms-final-rule (retrieved Aug. 1, 2015).

- *allow better population analytics,*
- *provide better patient information at the point of care, and*
- *lower the growth in the cost.*
- *Simply having a complete, accurate, and up-to-date patient heath care record available to the providers will accomplish all three of the Affordable Care Act's Triple Aims.* ***(sic)***
- *By providing accurate data at the population level, HIE will support the aims of the Accountable Care Organizations (ACOs), Meaningful Use (MU), and other goals of the Vermont healthcare system towards better measurement and accountability.*[61]

8.3 TANGIBLE COSTS & BENEFITS:

For reasons described in section 8.1 above, a listing of tangible benefits with dollar amounts would be speculative at best, and at worst misleading. The monetized benefits of VHIE are best seen in the context of Vermont's entire healthcare reform effort, which relies on VHIE as a central component of the HIT vision.

8.4 FUNDING:

Fund	Source	Amount
Global Commitment	Federal	$2,731,131.26
HIT Fund	State	$2,234,561.94
	TOTAL:	$4,965,693.20

(Also see other State costs in Section 9.2, *below*)

8.5 ASSUMPTIONS:

The analysis above assumes that the present grant is a key component of VHIEN enterprise as a whole, and that all components of VHIEN contribute to any benefits the State may gain .

8.6 COSTS VS. BENEFITS:

Although computing the benefits of HIEs in general, and of VHIE in particular, will require substantial research and analysis before generalized statements can be made, it is quite clear that national HIT policy and the Vermont HIT plan as part of healthcare reform policy depend on the efficient functioning of a vibrant HIE. Healthcare reform efforts nationwide are betting heavily on the usefulness of HIEs in

[61] State of Vermont*, IT Activity Business Case & Cost Analysis: Health Information Exchange (HIE),* pg. 2 (October 14, 2014).

transforming healthcare, and we see no evidence to the contrary. The present grant seems a reasonable investment for the potential of a very significant return over time.

9 IMPACT ANALYSIS ON NET OPERATING COSTS

9.1 INSERT A TABLE TO ILLUSTRATE THE NET OPERATING COST IMPACT.

See **Attachment E, Cost Spreadsheet**

9.2 PROVIDE A NARRATIVE SUMMARY OF THE ANALYSIS CONDUCTED AND INCLUDE A LIST OF ANY ASSUMPTIONS.

As is true of other State HIEs, Vermont's VHIE developed initially through Federal funding leveraged by State funds, specifically the Health Information Technology Fund (HIT Fund), defined by 32 V.S.A. § 10301 as "a special fund to be a source of funding for medical healthcare information technology programs and initiatives such as those outlined in the Vermont health information technology plan administered by the secretary of administration or designee." VITL is explicitly named in § 10301(a)(2) as a recipient of these funds to "build and operate the health information exchange network." At the time of this writing, the HIT fund portion of the Healthcare Claims Tax is scheduled to sunset at the end of FY2017.

Federal funding was never intended or expected to continue at the relatively high level created by Congress to encourage HIE initial development. Consequently, every public HIE program effort has known from the start that a model for sustainability would be required to ensure that HIE services would be available into the indefinite future. An evaluation of sustainability models for VHIE is well beyond the scope of the present review, but understanding of the sustainability context is useful to appreciating the cost impact of the present O&M grant.

From 2011 – 2014, the State's Cooperative Agreement Grant from the Office of the National Coordinator (ONC), matched 90/10 with the HIT Fund, was the primary source of State funding for VITL through a grant agreement between DVHA and VITL. Since 2014, the State has used Global Commitment funding for some VHIE expenses at a match rate of 55/45 and Federal HITECH funding through a CMS fair share formula at an average match rate of roughly 75/25. The State's current best information indicates that these federal funding sources will continue to be available for the next 5 years or more.

The current funding breakdown of the present grant for FY2016 is therefore:

Fund	Source	Amount
Global Commitment	Federal	$2,731,131.26
HIT Fund	State	$2,234,561.94
	TOTAL:	$4,965,693.20

(NOTE: Other sources of Federal fund, particularly State Innovation Model (SIM) grant and HIT Implementation Advance Planning Document (IAPD) funds, are also leveraged by State funds to support VHIE/VITL activities, but the grant here under review utilizes the Global Commitment and HIT funds as shown above.)

In addition, some costs are incurred by the State outside of the grant for personnel to develop, monitor, and manage the grant. These costs, as well as the cost of this Independent Review, are added to total grant costs in the Cost Assessment spreadsheet, for a total cost over a 1 year lifecycle of

$ 5,210,394.60

SUSTAINABILITY

At this point in time, the State is not asking VITL to develop a model for developing non-State revenue streams as a way of sustaining VHIE in the long term. Some states (such as Delaware) have adopted models or partial models that charge providers and other users for HIE access, and/or charge for access to software tools. Other states may choose to fund and HIE long-term through state funds, as a public health resource necessary for improved healthcare. As noted above, states vary widely in their healthcare provider, payer, and policy landscapes. Our interviews indicate that our State is leaning toward a State funded model. However, our point here is not to identify a sustainability model for Vermont, but rather to report that State administrators are very much engaged in analyzing, developing, and recommending an appropriate sustainability model for VHIE, which bodes well for the long term.

Within the lifecycle of this grant, State funds (via the HIT fund) are adequate and well-accounted for.

