Nova Scotia Health
Project Services &
Performance Improvement
Quality & System Performance

Project Services & Performance Improvement (PSPI) COVID-19 Support

How Project Managers and Industrial Engineers Supported the Vaccination Planning and Roll Out

Nova Scotia Health
Project Services &
Performance Improvement
Quality & System Performance

Project Management COVID-19 Support

- Planning Phase
- Implementation Phase

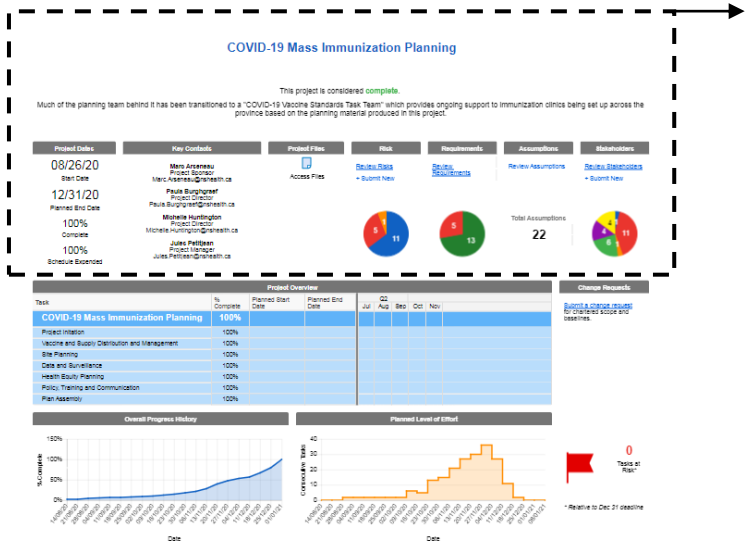
Planning Phase Timeline

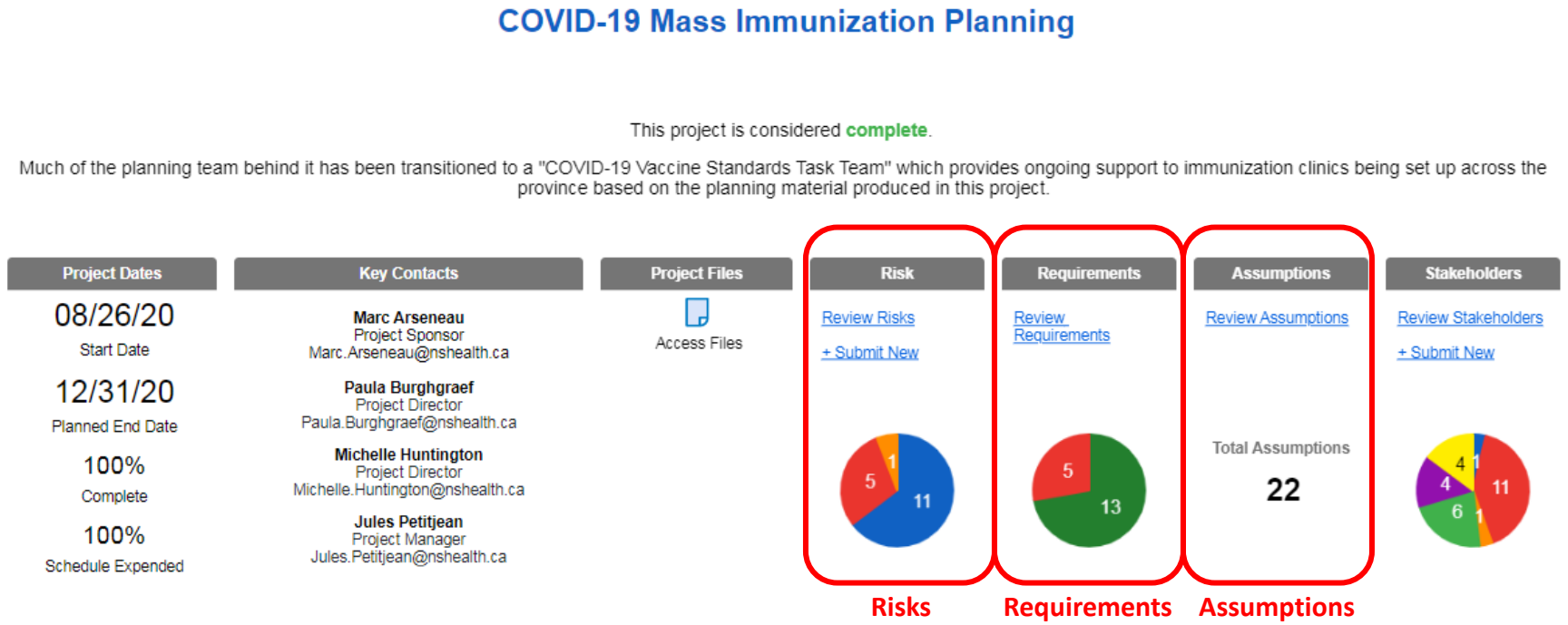
Milestone	Date
Project kick-off	Aug 2020
Charter drafted	Sept 2020
Preliminary work began	Sept 2020
Charter approved	Oct 2020
Core work began	Oct 2020
First clinic opened	Dec 2020
Project completed	Jan 2021

Project Organization

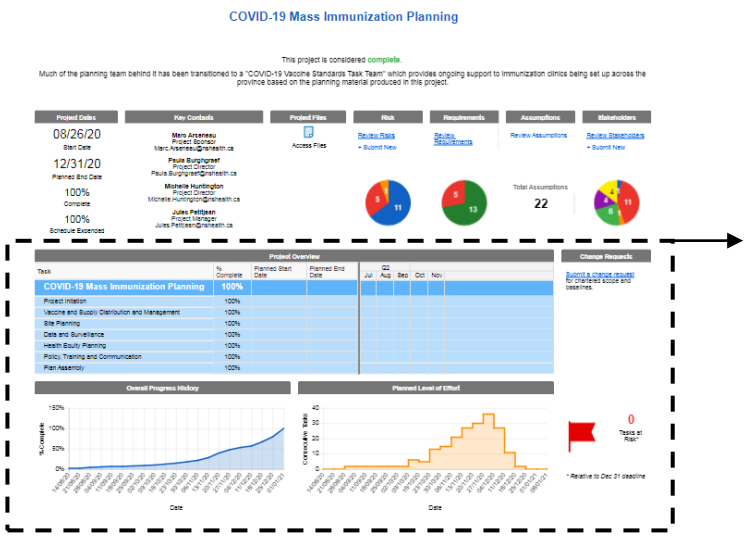
- Sponsored and directed by Public Health
- Project managed by PSPI (Jules Petitjean)
- Smartsheet was used for
  - Project dashboard
  - Tracking of risks, requirements and assumptions
  - Work planning and task definition
  - Document management, review, approval
  - Task tracking and weekly updates
  - ❖ **Single source of truth**

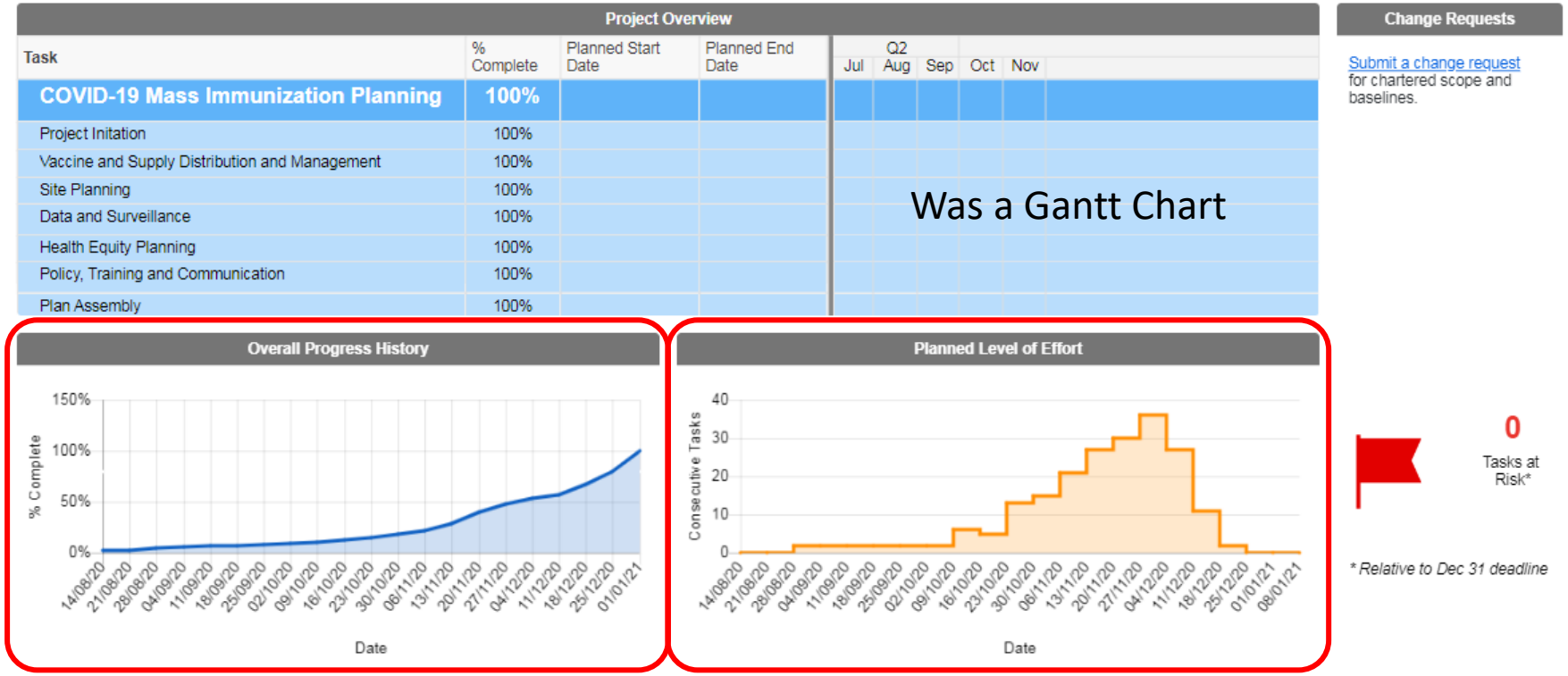
Project Dashboard





Project Dashboard





Progress History

Planned Level of Effort
(Count of ongoing tasks per week)

Tracking Risks, requirements, assumptions

- Link to risk, requirement and assumption logs from the dashboard

Risk Log

Risk ID	Source	Status	Description	Impact Description	Probability	Impact	Score	Strat...	Strategy Description	New WBS Item?	Managed Probability	Managed Impact	Managed Score
51		Open	AEFI monitoring and follow-up SOP could sit as a draft at project end, waiting for various stakeholders to approve.	Could delay development of adverse event training package, depending on the content of that	4 - Likely	3 - Moder	12 - High Risk	Mitigate	Escalate to sponsor level and above the need for stakeholders to review and return feedback promptly.		2 - Unlikely	3 - Moderate	6 - Moderate Ri

Requirement Log

ID	Type	Requirement	Source	Method of Assessment
003	Requirement	Clinics must be safe.	Charter	Health equity checklists
004	Requirement	Clinics must be efficient, as measured by (but not limited to) appointment wait times, line up wait times, ease of appointment booking and clinic flow.	Charter	Appointment wait times, line up wait times, ease of appointment booking and clinic flow.
005	Requirement	Clinic sites must be accessible, including by priority populations by following the NSHA Health Equity Lens.	Charter	Health equity checklists

Assumption Log

Assumption ID	Assumption	Source
A01	Assumption for planning purposes based on guidance from DHW is to plan to immunize 100% of Nova Scotia's population (no minimum age	Charter
A02	COVID case/contact management first priority; COVID immunization/AEFI monitoring second priority; NDs and then other BCP essential services	Charter
A03	We will not be concurrently offering school based imms	Charter

Work Plan

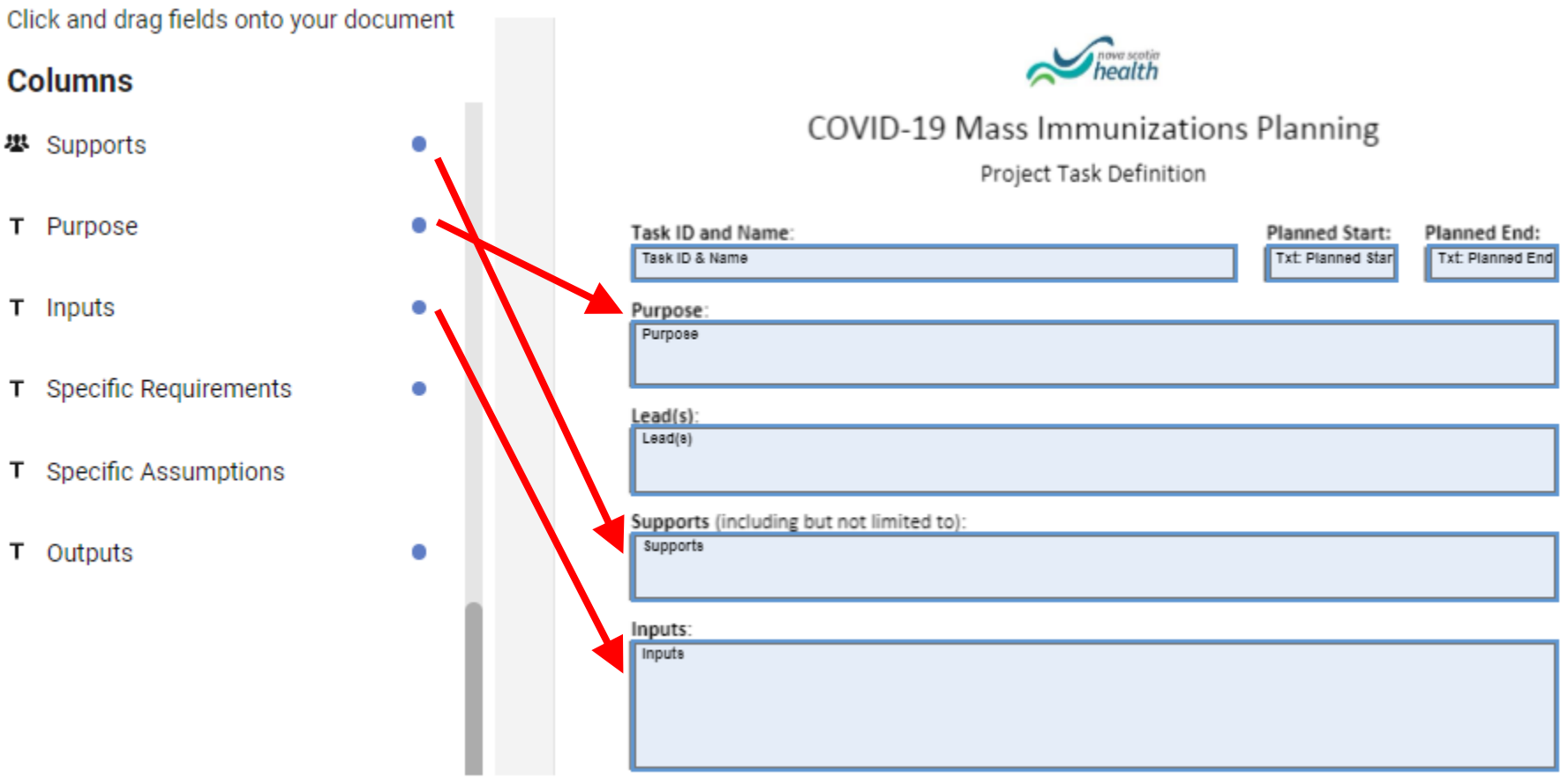
Task ID	Task Name	D...	Note	Lead(s)	Managed Start	Managed End	% Com...
T003	**COVID-19 Mass Immunization Planning**				**2020-08-26**	**2020-12-31**	**100%**
T084	+ Project Initation			Jules Petitjean	2020-08-26	2020-10-19	100%
T004	+ External Milestones			M melissa.boland@novascotia.ca	2020-11-06	2020-11-20	100%
T007	− Vaccine and Supply Distribution and Management			CB Clare Barter SD Stacey Dunphy	2020-10-08	2020-12-23	100%
T008	− Distribution and storage plan for vaccines & supplies	1.1		CB Clare Barter SD Stacey Dunphy	2020-10-21	2020-12-11	100%
T187	NSH procurement of supplies for later distribution to clinics			CB Clare Barter SD Stacey Dunphy	2020-11-30	2020-12-11	100%
T010	Supply Distribution (Previously "Procurement Process and F			CB Clare Barter SD Stacey Dunphy	2020-10-21	2020-12-04	100%
T128	Warehouse storage			CB Clare Barter SD Stacey Dunphy	2020-10-21	2020-12-04	100%
T012	− Inventory monitoring			CB Clare Barter SD Stacey Dunphy	2020-10-21	2020-12-11	100%
T013	− Vaccine inventory monitoring		Panarama	CB Clare Barter SD Stacey Dunphy	2020-12-02	2020-12-11	100%
T182	Ordering via Panarama			SD Stacey Dunphy	2020-12-02	2020-12-11	100%
T165	Recieving		Pharmacy	SD Stacey Dunphy	2020-12-02	2020-12-11	100%
T167	Step-by-step receiving instructions			JM Jessica McCarthy SD Stacey Dunphy	2020-12-02	2020-12-11	100%
T166	Reporting to Biodepot			JM Jessica McCarthy SD Stacey Dunphy	2020-12-02	2020-12-11	100%
T162	Return of thermal shippers and GPS trackers			JM Jessica McCarthy SD Stacey Dunphy	2020-12-02	2020-12-11	100%
T014	Clinic supply inventory monitoring			CB Clare Barter SD Stacey Dunphy	2020-10-21	2020-12-04	100%
T016	− Vendor needs / site capacity assessment		Vendor=va	CB Clare Barter SD Stacey Dunphy	2020-11-26	2020-12-09	100%
T017	Adequate vaccine storage			CB Clare Barter SD Stacey Dunphy	2020-11-26	2020-12-09	100%
T018	Adequate supply storage			SD Stacey Dunphy U urtina.shala-ramosaj@nshe	2020-11-26	2020-12-09	100%

Work Plan (cont.)

% Com...	% Schedule Expended	Sch... Risk	Health	Raise for discus...	Supports	Purpose	Inputs	Speci... Requi...	Sp... As...	Outputs
100%	100%									
100%	100%									
100%	100%									
100%	100%									
100%	100%									
100%	100%					Determine what supplie	- NSH supp			Write-up including: - Wl
100%	100%				JR JP Rochon M melissa.boland@novascotia.ca	Document the procurer		- Assume		Written narrative as to:
100%	100%				M melissa.boland@novascotia.ca	Produce a written plan				Written plan covering: -
100%	100%									
100%	100%				J james.anderson@nshealth.ca M markl2.benr	Document the tools anc		- Assume		Written report explainin
100%	100%					Have a specific plan, ar				
100%	100%					Who will be there to ent				
100%	100%									
100%	100%									
100%	100%					Guide for sites (HI to st				
100%	100%				J james.anderson@nshealth.ca M markl2.benr	Produce a written narra		- Assume		A written narrative abou
100%	100%									
100%	100%				J james.anderson@nshealth.ca U urtina.shala	Provincially, determine	- Vaccine s	- Assume		Written plan that includ

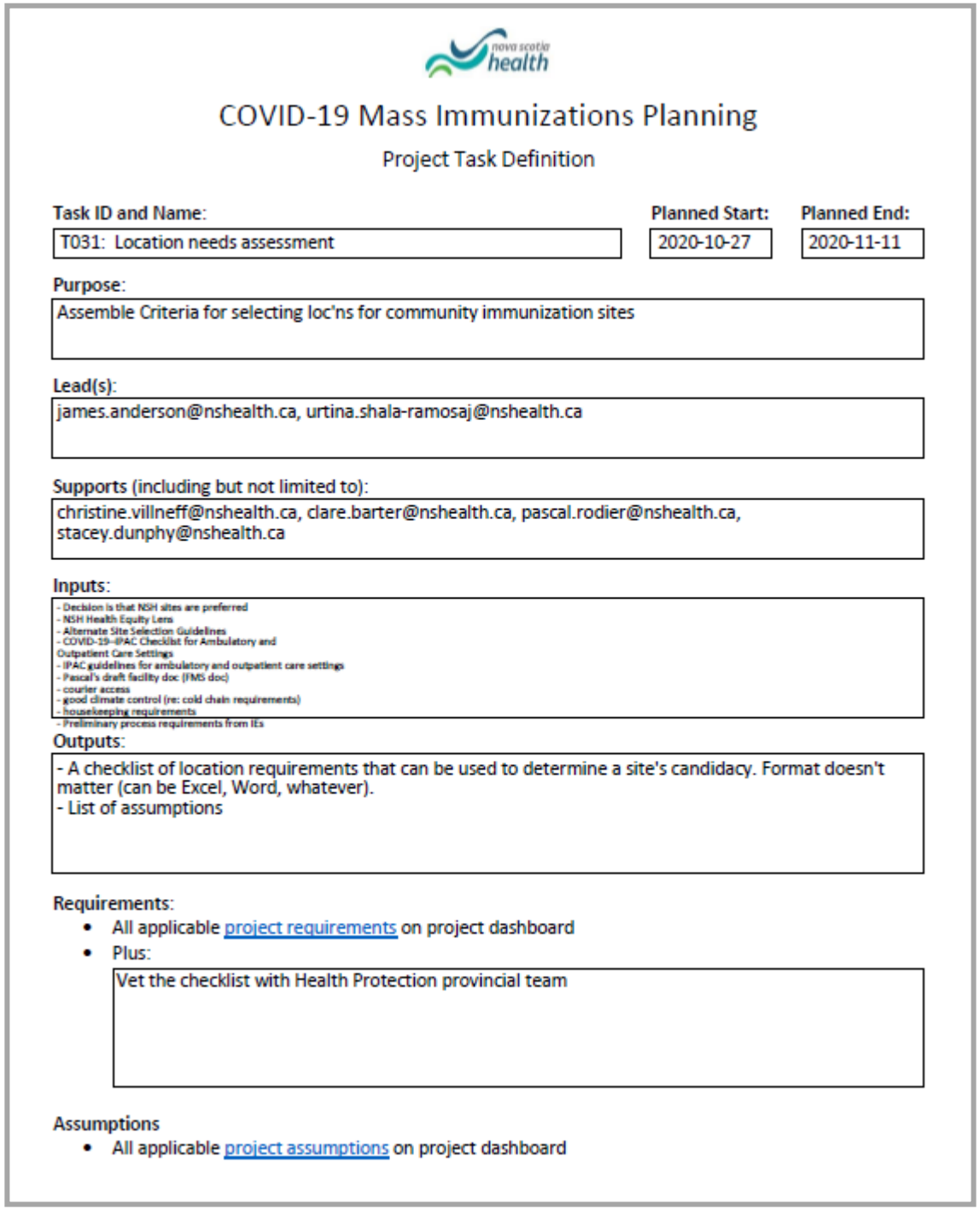
Task Definitions

- Work plan fields fed an Adobe form to create **Task Definition Forms**



Task Definition Forms

- Task purpose, inputs, outputs, etc, had to be constantly updated by the PM as the plan was elaborated
- Task Definition Forms were referred to consistently in project meetings
- Project team members knew to refer to them for the PM's most up-to-date understanding of task details
- This vastly improved communication and avoided redundant work



COVID-19 Mass Immunizations Planning

Project Task Definition

Task ID and Name: T031: Location needs assessment

Planned Start: 2020-10-27

Planned End: 2020-11-11

Purpose:
Assemble Criteria for selecting loc'ns for community immunization sites

Lead(s):
james.anderson@nshealth.ca, urtina.shala-ramosaj@nshealth.ca

Supports (including but not limited to):
christine.villneff@nshealth.ca, clare.barter@nshealth.ca, pascal.rodier@nshealth.ca, stacey.dunphy@nshealth.ca

Inputs:
- Decision is that NSH sites are preferred
- NSH Health Equity Lens
- Alternate Site Selection Guidelines
- COVID-19--IPAC Checklist for Ambulatory and Outpatient Care Settings
- IPAC guidelines for ambulatory and outpatient care settings
- Pascal's draft facility doc (FMS doc)
- courier access
- good climate control (re: cold chain requirements)
- housekeeping requirements
- Preliminary process requirements from IEs

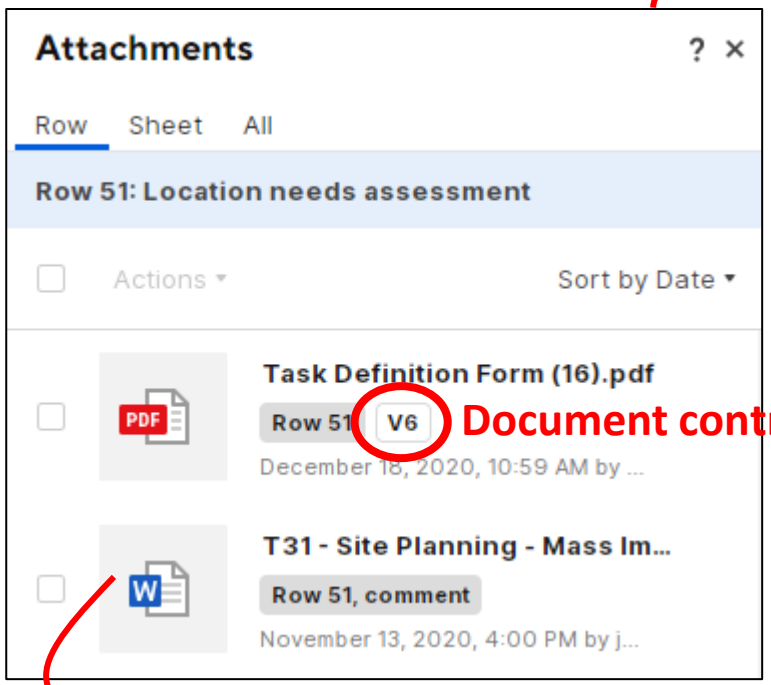
Outputs:
- A checklist of location requirements that can be used to determine a site's candidacy. Format doesn't matter (can be Excel, Word, whatever).
- List of assumptions

Requirements:
- All applicable project requirements on project dashboard
- Plus:
  - Vet the checklist with Health Protection provincial team