COST ALLOCATION

As a look at the Cost Assessment spreadsheet will quickly reveal**, costs in this grant are not explicitly tied to individual activities on a line-by-line basis** **_RISK_ID#_7_**. We identify this as a risk, for two reasons: first, it can make it difficult to identify separate costs of specific activities, should funding become scarce, or if new funding for specific activities becomes available; second, it could possibly reflect difficulties in properly allocating the use of funds from Federal funding sources, as is necessary for grant auditing and reporting activities. There are some historical reasons for this situation: the State has, in recent years, been refining and adjusting the way that it supplies funds for VITL activities; and VITL tells us that the use of multiple funding streams for activities which may benefit more than just the original supplier of funding makes it difficult to divide costs in a simple way.

Our conversations with State staff demonstrate that this situation is a major source of the tension identified above in Section 7.2 and Risk ID #6. Through its internal planning and funding processes, the State typically assesses the new and continuing costs of projects not only by bottom line, but also on a cost per item basis (whether material, service, or activity). In negotiating contracts with vendors, the State may often decide to increase, decrease, or eliminate specified line items, before a final contract is agreed. Even Requests For Proposals (RFPs) that request an all-inclusive fixed price often require breakout of various items. The understanding is that, even though line items may be interdependent, and might not constitute a pick-and-choose “menu,” these delineations form the basis for further negotiations and refinement of the State’s purchasing plans.

We acknowledge that VITL is not precisely a vendor, and a grant is not exactly a purchasing contract; however, the budget as presented in Attachment B of the current grant does not break out costs of activities at all (except for Direct Allocations, which are effectively "pass-through" amounts). The resultant budget looks more like the budget for an *organization* than for a *data network*. While this may suit both VITL and State for the current fiscal year, we suggest that it may make future planning difficult, especially in light of the fact that VHIE activities interface with, and are interdependent with, many other aspects for the State's overall HIT plan, which are not under VITL's purview. The State's future possible need to adjust funding for *particular aspects* of VHIE activity in light of overall HIT and healthcare policy needs might be slowed in the absence of a more detailed breakout of VHIE activity costs.

The State, within the body of this grant, has initiated and funded a process, employing a third-party professional firm, to evaluate and improve VITL's internal cost allocation methodology. This activity is already underway, and we believe it is a good start to assuring appropriate cost allocation, particularly for purposes of assuring proper cost allocation for grant funding sources, such as federal grant sources. It may also provide the basis for developing better mutual understanding of VHIE network costs.

SEPARATE GRANTS AND CONTRACT

Finally, we note that the method of funding VHIE/VITL through separate grants and contract, although it does help to separate funding streams from a State perspective, does result in a set of agreements that can be difficult to navigate, from the perspective of a reviewer assigned to review just one of them. We also heard some acknowledgment from State interviewees that this separation of agreements may not be in the best interest of encouraging good planning within VITL, as people who work on specific initiatives within the organization do not necessarily see their work in terms of funding streams. However, we see that the development and improvement of these agreements is a work in progress, and we expect that the difficulties will be addressed creatively in future agreements.

9.3 EXPLAIN ANY NET OPERATING INCREASES THAT WILL BE COVERED BY FEDERAL FUNDING. WILL THIS FUNDING COVER THE ENTIRE LIFECYCLE? IF NOT, PLEASE PROVIDE THE BREAKOUTS BY YEAR.

(See above)

9.4 WHAT IS THE BREAK-EVEN POINT FOR THIS IT ACTIVITY (CONSIDERING IMPLEMENTATION AND ON-GOING OPERATING COSTS)?

This O&M grant is intended to continue support for one year of VITL's operation of VHIE and associated activities, and not as a replacement for a previous system. The currently projected sustainability model (see above) does not at this point include revenue generating offerings by VITL to offset or replace State funding.

10 ATTACHMENTS

Attachment A – State Diagram of High-Level HIT Architecture ("To-Be Vision") from Vermont HIT VSOP, 2013

Attachment B – State Schematic View of Health Information Exchange (HIE) "eco-system", from Vermont HIT VSOP, 2013

Attachment C – Network Integration High Level Diagram of Vermont Health Information Exchange Network

Attachment D – VITL diagram of "Proposed Clinical Data Management Infrastructure," showing logical diagram of VHIEN

Attachment E – Cost Spreadsheet, Excel File Tab 1

Attachment F – Acquisition Cost Spreadsheet, Excel File Tab 2

Attachment G – State Personnel Cost, Excel File Tab 3

Attachment H – Risk Register Summary

Attachment H – *Additional Notes:* List Of Recommendations Contained Within The Report Narrative (Exclusive Of Risk Register)