Assumptions
- All applicable project assumptions on project dashboard

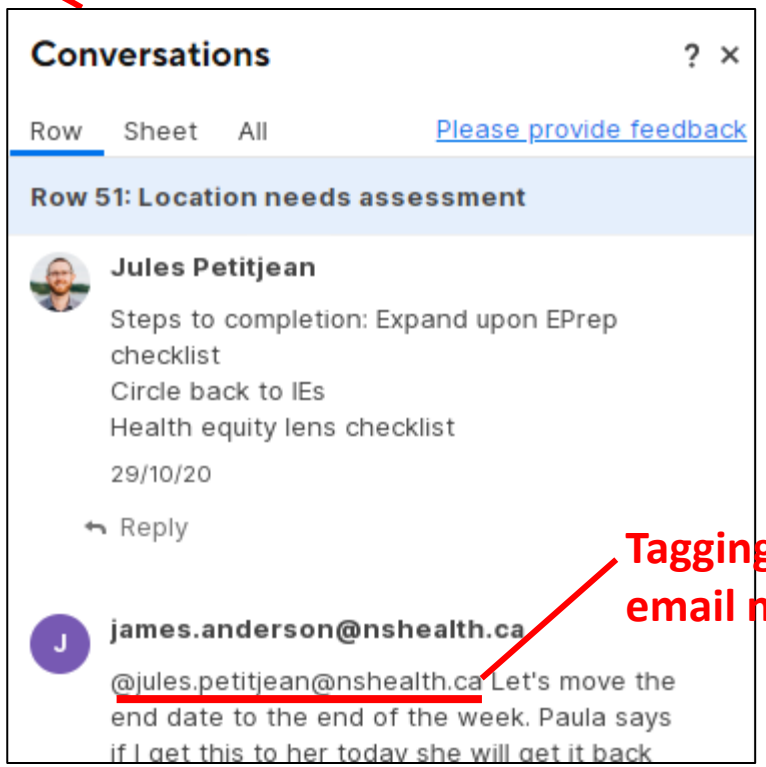
Document Management and Collaboration

- Row attachments and conversations enabled topic-specific dialogue and document management



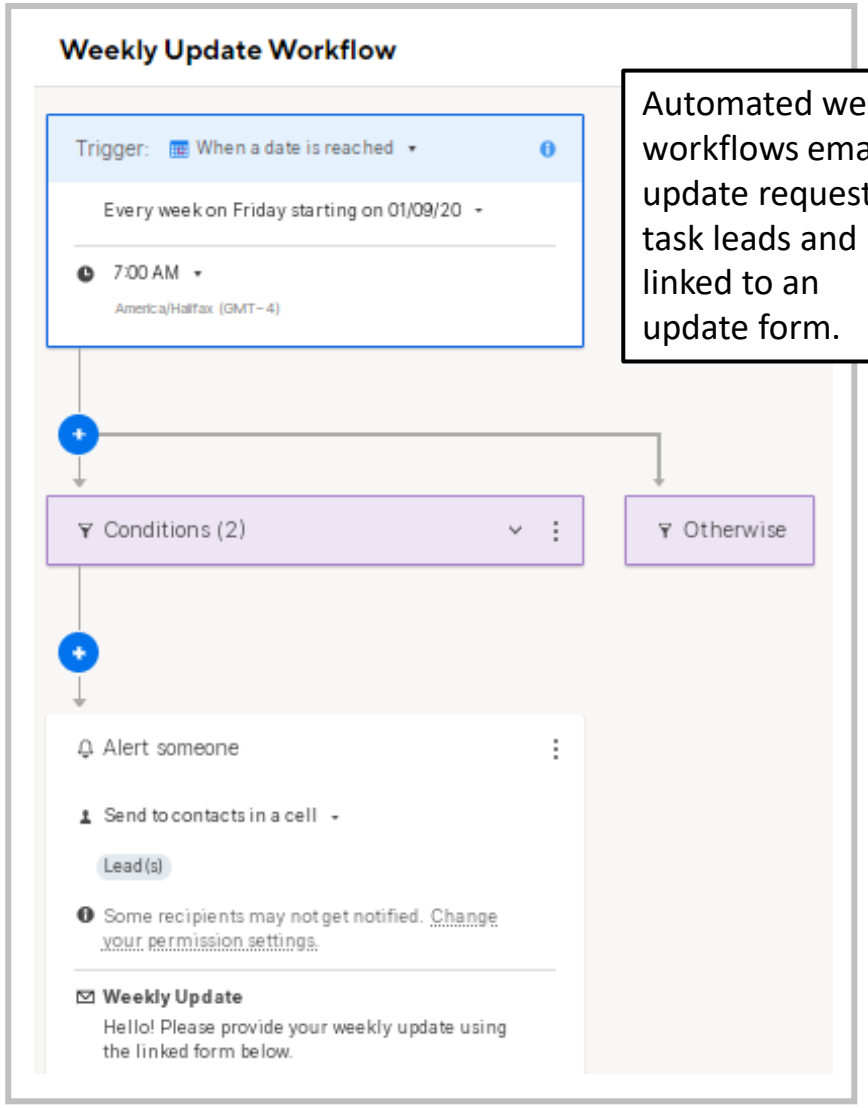
Document control

Task outputs were saved to each row

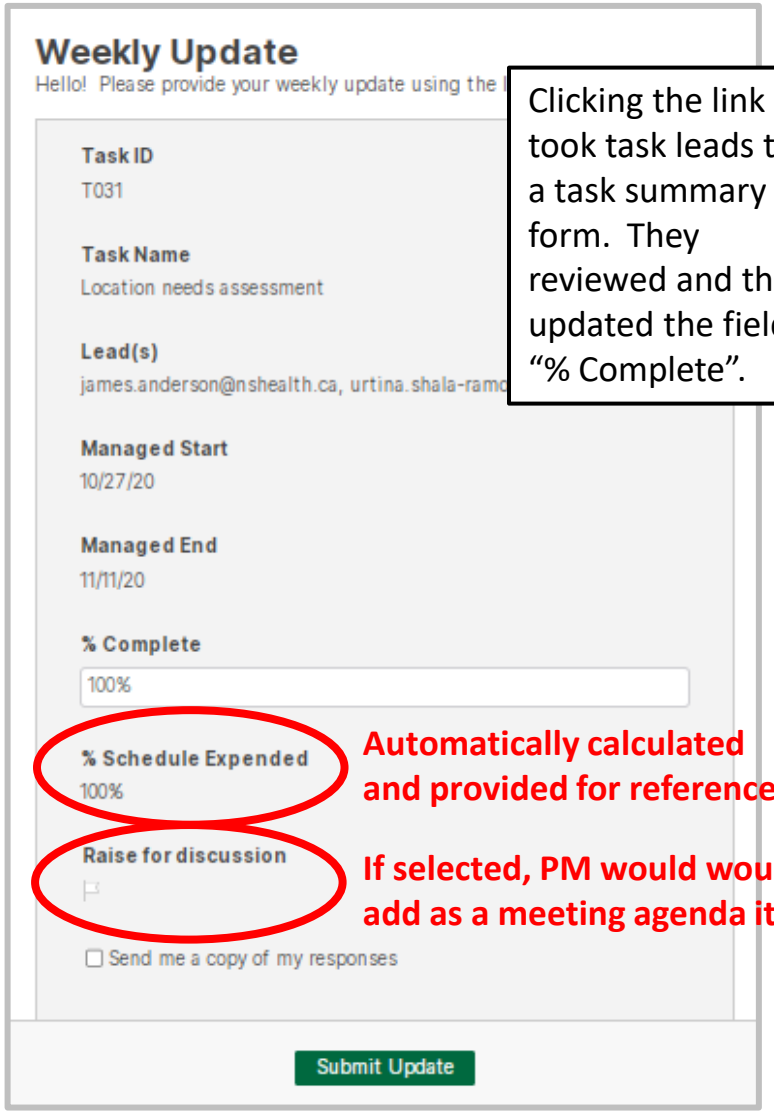


Tagging sends an email notification

Task Tracking and Weekly Updates



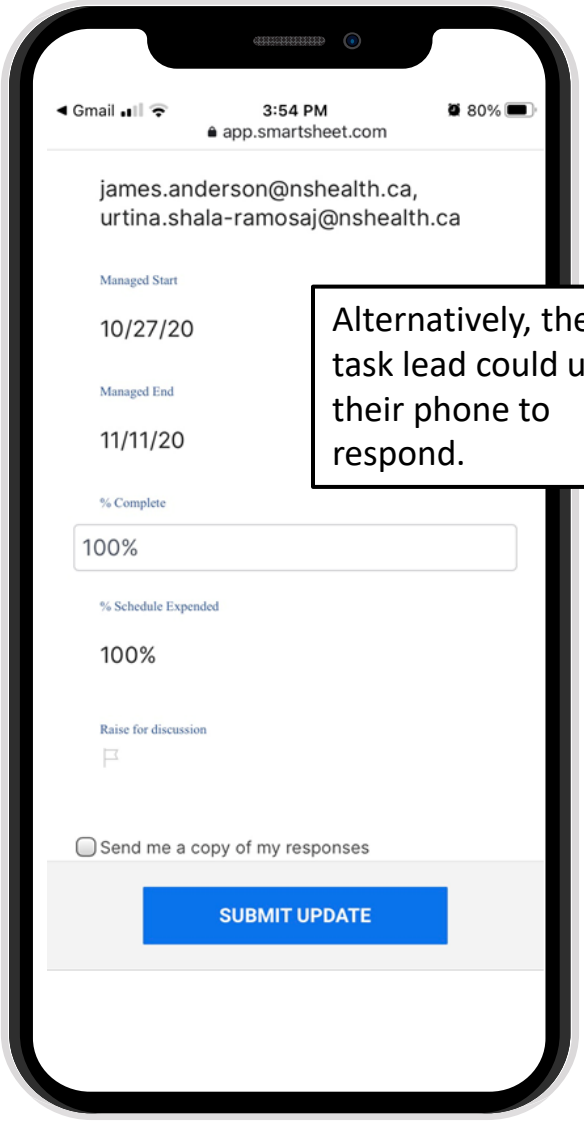
Automated weekly workflows emailed update requests to task leads and linked to an update form.



Clicking the link took task leads to a task summary form. They reviewed and then updated the field "% Complete".

Automatically calculated and provided for reference.

If selected, PM would would add as a meeting agenda item



Alternatively, the task lead could use their phone to respond.

Implementation Phase Intro

- Began in January 2021
- Led by Public Health
- The planning team transitioned to an operations support role
  - Oversaw clinic setup and vaccine distribution IAW the processes designed in the planning phase
- PM transitioned to a support and advisory role
  - Knowledge transfer from planning documents to operations support team
  - Risk management, barrier removal, resource management, problem solving
  - General coordination

The Need for Daily Clinic Reports

- Appointment and inventory numbers were not adding up
- There was no means of clinics reporting wastage
- Needed to introduce daily clinic reporting
- Smartsheet was well positioned

Daily Clinic Report Requirements

- Reporting requirements were mostly common for all clinic types
  - Community Clinic
  - Continuing Care
  - Drive Thru Clinic
  - First Nations Clinic
  - Healthcare Worker Clinic
  - Hospital Inpatients
  - Long Term Care Clinic
  - Pharmacy
  - Physician or Family Practice
  - In-home Vaccinations by Continuing Care
- But there were slight differences
- Decided all clinics would feed a common Smartsheet
- Different requirements would be accommodated using form logic
  - i.e. Only show field X when field Y is value A

User-facing Form Fields

Field Name	Note
Clinic Type	Revealed a drop-down list of clinics of selected type
Clinic Name	
Clinic Location	Automatically populated
Clinic Zone	Automatically populated
Clinic Manager(s)	Automatically populated
Escalate To	Automatically populated
Clinic Date	
Submitter's Name	
Vaccine Product	Revealed some product-specific fields
User-Selected Vial Size (Moderna)	

Field Name	Note
Vial Size	Automatically populated
Lot #	
Vials used	
Reported doses used	
Doses wasted	
Extra doses	
Number of doses missing/short	
Risks or requests for decision	
Doses remaining on-hand	
Corrected Entry?	Yes/no
Two Lot #s	Yes/no

Back-end Fields (All Auto-populated)

Field Name	Note
Date submitted	Automatically populated
Duplicate	Unique entries identified and compared using Clinic Name, Clinic Date, and Lot #
Newest Version?	Yes/no, by comparing submission dates of duplicates.
Check: Doses expected used	Calculated an expected value based on vials used, vial size, extra doses, doses wasted, etc
Dose Audit	Pass if doses reported = doses expected. Fail otherwise --> **kicked off an audit process**
Audit Sent	Date

Extensive use of Automated Workflows

- Dose audits
- Audit reminders and escalations
- Auto-archive entries > 2 weeks old
  - Old entries moved daily to an “Archive” sheet
  - Required because we hit a maximum allowable cell references on the sheet
- Identify and delete duplicate entries
  - Corrections are common, and clinics are directed to re-submit entirely
  - Keep the most recent duplicate (it will be the one with corrections)
  - Older duplicate is moved to a “Deleted” sheet

Daily COVID-19 Vaccination Clinic Report

This daily COVID-19 vaccination clinic report is used to inform program improvements and immunization program reporting. We appreciate the information provided to enable the vaccine roll-out in Nova Scotia to be a success.

Your Name *

Clinic Type *

Select

Clinic Date *

Product Type *

Pfizer Moderna AstraZeneca

Vaccine Lot # *

Multiple Vaccine Lot #s *

Are there multiple vaccine lot #s to report on this clinic day?

No Yes

Number of vials used during clinic day *

Numbers only please. No text.

Total number of extra doses obtained beyond manufacture label *

i.e.: 7th dose for Pfizer, 11th or 15th dose for Moderna, 11th dose AstraZeneca, and any extra doses obtained by pooling vials

Number of doses administered during clinic day *

Numbers only please. No text.

Number of doses wasted during clinic day *

i.e. particulate in the vial, dropped, out of time

ot be extracted during clinic day *

ing on-hand *

-submitted report with corrections.

Send me a copy of my responses

Submit

Privacy Notice | Report Abuse

8956

submissions …and counting!

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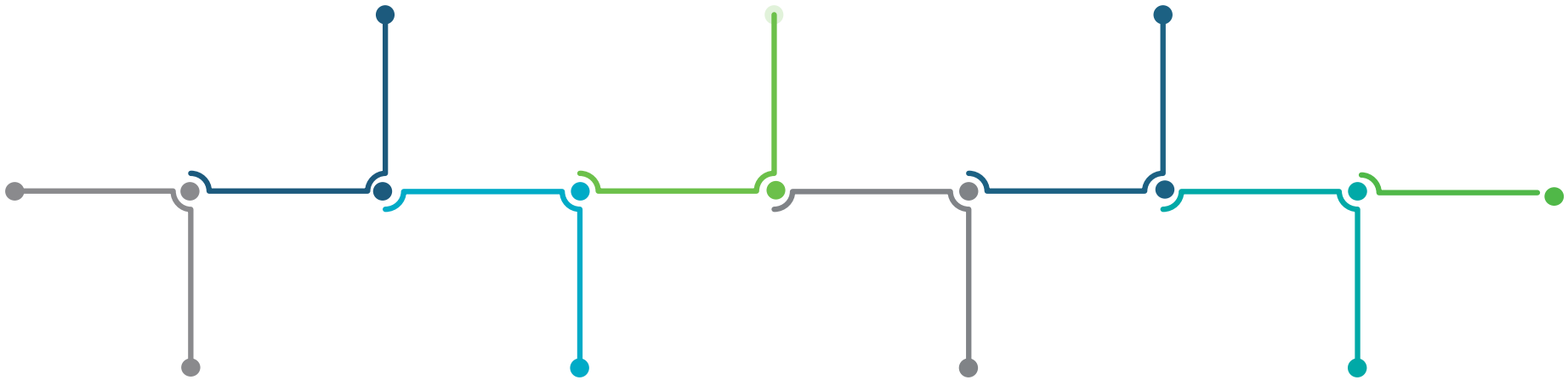
Industrial Engineering COVID-19 Support

Design and Planning for Mass Immunization Clinics

PSPI Industrial Engineering Vaccine Clinic Support Timeline



Early Dec 2020

Dal Clinic space assessment, modeling and design (based on previous Jr. high simulation modeling and PAC design configuration)

Mid Dec 2020

Clinic set-up support and onsite data collection + time studies for model validation

Early January 2021

Simulation model refinement based on collected data and statistics, design guidelines developed

Mid Jan – Feb 2021

Design and planning support for additional community vaccination sites across province (15+ sites)

Mar 2021

Additional data collection activities across province for model validation and sensitivity analysis

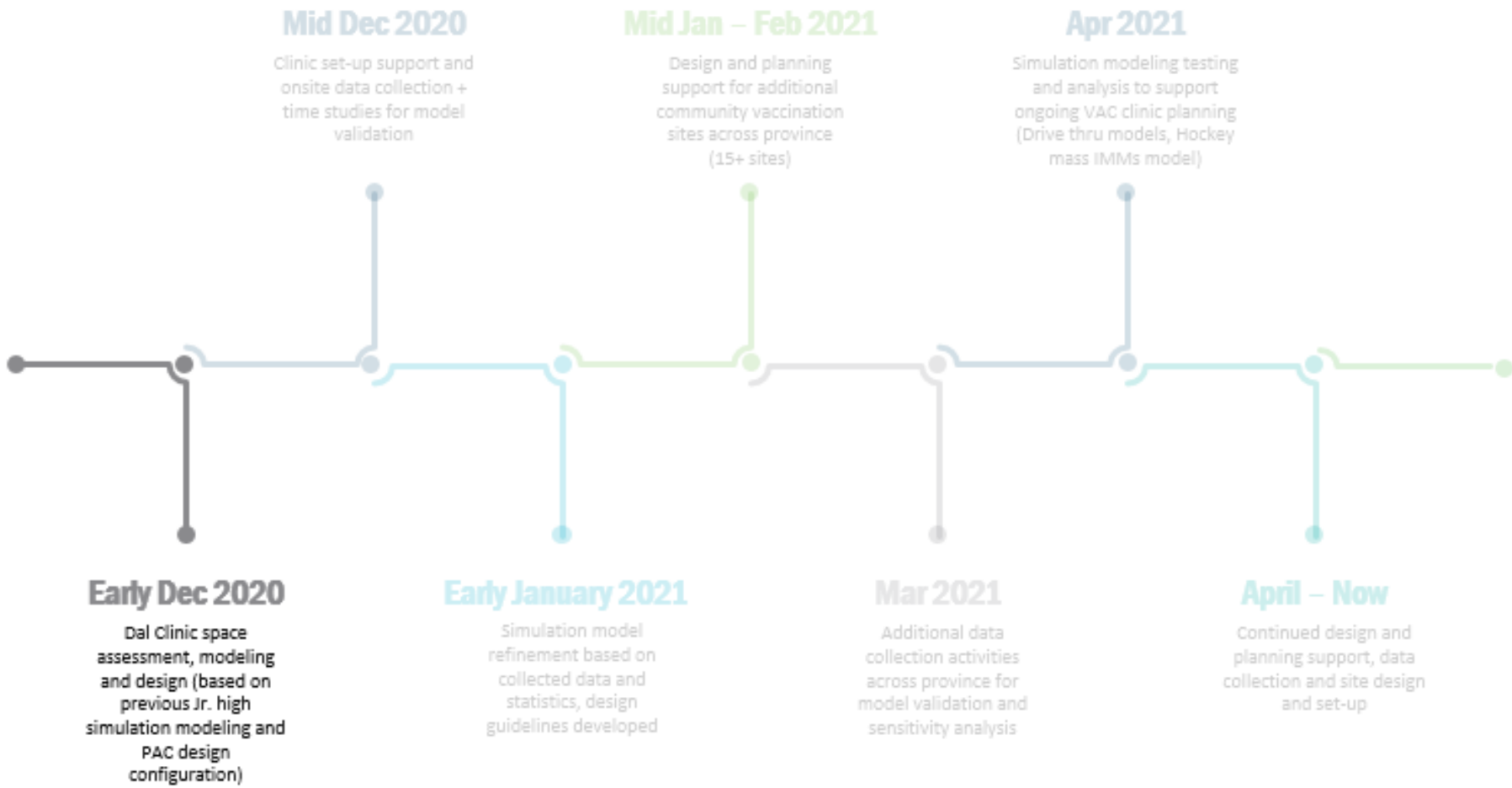
Apr 2021

Simulation modeling testing and analysis to support ongoing VAC clinic planning (Drive thru models, Hockey mass IMMs model)

April – Now

Continued design and planning support, data collection and site design and set-up

PSPI Industrial Engineering Vaccine Clinic Support Timeline



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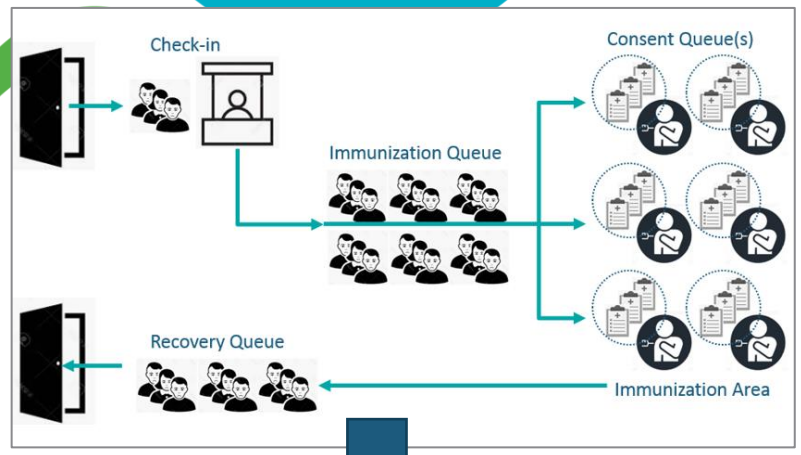
Dalhousie Life Sciences Research Institute Vaccination Clinic (Dec 2020) - Design and Planning

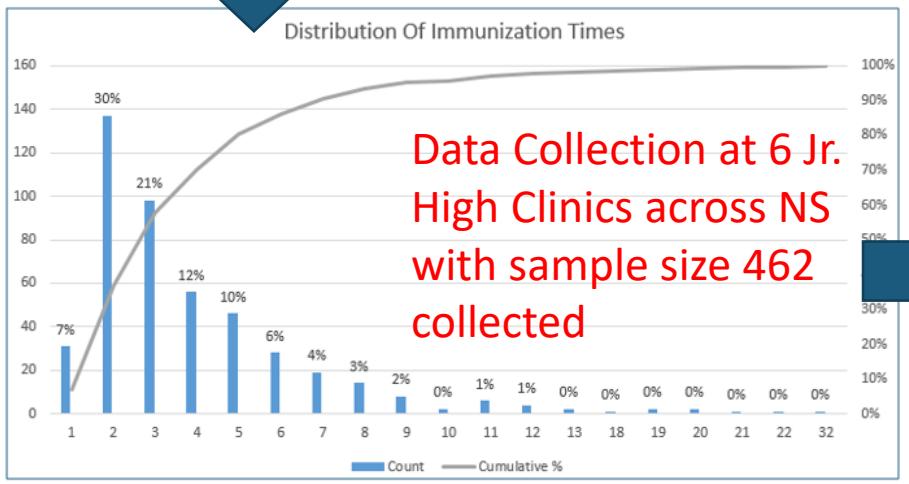
- Needed to have engineering design and planning done very quickly to meet immunization timelines (~1 week)

- Leveraged previous Lean Immunization Clinic Project (Fall 2019) carried out across a number of Jr. High Immunization Clinics
  - Focused on data collection, analysis, simulation modeling and Lean Six Sigma principles

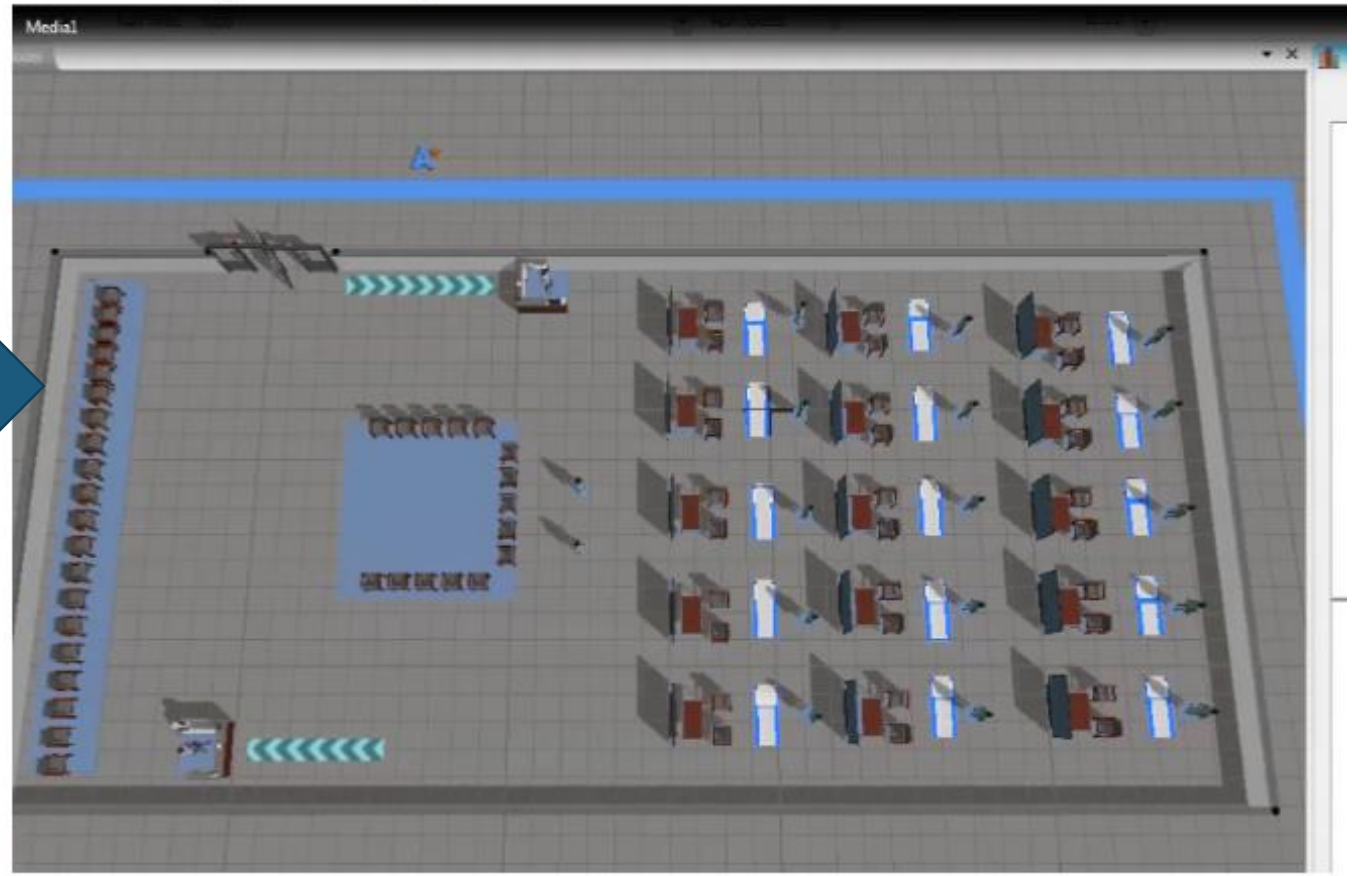
- Also applied more recent Primary Assessment Center (COVID-19 testing clinic) design and planning support work for layout and clinic configuration planning