ATTACHMENT A – STATE DIAGRAM OF HIGH-LEVEL HIT ARCHITECTURE ("TO-BE VISION") FROM VERMONT HIT VSOP, 2013

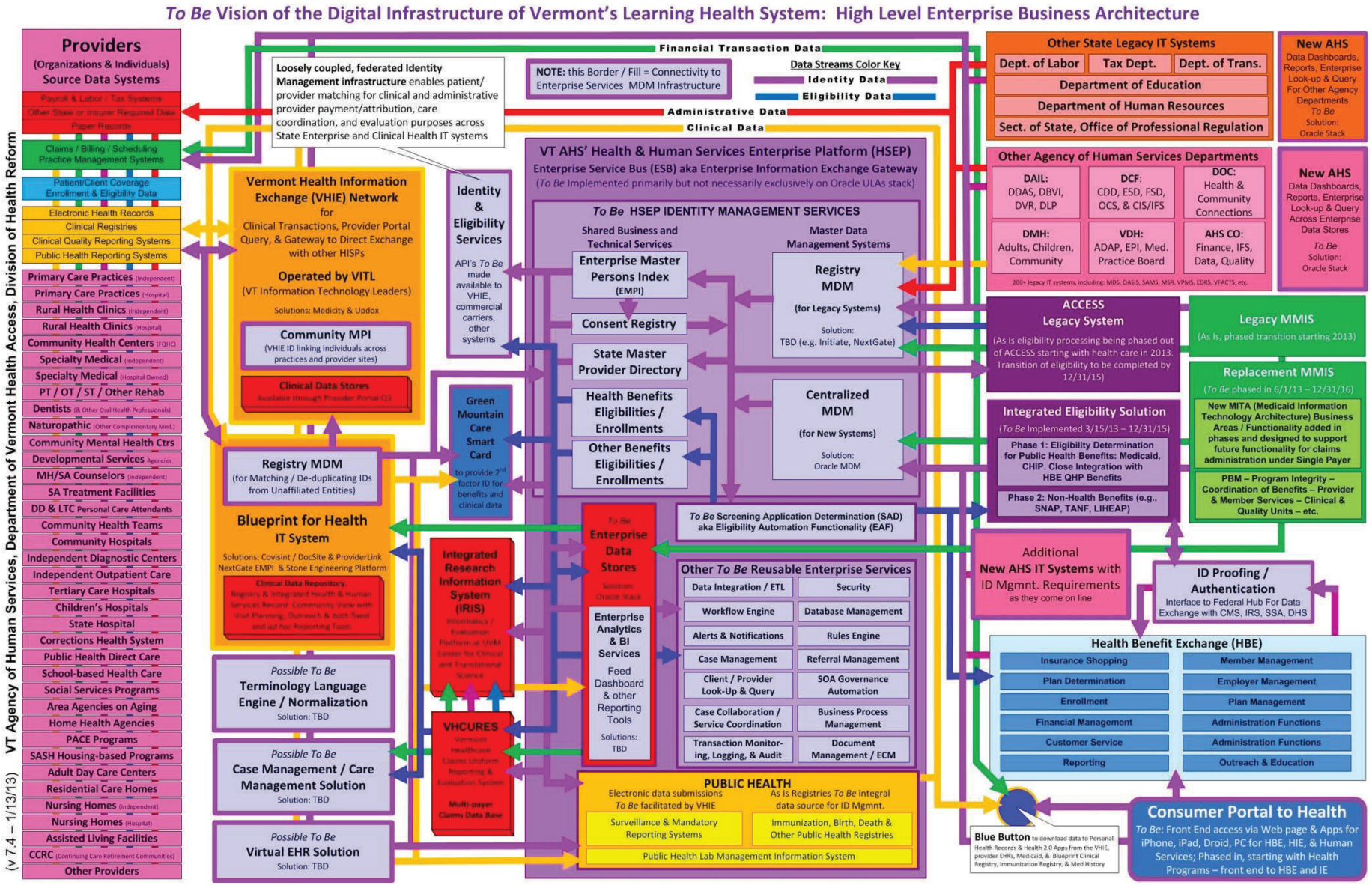
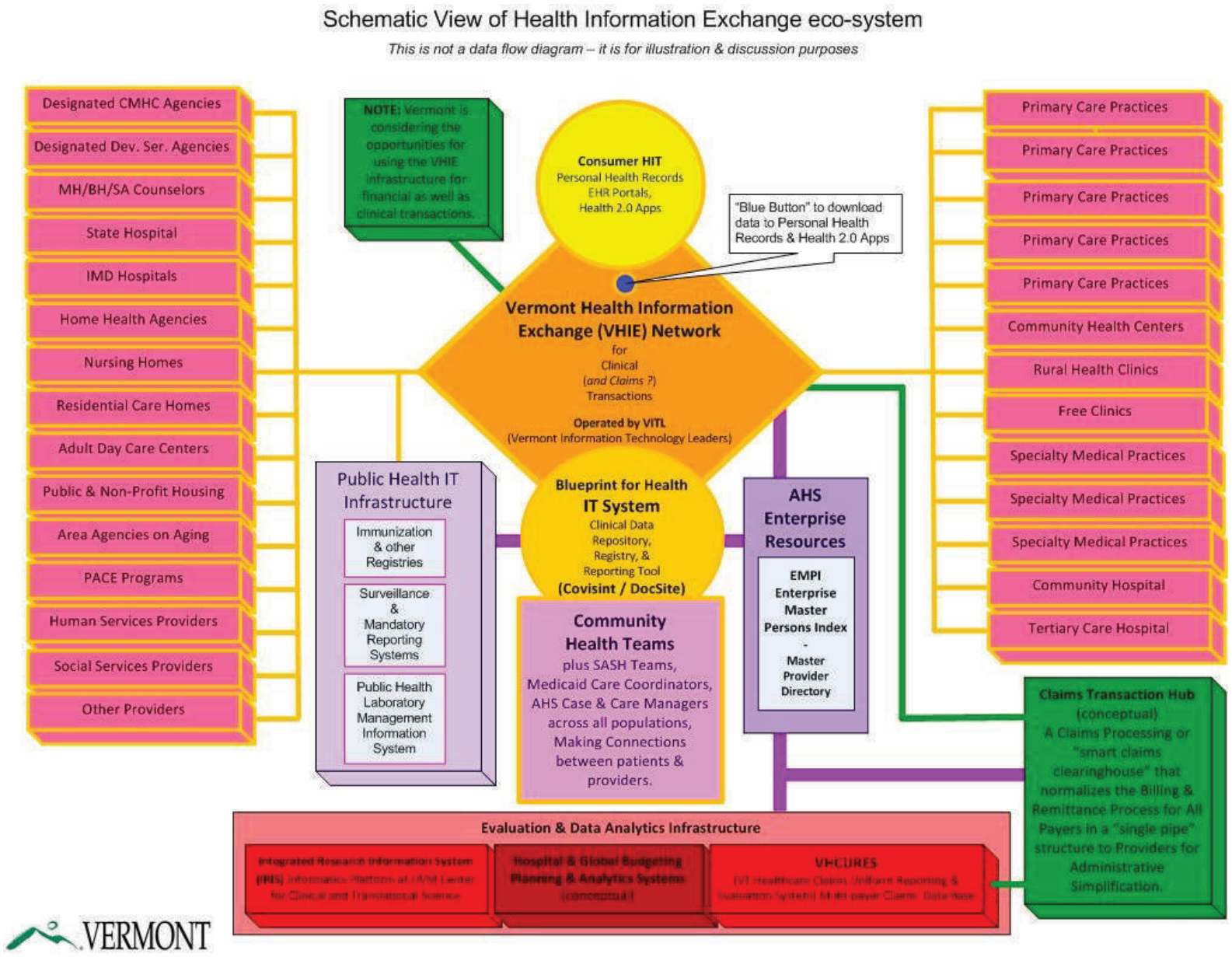