Leveraged previous Lean Immunization Clinic Project (Fall 2019) carried out across a number of Jr. High Immunization Clinics





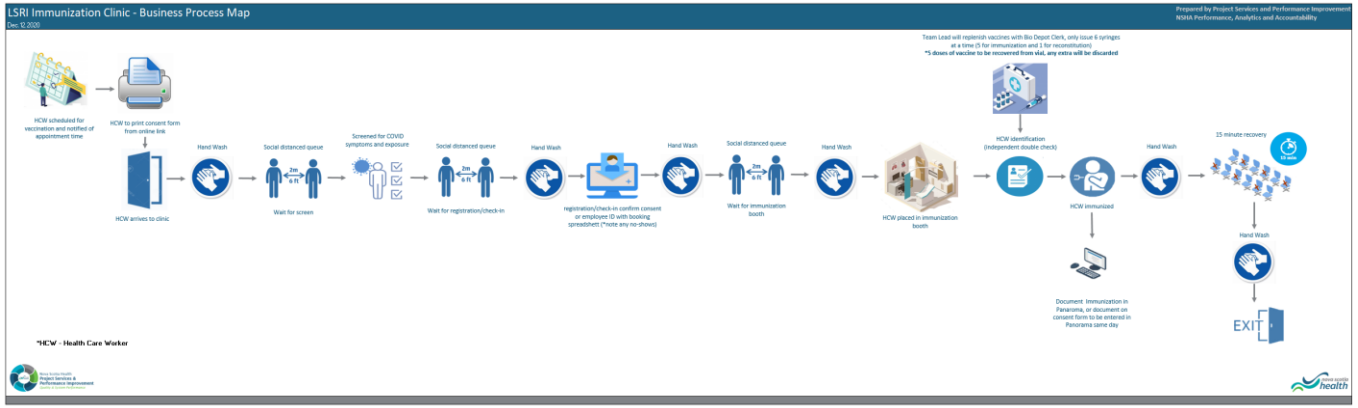
Data Collection at 6 Jr. High Clinics across NS with sample size 462 collected



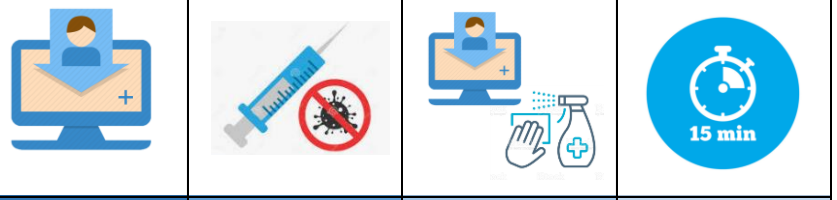
Developed a Discrete Event Simulation model (FlexSim) to analyze and test design configurations and scenarios

Clinic Workflow Model Inputs

Clinic Workflow - developed with Site Leads



Clinic Service Times (λ) – used previous Jr high + practical estimate assumptions

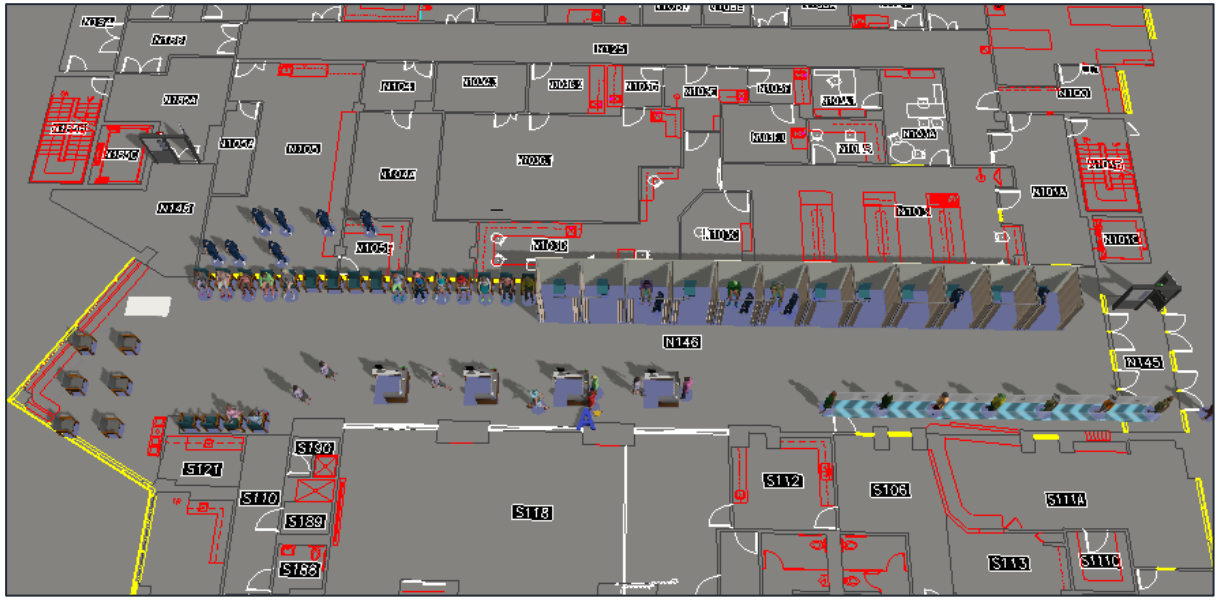


	Registration	Immunization	Documentation /	Patient Recovery
Shortest	1 mins	3 mins	2 mins	15 mins
Most Likely	2.3 mins	4 mins	2 mins	15 mins
Longest	3.5 mins	8 mins	2 mins	15 mins

Clinic Schedules and Arrival Distribution

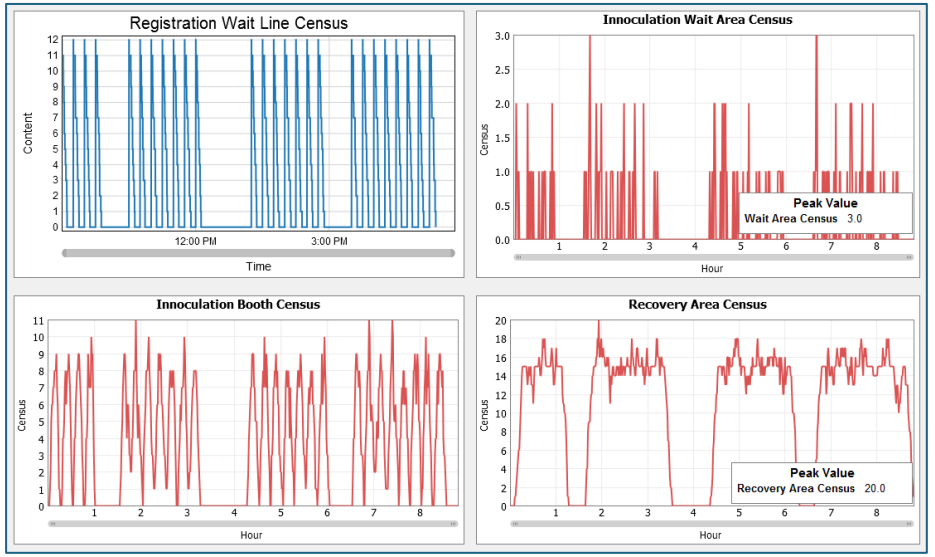
From	To	Status	Booked Appointments
8:00	8:15	Travel	
8:15	8:30	Travel	
8:30	8:45	Set-up	
8:45	9:00	Set-up	
9:00	9:15	Immunizing	15
9:15	9:30	Immunizing	15
9:30	9:45	Immunizing	15
9:45	10:00	Immunizing	15
10:00	10:15	Immunizing	
10:15	10:30	break	
10:30	10:45	Immunizing	15
10:45	11:00	Immunizing	15
11:00	11:15	Immunizing	15
11:15	11:30	Immunizing	15
11:30	11:45	Immunizing	15
11:45	12:00	Immunizing	15
12:00	12:15	Immunizing	15
12:15	12:30	Immunizing	
12:30	12:45	break	
12:45	13:00	break	
13:00	13:15	break	
13:15	13:30	Immunizing	15
13:30	13:45	Immunizing	15
13:45	14:00	Immunizing	15
14:00	14:15	Immunizing	15
14:15	14:30	Immunizing	15
14:30	14:45	Immunizing	15
14:45	15:00	Immunizing	15
15:00	15:15	Immunizing	
15:15	15:30	Break	
15:30	15:45	Immunizing	15
15:45	16:00	Immunizing	15
16:00	16:15	Immunizing	15
16:15	16:30	Immunizing	15
16:30	16:45	Immunizing	15
16:45	17:00	Immunizing	15
17:00	17:15	Immunizing	15
17:15	17:30	Immunizing	15
17:30	17:45	Clean-up	
17:45	18:00	Clean-up	
18:00	18:15	Travel	
18:15	18:30	Travel	

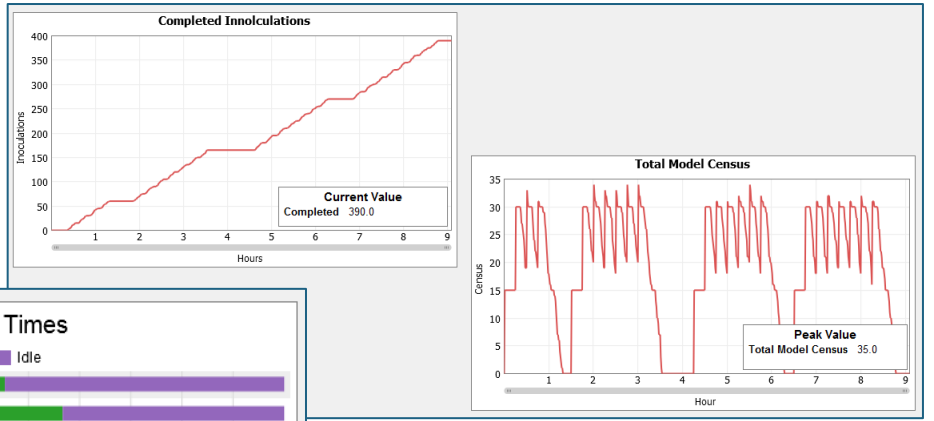
MODEL DESIGN

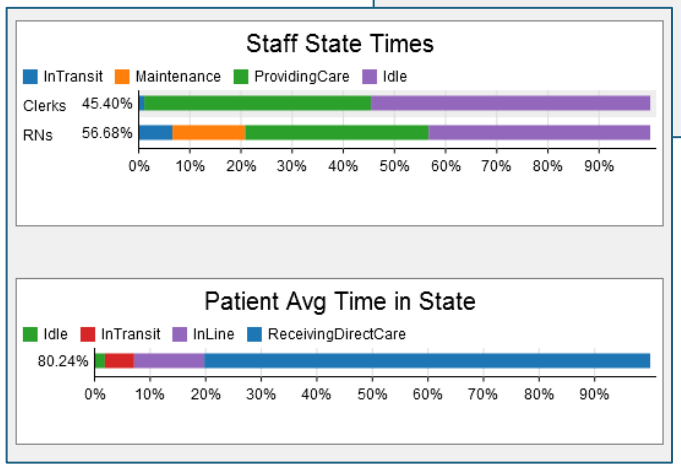


Simulation Model developed based on inputs to test clinical configuration and determine feasibility of arrivals, space requirements and staffing needs