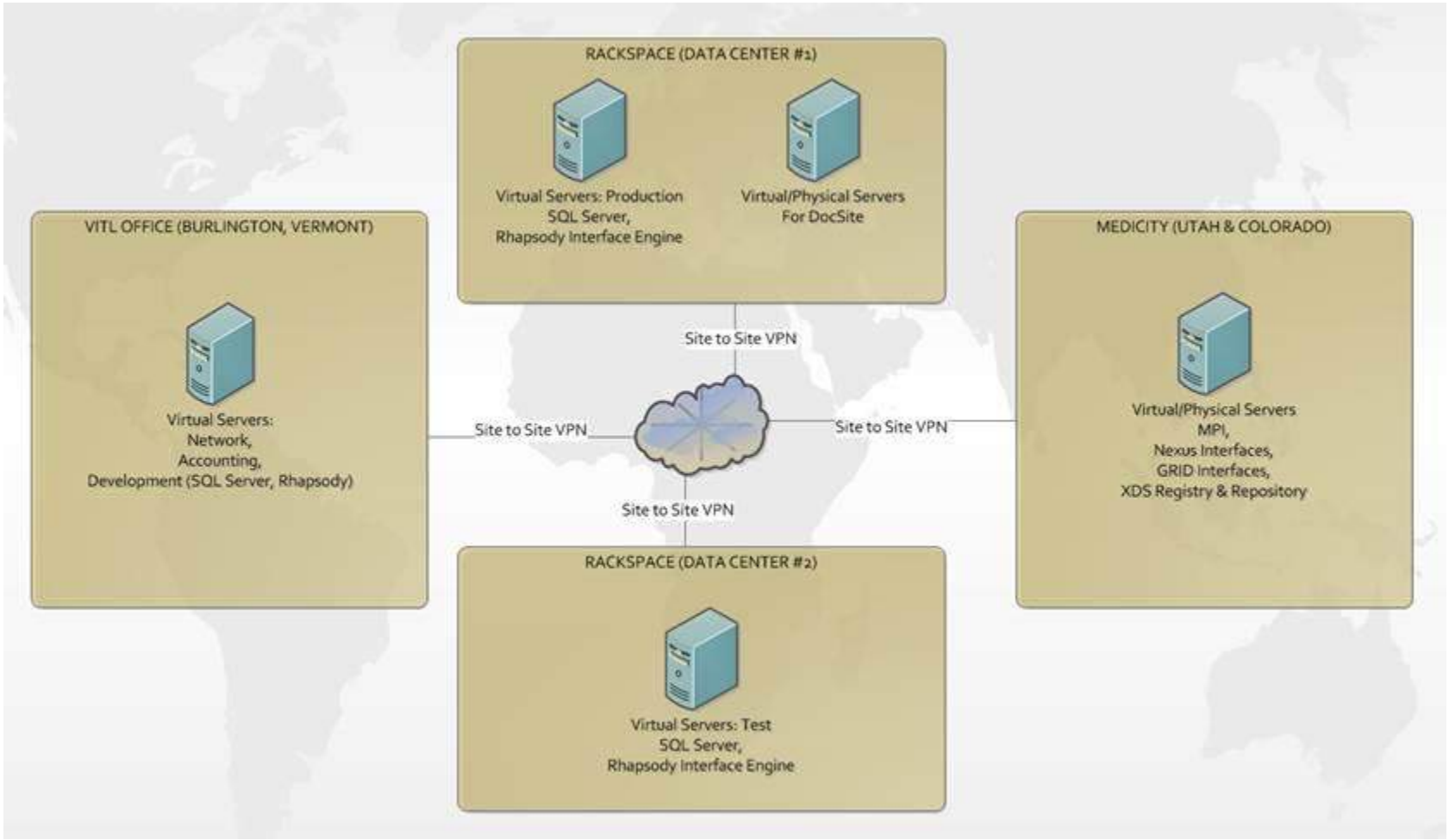
Diagram 1: Health Reform Enterprise HIT

ATTACHMENT B – STATE SCHEMATIC VIEW OF HEALTH INFORMATION EXCHANGE (HIE) "ECO-SYSTEM", FROM VERMONT HIT VSOP, 2013

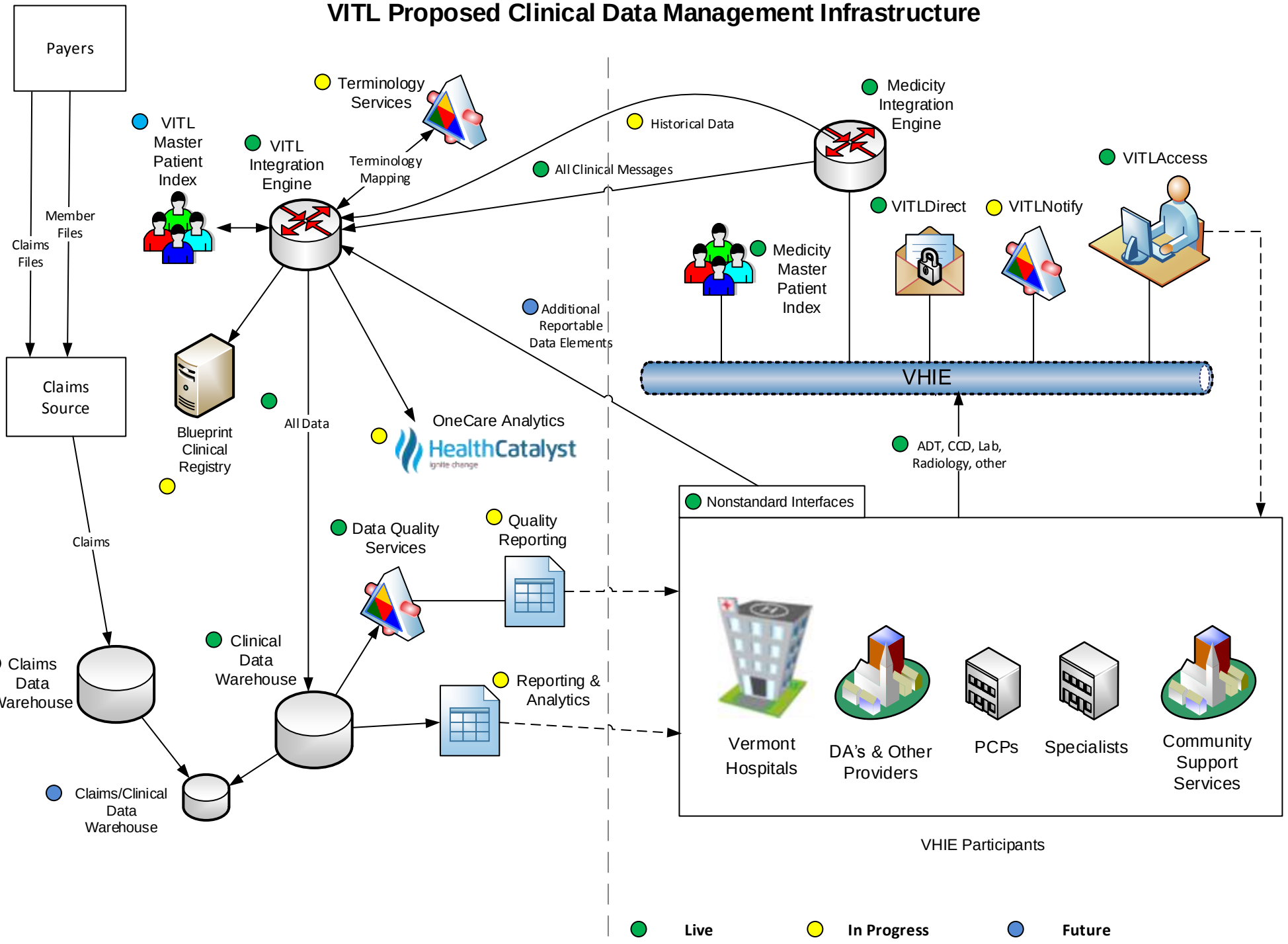
Diagram 2


Schematic View of Health Information Exchange eco-system
This is not a data flow diagram – it is for illustration & discussion purposes
Designated CMHC Agencies
Designated Dev. Ser. Agencies
MH/BH/SA Counselors
State Hospital
IMD Hospitals
Home Health Agencies
Nursing Homes
Residential Care Homes
Adult Day Care Centers
Public & Non-Profit Housing
Area Agencies on Aging
PACE Programs
Human Services Providers
Social Services Providers
Other Providers
NOTE: Vermont is considering the opportunities for using the VHIE infrastructure for financial as well as clinical transactions.
Consumer HIT
Personal Health Records
EHR Portals,
Health 2.0 Apps
"Blue Button" to download data to Personal Health Records & Health 2.0 Apps
Vermont Health Information Exchange (VHIE) Network
for
Clinical
(and Claims ?)
Transactions
Operated by VITL
(Vermont Information Technology Leaders)
Public Health IT Infrastructure
Immunization & other Registries
Surveillance & Mandatory Reporting Systems
Public Health Laboratory Management Information System
Blueprint for Health IT System
Clinical Data Repository, Registry, & Reporting Tool
(Covisint / DocSite)
Community Health Teams
plus SASH Teams, Medicaid Care Coordinators, AHS Case & Care Managers across all populations, Making Connections between patients & providers.
AHS Enterprise Resources
EMPI Enterprise Master Persons Index
-
Master Provider Directory
Primary Care Practices
Primary Care Practices
Primary Care Practices
Primary Care Practices
Primary Care Practices
Community Health Centers
Rural Health Clinics
Free Clinics
Specialty Medical Practices
Specialty Medical Practices
Specialty Medical Practices
Community Hospital
Tertiary Care Hospital
Claims Transaction Hub
(conceptual)
A Claims Processing or "smart claims clearinghouse" that normalizes the Billing & Remittance Process for All Payers in a "single pipe" structure to Providers for Administrative Simplification.
Evaluation & Data Analytics Infrastructure
Integrated Research Information System
Hospital & Global Budgeting Planning & Analytics Systems
(conceptual)
VHCURES
VERMONT

ATTACHMENT C – NETWORK INTEGRATION HIGH LEVEL DIAGRAM OF VERMONT HEALTH INFORMATION EXCHANGE NETWORK



ATTACHMENT D – VITL DIAGRAM OF "PROPOSED CLINICAL DATA MANAGEMENT INFRASTRUCTURE," SHOWING LOGICAL DIAGRAM OF VHIEN


VITL Proposed Clinical Data Management Infrastructure
Payers
Claims Files
Member Files
Claims Source
Terminology Services
Terminology Mapping
VITL Master Patient Index
VITL Integration Engine
Historical Data
All Clinical Messages
Medicity Integration Engine
VITLAccess
VITLDirect
VITLNotify
Medicity Master Patient Index
Additional Reportable Data Elements
VHIE
Blueprint Clinical Registry
All Data
OneCare Analytics
HealthCatalyst
ignite change
ADT, CCD, Lab, Radiology, other
Nonstandard Interfaces
Claims
Data Quality Services
Quality Reporting
Clinical Data Warehouse
Claims Data Warehouse
Reporting & Analytics
Claims/Clinical Data Warehouse
Vermont Hospitals
DA's & Other Providers
PCPs
Specialists
Community Support Services
VHIE Participants
Live
In Progress
Future

ATTACHMENT E – COST SPREADSHEET, EXCEL FILE TAB 1

Project Name:				VHIE O&M GRANT 2016			
Description	Included in Vendor Fixed Price	Qty	Unit Price	Initial Implementation	Maintenance	Refresh & Maintenance	Total
Fiscal Year				FY 2016	FY 2016		
Hardware							
Server Hardware				$ -	$ -	$ -	$ -
Network Upgrades				$ -	$ -	$ -	$ -
Desktop Hardware				$ -	$ -	$ -	$ -
Other (VITL Direct IT Expense)				$ -	$ 290,479.85	$ -	$ 290,479.85
Hardware Total				**$ -**	**$ 290,479.85**	**$ -**	**$ 290,479.85**
Software as a Service							$ -
Product License (Statewide Medicity Contract)				$ -	$ 785,268.74	$ -	$ 785,268.74
Medicity Interface				$ -	$ 129,813.37	$ -	$ 129,813.37