MODEL RESULTS







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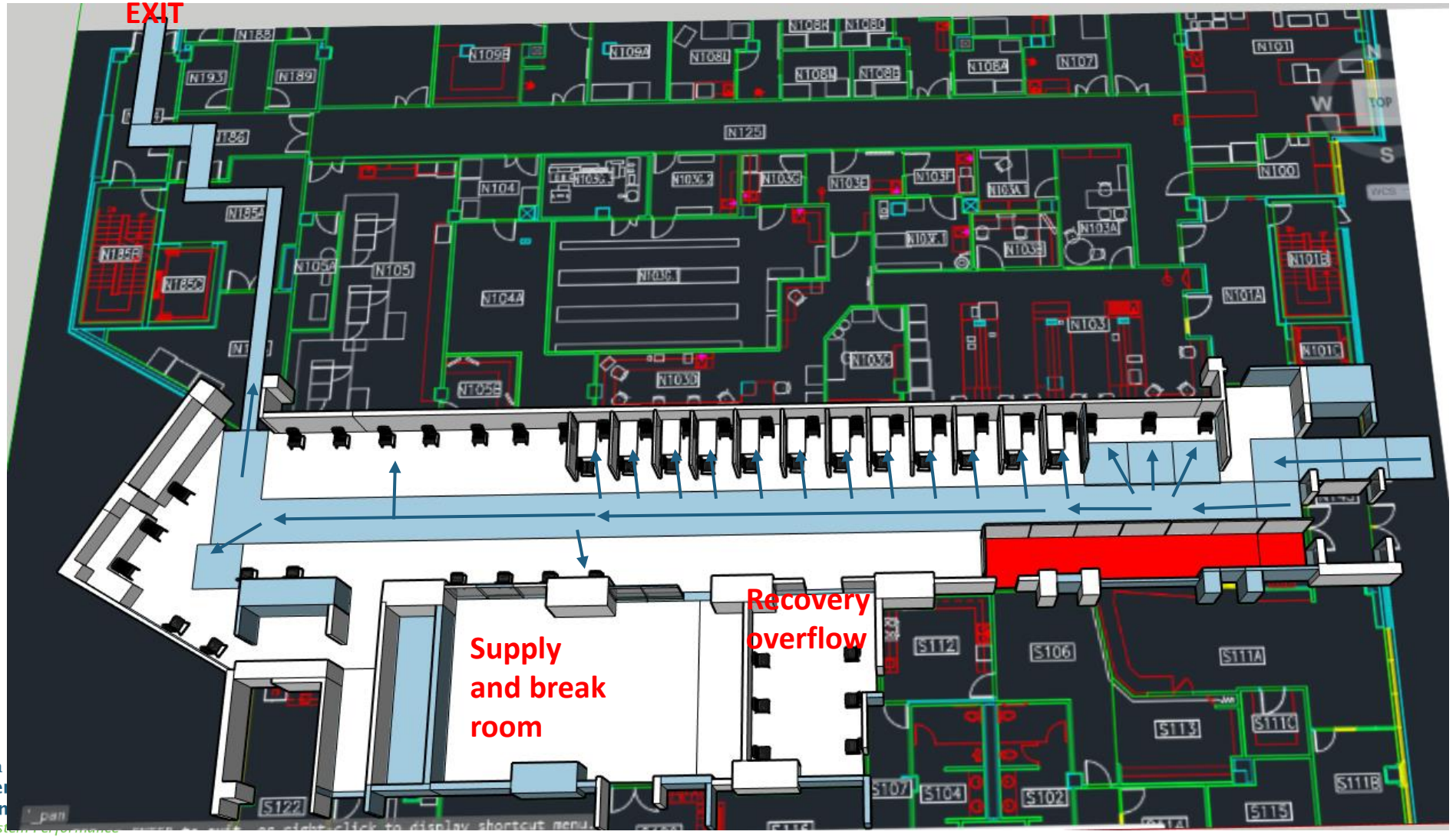
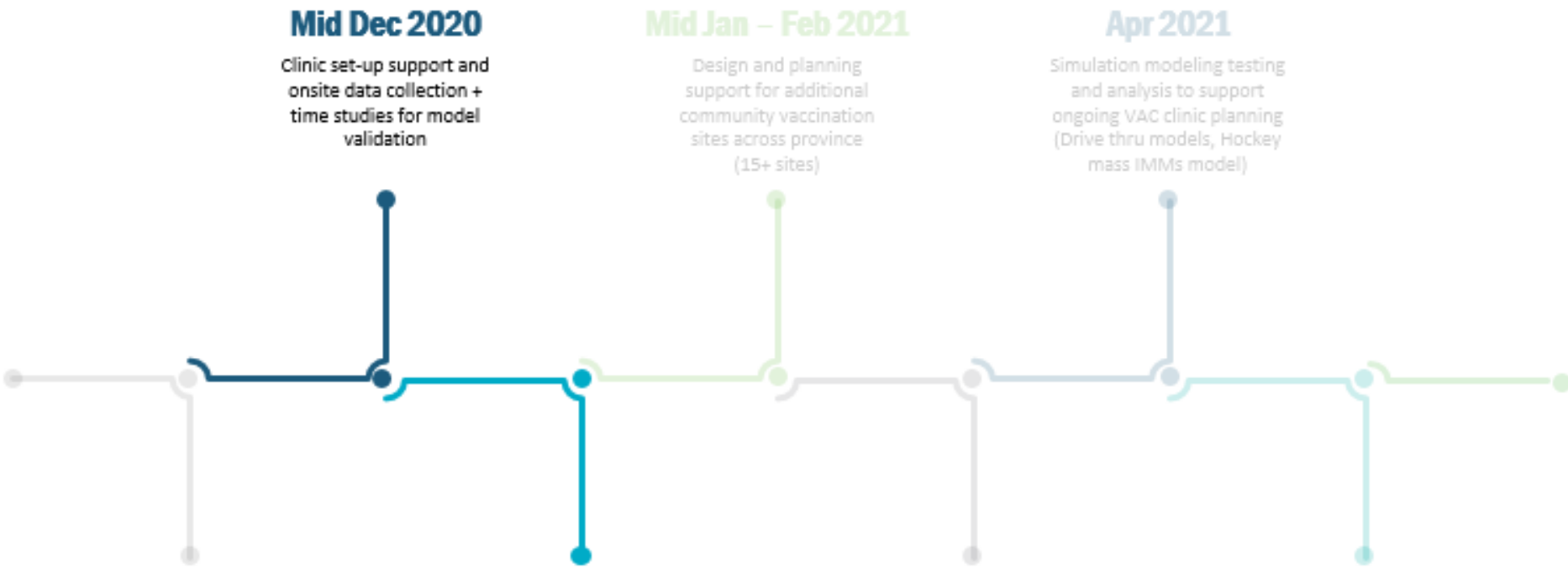
Recommended Layout Configuration (Dal LSRI site)



PSPI Industrial Engineering Vaccine Clinic Support Timeline



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Design and planning support for additional community vaccination sites across province (15+ sites)

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April – Now

Continued design and planning support, data collection and site design and set-up

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On-Site Data Collection

- Time studies conducted at various clinics, over various days, with different immunizers who had varying levels of experience
  - Approximately 200+ immunizations
- Data collection allowed for validation of initial modelling assumptions
- Early Data Collection exercise focused on model validation for next phases of vaccination Clinic roll-out…
  - Staff Immunization Clinics
  - Large Community Clinic

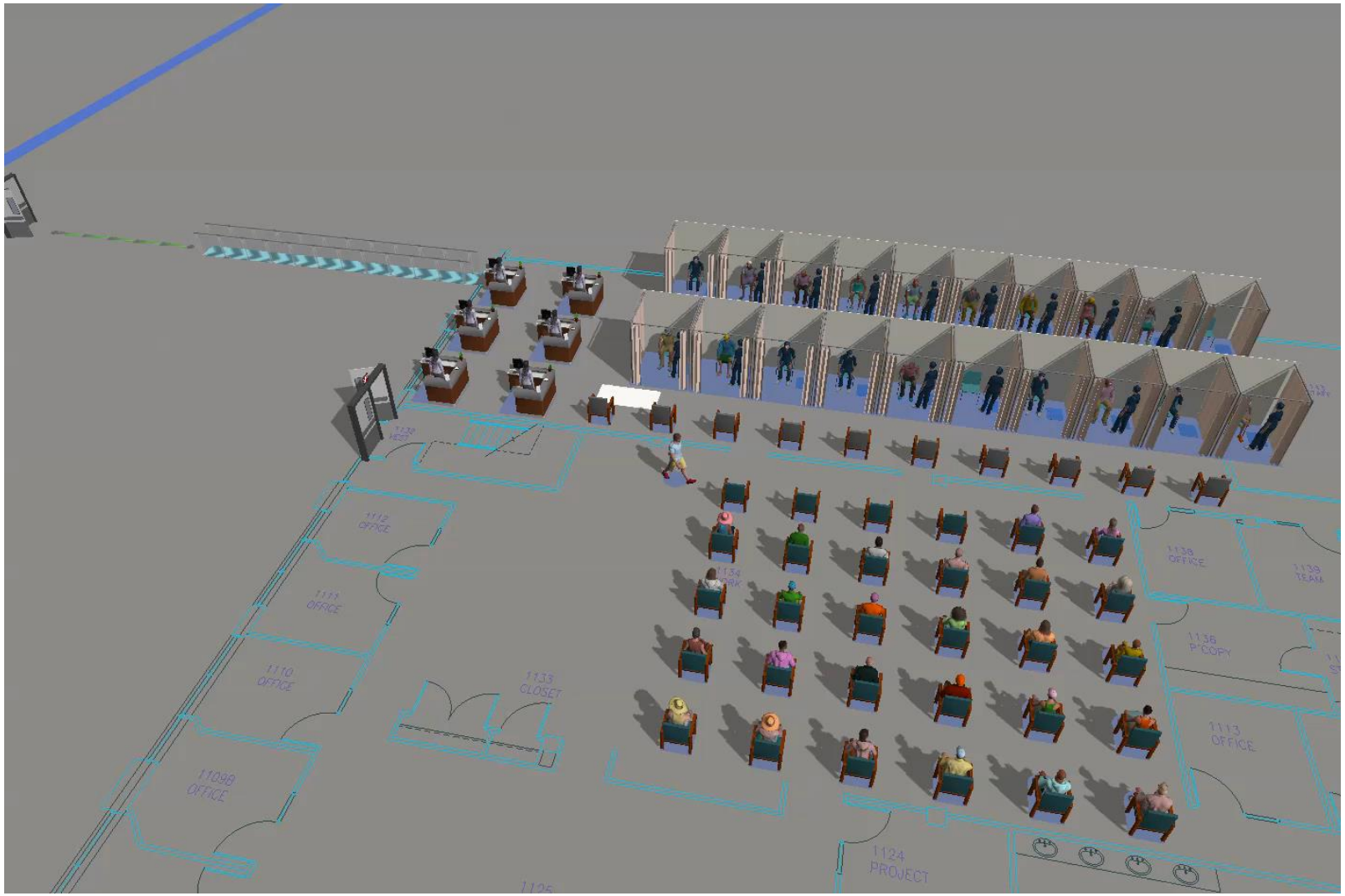
More Data Collection
More SIM Modeling
More clinic designs

Model Inputs - Process Inputs

				
	Registration	Immunization	Documentation /	Patient Recovery
Shortest	1 mins	1.5 mins	2 mins	15 mins
Most Likely	1.5 mins	3 mins	2.5 mins	15 mins
Longest	3.5 mins	9 mins	3 mins	15 mins

- Revised data inputs based on Dec. 16th and Dec. 17th time studies conducted by PSPI Industrial Engineering Team
- Sample size…
  - Registration/check-in time (ʎ) n = 43
  - Immunization time (ʎ) n = 64
  - Documentation/Turnover (ʎ) n = 23 (*1 minute added to account for vaccine reconstitution)

Simulation Model Video (*45s*)



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Model Output – Summarized Results

Varying Staffing Levels and Immunizations/Day

# Imm Booths	# Reg Desks	Appts / slot	Shots / Day	Max Reg Line Census	Max Imm Wait Area Census	Max Recovery Area Census	Max System Census	Patient Utilization (time not waiting)	Reg Utilization	RN Utilization	Immunizations Completed	% Immunizations Completed
4	1	4	152	4	2	9	14	82%	70%	64%	152	100%
4	1	5	190	9	3	10	20	69%	86%	82%	188	99%
4	2	4	152	4	2	8	12	89%	35%	64%	152	100%
4	2	5	190	5	4	10	17	82%	44%	81%	190	100%
6	2	8	304	8	8	15	29	75%	68%	88%	303	100%
6	2	9	342	15	10	16	43	58%	76%	95%	329	96%
8	2	9	342	10	5	19	31	79%	76%	71%	342	100%
8	2	10	380	18	7	19	40	72%	84%	79%	375	99%
8	3	10	380	8	7	20	34	82%	54%	78%	378	99%
8	3	11	418	9	10	21	43	74%	60%	88%	414	99%
10	3	13	494	13	8	24	44	77%	70%	81%	491	99%
10	3	14	532	17	10	25	53	70%	75%	88%	517	97%
10	4	13	494	11	10	25	45	80%	52%	82%	492	100%
10	4	14	532	16	10	26	54	73%	56%	88%	520	98%
12	3	14	532	16	5	26	48	77%	75%	73%	532	100%
12	3	15	570	23	6	27	55	71%	80%	78%	566	99%
12	4	15	570	13	9	27	53	77%	59%	77%	568	100%
12	4	16	608	19	10	28	62	69%	64%	91%	599	99%
14	3	14	532	16	3	26	48	78%	75%	62%	532	100%
14	3	15	570	23	4	27	55	71%	80%	66%	567	99%
14	4	17	646	15	7	31	57	79%	67%	74%	645	100%
14	4	18	684	19	10	32	64	75%	71%	79%	681	100%

Simulation model provided a validated “cheat sheet” for more efficient design and planning for clinic set-up and configuration