Provider Interface Reimbursement				$ -	$ 280,000.00	$ -	$ 280,000.00
Product Per-User Charges				$ -	$ -	$ -	$ -
Database				$ -	$ -	$ -	$ -
Operating System Software				$ -	$ -	$ -	$ -
Additional Server Software				$ -	$ -	$ -	$ -
Additional Network Software				$ -	$ -	$ -	$ -
Other				$ -	$ -	$ -	$ -
Software Total				**$ -**	**$ 1,195,082.11**	**$ -**	**$ 1,195,082.11**
Consulting				$ -	$ -	$ -	$ -
Third-Party - Technical				$ -	$ -	$ -	$ -
Third-Party - Business (Direct Consulting)				$ -	$ 250,476.95	$ -	$ 250,476.95
Direct Travel				$ -	$ 40,462.27		
Deployment				$ -	$ -	$ -	$ -
Upgrade				$ -	$ -	$ -	$ -
Other (Project Management)				$ -	$ -	$ -	$ -
Consulting Total				**$ -**	**$ 290,939.22**	**$ -**	**$ 290,939.22**
							$ -
Training							$ -
Trainer				$ -	$ -	$ -	$ -
Other				$ -	$ -	$ -	$ -
Training Total				**$ -**	**$ -**	**$ -**	**$ -**
Other							
Outreach and Education				$ -	$ 343,862.10	$ -	$ 343,862.10
Occupancy / Rent				$ -	$ 162,108.68	$ -	$ 162,108.68
Telecommunications				$ -	$ 145,857.74	$ -	$ 145,857.74
Operational Expense				$ -	$ 104,712.72	$ -	$ 104,712.72
Professional & Legal				$ -	$ 109,394.97	$ -	$ 109,394.97
Insurance				$ -	$ 74,809.12	$ -	$ 74,809.12
Interest & Depreciation				$ -	$ 24,103.99	$ -	$ 24,103.99
Meetings, Travel, Prof. Dev.				$ -	$ 76,301.96	$ -	$ 76,301.96
Implementation Services				$ -	$ -	$ -	$ -
Customization / Development				$ -	$ -	$ -	$ -
Deliverables				$ -	$ -	$ -	$ -
Independent Review				$ 16,750.00	$ -	$ -	$ 16,750.00
Other Total				**$ 16,750.00**	**$ 1,041,151.28**	**$ -**	**$ 1,057,901.28**
Personnel - Additional							
Business Staff (Administrative Personnel VITL)				$ -	$ 2,148,040.74	$ -	$ 2,148,040.74
State Personnel (note 1)				$ -	$ 227,951.40	$ -	$ 227,951.40
DII Proj. Mgt. & Enterprise Architecture Services				$ -	$ -	$ -	$ -
Personnel - Additional Total				**$ -**	**$ 2,375,992.14**	**$ -**	**$ 2,375,992.14**
Grand Total				**$ 16,750.00**	**$ 5,193,644.60**	**$ -**	**$ 5,210,394.60**

V.1.0.a

NOTES / ASSUMPTIONS:

[1] For State personnel whose salary is not known to reviewer, cost computed on the basis of FTE * $55/hr. See State Personnel Cost tab for breakout.

checksum: $ 5,210,394.60

ATTACHMENT F – ACQUISITION COST SPREADSHEET, EXCEL FILE TAB 2

Cost	Hardware	Software	Implementation Services	System Integration Costs	Professional Services	
Administrative Personnel Cost					$ 2,148,040.74	
Insurance					$ 74,809.12	
Professional & Legal					$ 109,394.97	
Outreach and Education			$ 343,862.10			
Occupancy / Rent			$ 162,108.68			
Telecommunications			$ 145,857.74			
Operational Expense			$ 104,712.72			
Meetings, Travel, Prof. Dev.					$ 76,301.96	
Interest & Depreciation					$ 24,103.99	
Direct IT Expense	$ 290,479.85					
Direct State-wide Medicity Contract		$ 785,268.74				
Direct Consulting					$ 250,476.95	
Direct Travel					$ 40,462.27	
Medicity Interface				$ 129,813.37		
Provider Interface Reimbursement				$ 280,000.00		
TOTAL:	**$ 290,479.85**	**$ 785,268.74**	**$ 756,541.24**	**$ 409,813.37**	**$ 2,723,590.00**	**$ 4,965,693.20**
State personnel cost (not in grant budget)						$ 227,951.40
Independent Review						$ 16,750.00
						$ 5,210,394.60

ATTACHMENT G – STATE PERSONNEL COST, EXCEL FILE TAB 3

Estimated State Personnel for VITL Grant	Est. Hrly.[1]	Hrs/Wk	Wks/Yr	1 FTE / yr	FTE needed	Total
HIE Business Lead/ State HIT Coordinator – 10% or 0.1 FTE				$ 87,672	0.1	$ 8,767.20
Assoc. State HIT Coord. – 10%	$ 55.00	40	52	$ 114,400	0.1	$ 11,440.00
HIE Program Manager – 20%	$ 140.00	40	52	$ 291,200	0.2	$ 58,240.00
HIE Project Manager – 5%	$ 125.00	40	52	$ 260,000	0.5	$ 130,000.00
HIE Business Analyst – 10%	$ 69.00	40	52	$ 143,520	0.1	$ 14,352.00
Grants Management Specialist (DVHA Business Office) – 10%				$ 51,522	0.1	$ 5,152.20
					TOTAL	**$ 227,951.40**

[1] For State personnel whose salary is not known to reviewer, cost computed on the basis of FTE * $55/hr. See State Personnel Cost tab for breakout.

ATTACHMENT H – RISK REGISTER SUMMARY

Risk ID	Risk Description	Overall Rating	Impact	Prob-ability	Source	State Response	Reviewer's Assessment
1	Model for evaluation of program effectiveness is not yet well developed.	24	8	3	State and VITL	**Accept**: The State and VITL are working together to evolve a usable quantitative and qualitative model for evaluating program effectiveness. The focus on data quality and connectivity, reflected in this grant, are seen as early steps in the evaluation project.	Concur. There is as yet no national model for evaluating HIE effectiveness. The State's planned response is in line with best practices as they are currently understood.
2	VITL does not have an established comprehensive data governance council with process.	27	9	3	VITL	**Mitigate**: VITL has extensive written data governance policy, approved by the VITL board, and at this time the VITL board itself fills any emergent need for data governance decisions, but does not have an established data governance council with associated process defined. VITLE reports that the development of a council and associated process is underway.	Concur. Note that a similar policy development was undertaken by GMCB, and may be a potential model.
3	The review process which can be required under Act 54 of 2015 § 9352(c)(2) has not been defined.	15	5	3	State and VITL	**Mitigate:** Clearly define the Act 54 review process in advance of an actual triggered review. Ideally, this would demonstrate the benefit to both State and VITL of sharing technical information, standards, and requirements.	Concur. The State response is appropriate and practical as long as it continues to completion.
4	The lack in the grant of Security Plan specifications according to CISO requirements presents a small but real risk to the timeline of the grant activities. (State may not be able to **directly confirm** PHI protection with high degree of confidence as State does not directly control or monitor security/privacy measures for VHIE)	16	4	4	State and VITL	**Mitigate:** Grant requires VITL to produce current security plan, with specific report components, detailed in Attachment A.3.13, which will be delivered to SOV CISO. *[However, this section of grant may not explicitly require VITL to meet standards representative of current best practices, such as NIST 800-53r4]* State will meet quarterly to check progress especially on any high or moderate risk items that may emerge in report.	Concur. However, the roles of the CIO and CISO (and any other appropriate State personnel) in reviewing and accepting the required documentation should be defined.