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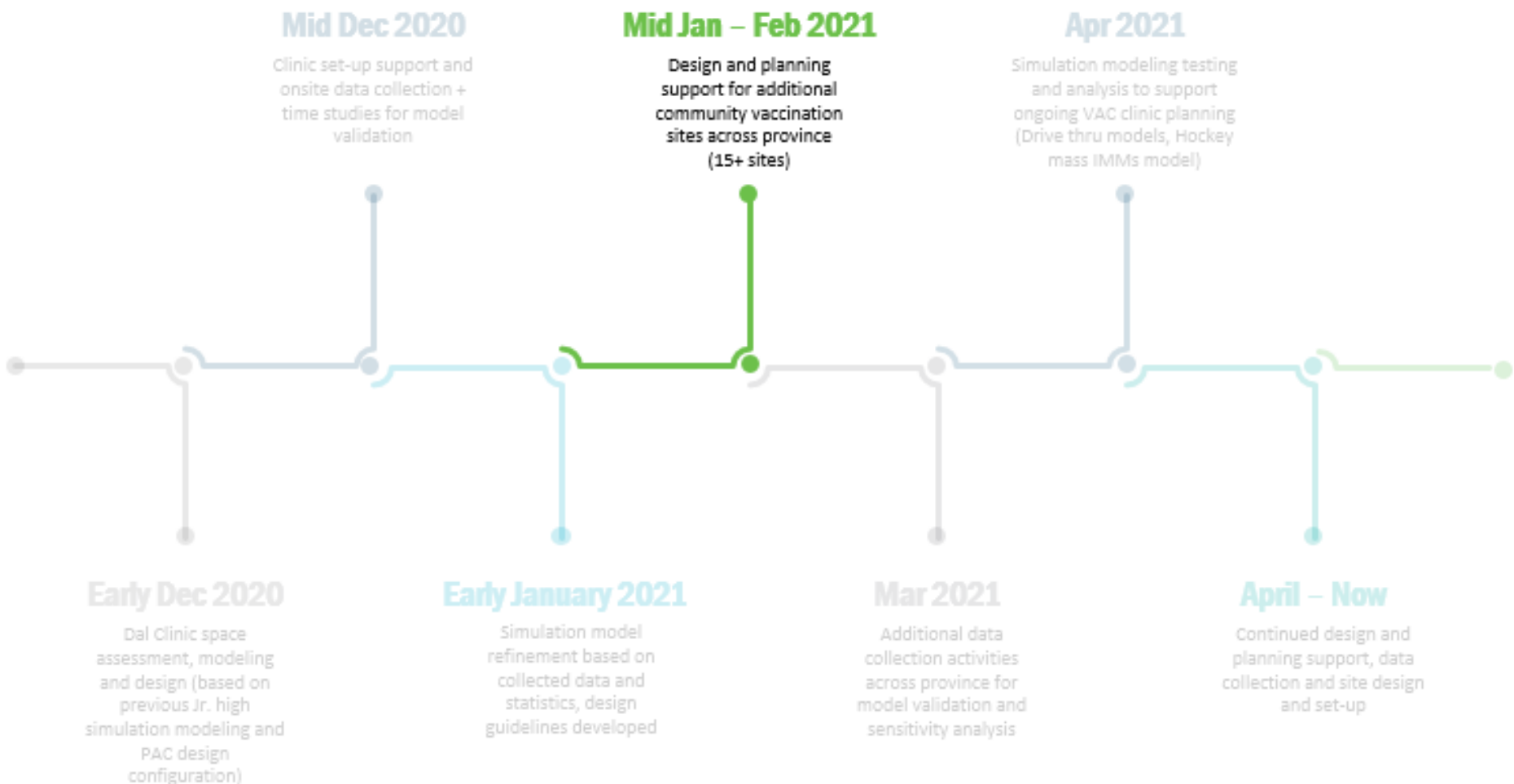
PSPI Industrial Engineering Vaccine Clinic Support Timeline



St. Martha's Regional Hospital Health Care Worker Clinics

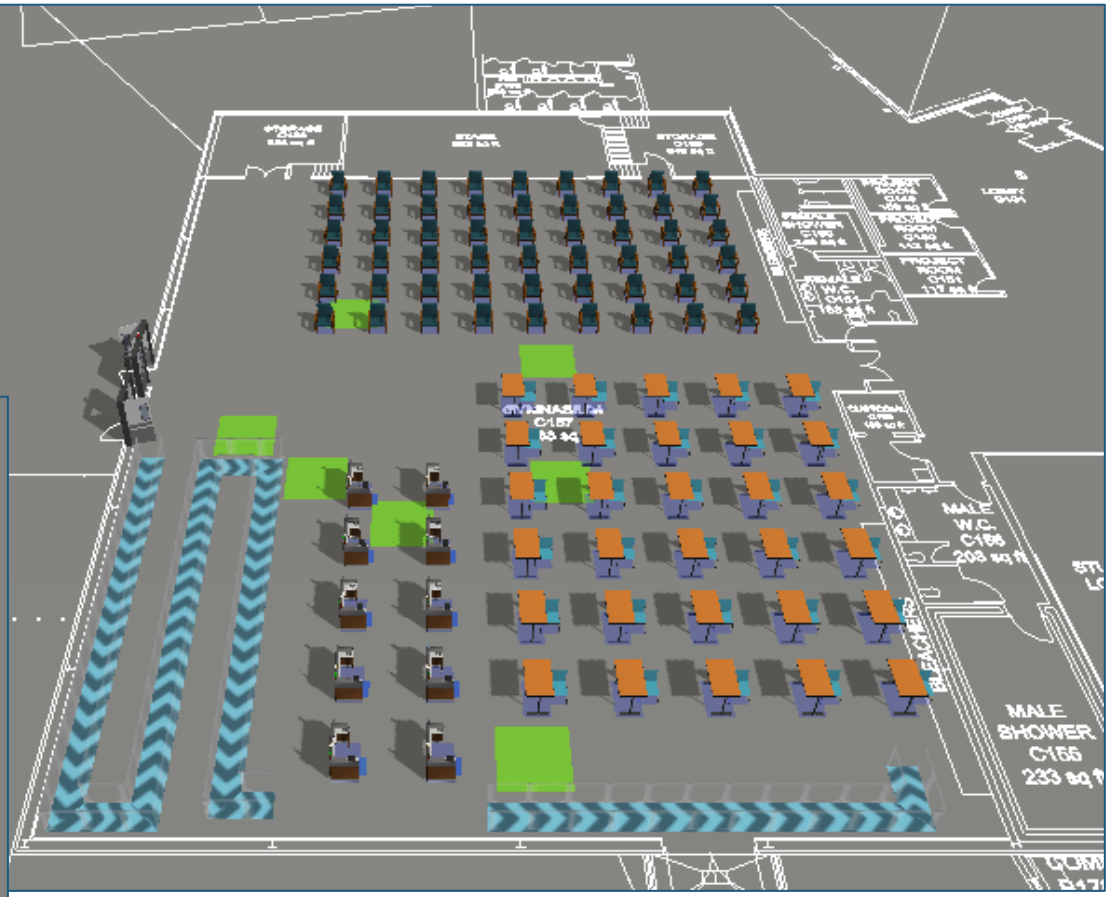
- As the vaccine roll-out was initiated with HCW, significant effort within the design and layout focused on
  - Public Health measures (social distancing, one-way traffic)
  - Rapid access to an adverse reaction area (in proximity to emergency services)
  - Location and transportation of the vaccine from the ULT freezers to the clinic location

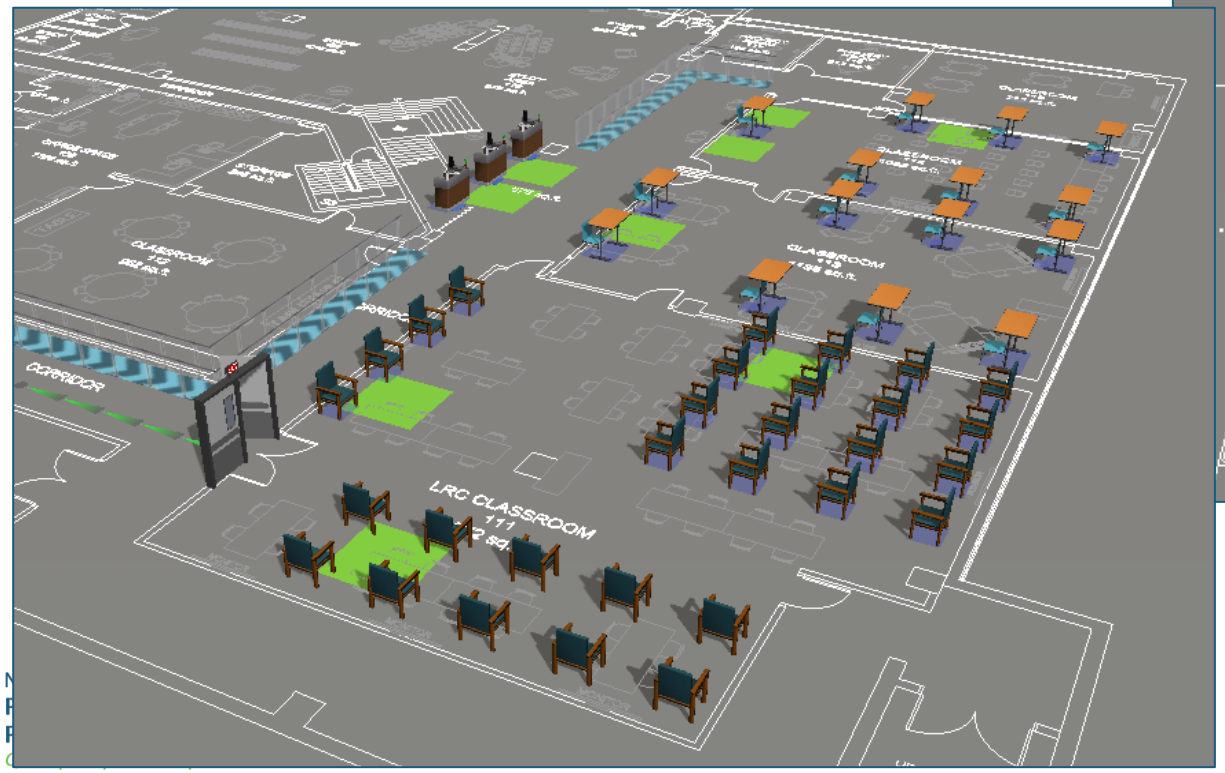
Cape Breton University Community Clinic (80+)

- Being that the population being vaccinated was age-based, there were evolving demands throughout the initial weeks of the community clinics
  - There was a great need for companion seating and spacing as many older Nova Scotians had someone accompany them to their appointments
  - There was also a larger need for wheelchairs and handicap recovery spaces
  - Considerations were also made for the distance required to travel for each immunized person and was factored into layout and design

Truro NSCC Community Clinic

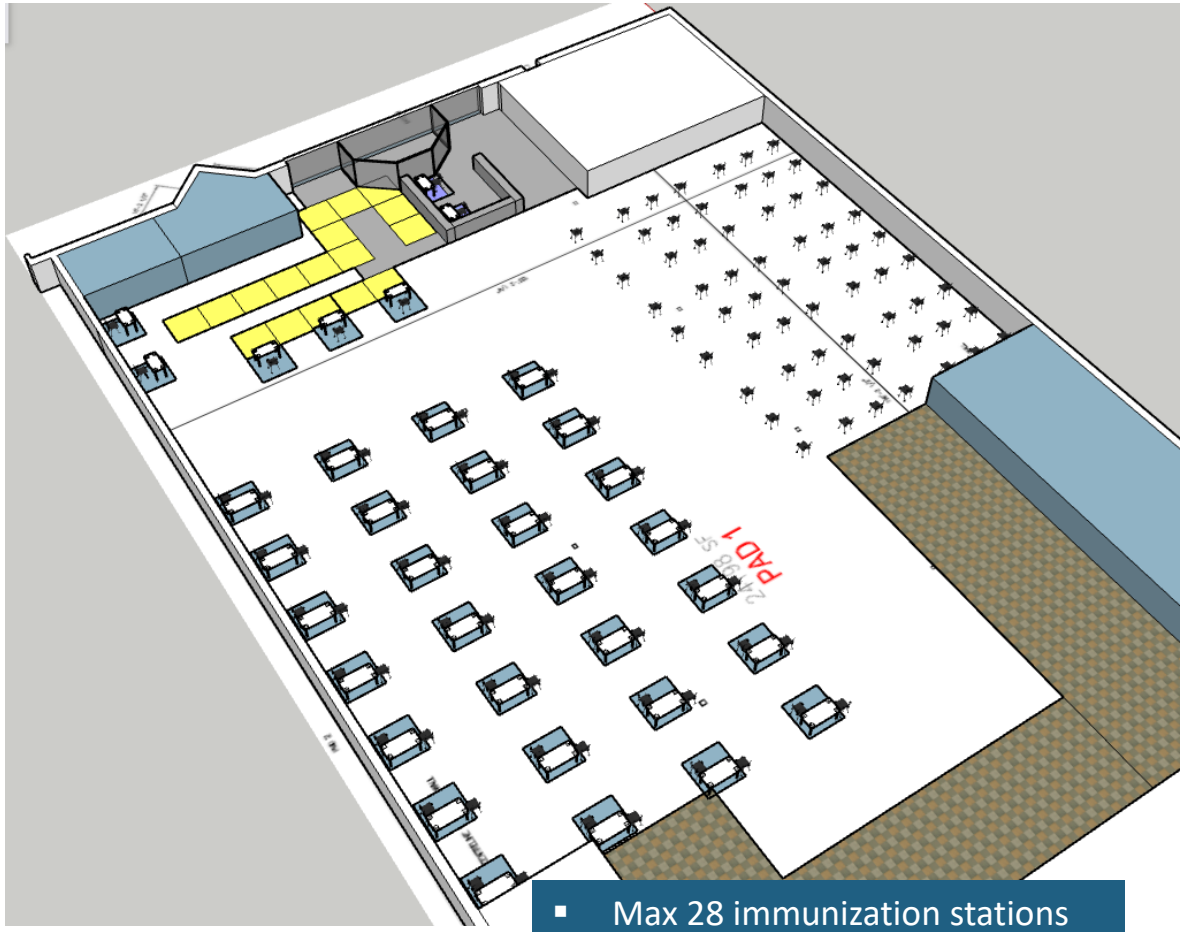
- Worked with clinic managers to mock-up potential clinic configuration options using a variety of software tools including SketchUp, Flexsim, and Visio for Community Clinics Across the Province