5	A requested Act 54 review of interoperability could result in grant timeline delay if DII State Enterprise Architectural expectations are not met. (State expects internal State network architecture to be TOGAF compliant, but VHIE is not internal to State network. State has no direct oversight of VHIE network architecture planning, and grant does not include review process or reference.)	28	4	7	State and VITL	**Mitigate:** Clearly define the Act 54 review process in advance of an actual triggered review. Ideally, this would demonstrate the benefit to both State and VITL of sharing technical information, standards, and requirements.	The State response is appropriate and practical as long as it continues to completion.
6	Tension between State and VITL **could result in delay** on performance of grant activities, **yet also may lead to creative solutions** to problems.	35	7	5	State and VITL	**Accept/Mitigate**: The grant sets out significant deliverables, check-ins, and progress meetings to convey information in both directions between State Agency and VITL. Act 54 of 2015 sets out certain State oversight and/or review of certain VITL activities. These include budgetary oversight by the Green Mountain Care Board, and the possibility of review by DII of VITL's technology for security, privacy, and interoperability with State government information technology, if requested by the Secretary of Administration. Oversight and/or review could increase the flow of relevant information in both directions and lead to a clearer definition of roles and expectations.	Implementation of these processes should provide clarity in the most important areas, if they continue to develop in detail. All participants expressed a strong interest in VHIE continuing to develop well and on schedule, even if they conveyed frustrations. Both State and VITL participants interviewed view GMCB oversight positively. The likelihood of serious problems seems small during the grant period; this bodes well, as benefits may be minimal in the current grant period, but can set the stage for subsequent grants.

7	The activities and deliverables itemized in the grant do not correspond on a one-to-one line item basis with the grant's budget category totals.	27	3	9	State and VITL	Current: **Accept** Future: **Mitigate** Grant requires VITL to engage "third party contracted accounting expertise to review the VITL's cost allocation methodology utilized under the VITL's current agreements with the State and other entities." -and- As enacted in Act 54 of 2015, the GMCB will annually review the budget and activities of VITL in a process not yet defined, but now in progress.	Concur. These mitigations, especially the GMCB oversight process, are likely to move both State and VITL to a condition of mutual budget understanding and planning for future grant years; this will not be accomplished nor is it expected within the timeframe of the current grant. Mutual budget understanding will not necessarily result in assigning costs to activities *as they are itemized in the current grant*, but could ultimately achieve the same ends.

ATTACHMENT H – LIST OF RECOMMENDATIONS CONTAINED WITHIN THE REPORT NARRATIVE (EXCLUSIVE OF RISK REGISTER)

Additional notes to:

INDEPENDENT REVIEW OF THE OPERATION, MANAGEMENT, AND EXPANSION OF THE VERMONT HEALTH INFORMATION EXCHANGE (VHIE) NETWORK

For the State of Vermont Department of Information & Innovation (DII) And Department of Vermont Health Access (DHVA)

Submitted to the State of Vermont, Office of the CIO by:

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November 17, 2015

LIST OF RECOMMENDATIONS CONTAINED WITHIN THE REPORT NARRATIVE (EXCLUSIVE OF RISK REGISTER)

(these notes are extracted for convenience; for complete understanding, they should be read in narrative context in the report sections indicated):

Section	Recommendation
1.5	We recommend without reservation that the State continue operation, management, and expansion of the VHIE network as planned, with additional attention to development of a process, within or without the grant, for the possibility of technology review as allowed by Act 54 of 1015.
6.3.D	In order for [VHIE] to work within the State's HIT plan, we suggest it will be necessary to ensure that VITL's VHIE network architecture plan, or "vision," is congruent with the State's.
6.10	We suggest that ensuring a more complete exchange of appropriate information between State and VITL on these technology matters before any such review process commenced could go far in obviating the need for [an Act 54 review], or at least simplifying its execution. Such an exchange would imply responsibilities for both State and VITL, and in fact the present grant begins to implement this sort of process in the requirement of a VITL Security Plan.
6.10	We therefore suggest a process in which the State defines to VITL its expectations for attestations, plans, and standards related to security and to network architecture, with a timeframe and report expectations for response.
6.10	We suggest as a possibility that, either for this or subsequent grants, the State and VITL develop the expectation of a Network Architecture Plan, mirroring the Security Plan expectation, and including VITL's existing plans and State architectural planning expectations. This may not be the only way to achieve the goal of information sharing; participation of the CIO in VITL network planning or other direct connections are alternatives.