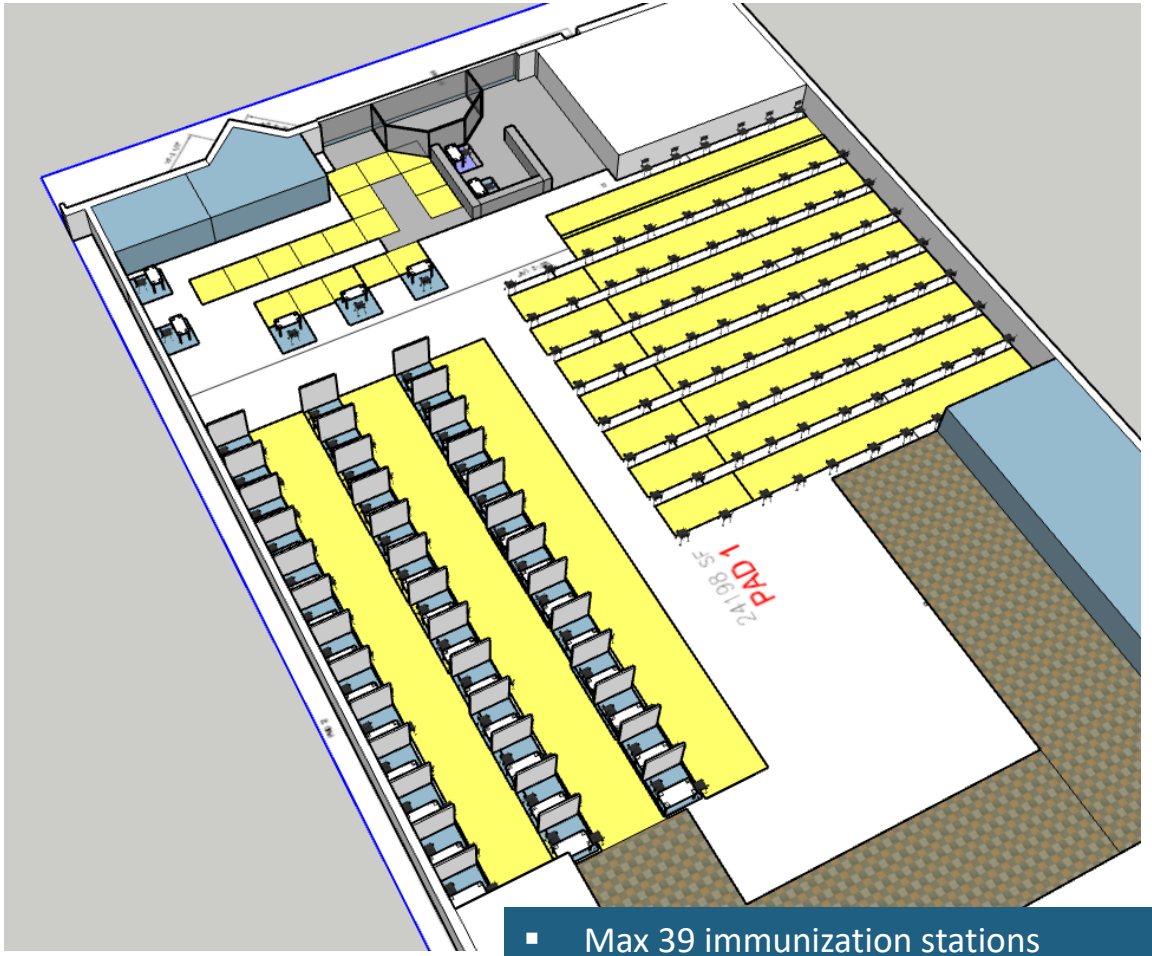


Dartmouth MicMac Mall Community Clinic Layout Options Max

Max Booths with and without partitions



- Max 28 immunization stations
- 63 Recovery Spaces
- Room for 7 Registration/Check-in stations



- Max 39 immunization stations
- 39 - 6’ x 6’ partitions
- 96 Recovery Spaces
- Room for 7 Registration/Check-in stations

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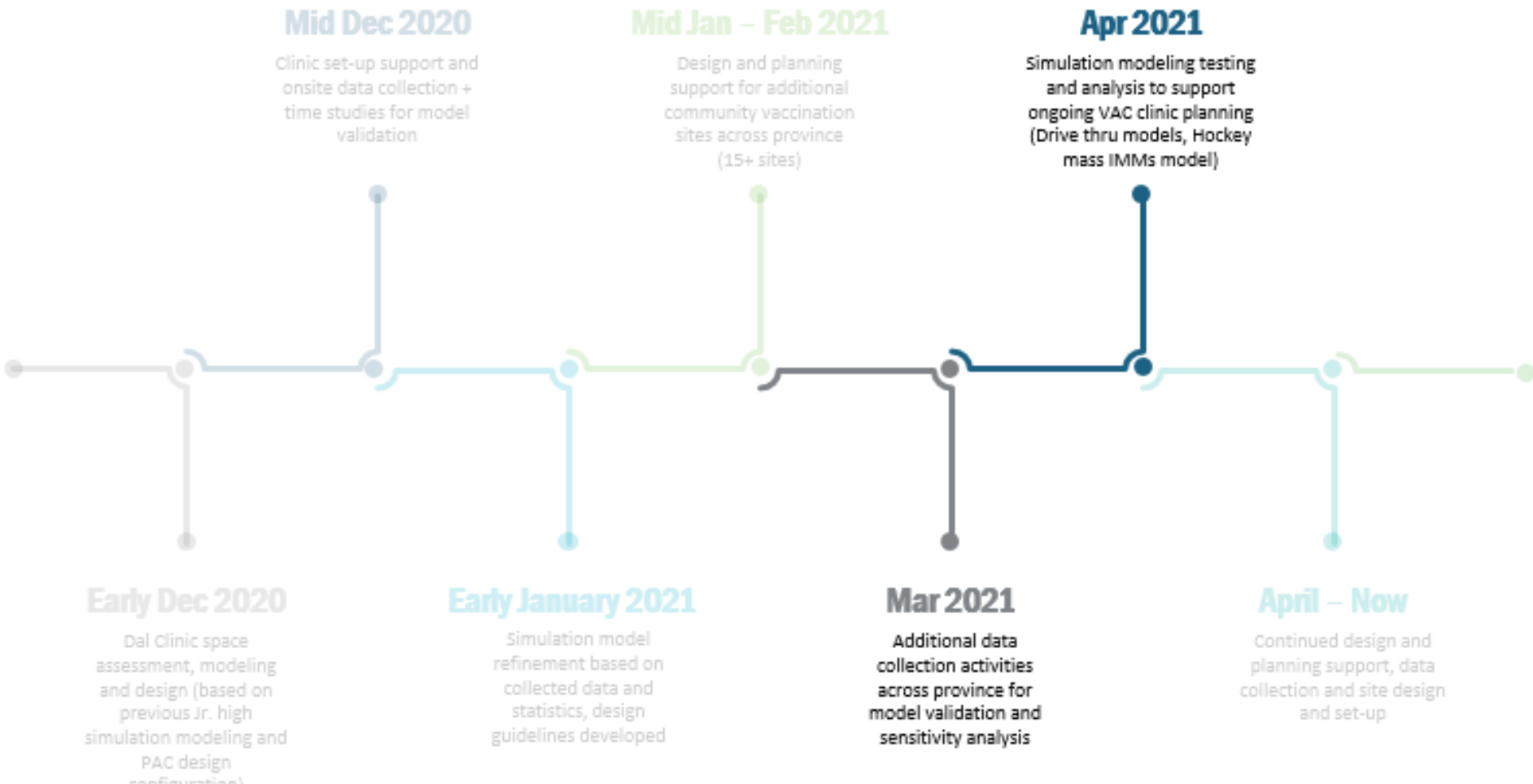
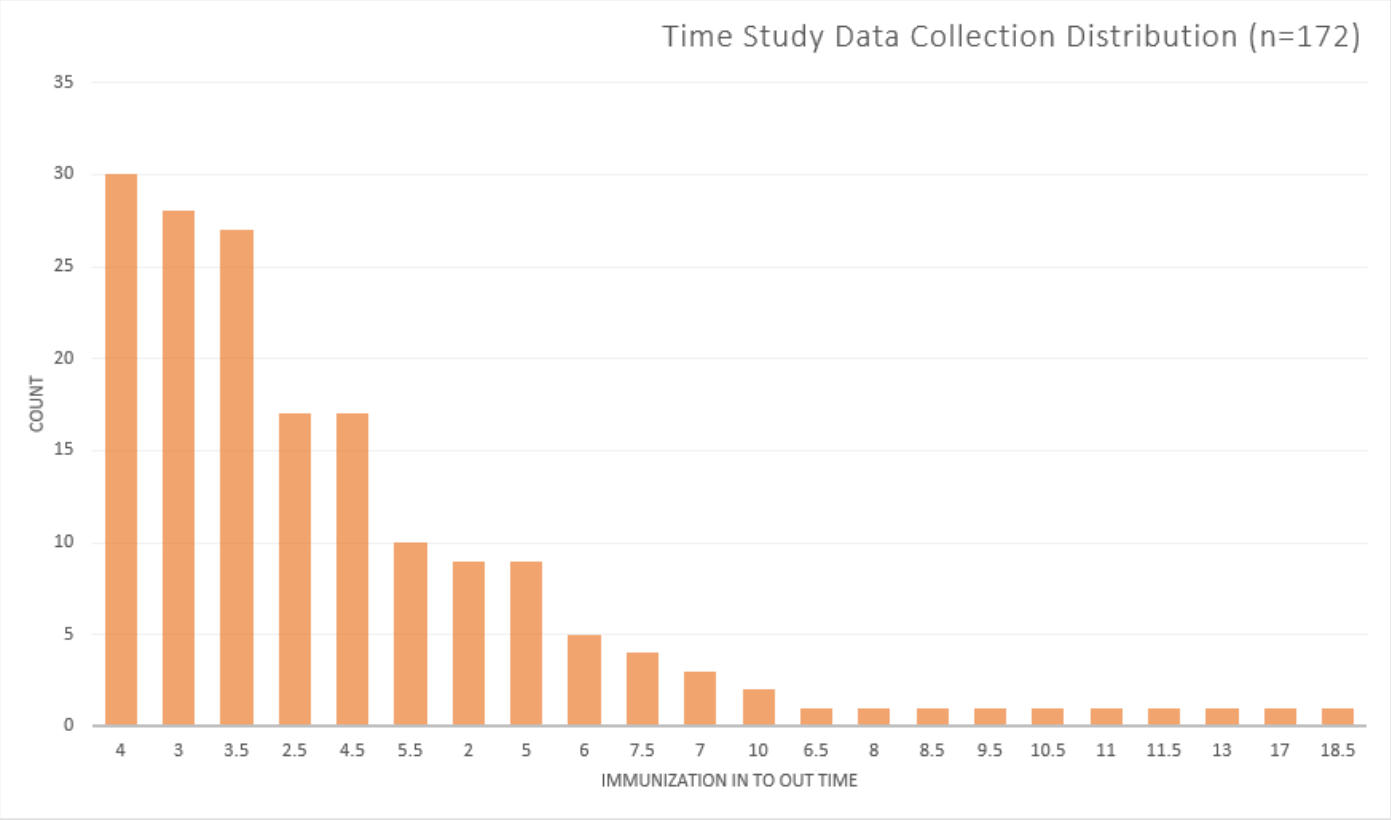
PSPI Industrial Engineering Vaccine Clinic Support Timeline



Immunization Time

Variation in Time Study Data



Time studies were done throughout clinics in the province which aided in building the initial model.

As the number of doses administered increased, the time allotted for each step decreased. While this allowed for a greater throughput it also required more space/seating in the recovery areas for each clinic.

Data collection provided more accuracy in service time and the level of variation to plan for. The variation will impact upstream and downstream areas (intake, queue, recovery, etc.)

- In most cases it is <5 minutes, but can be much longer
- This will greatly impact delays in the Hockey Hub configuration

Example of Data Collection and Modelling Adjustments

	Northern Zone	
	Truro	Amherst
	Pre-CanIMMS	Post-CanIMMs
Registration/Screen	1:00	~ 0:45
Immunization	4:25	5:11
Booth Changeover	2:53	0:33
Reconstitution (1 every 6)	~ 8:00	~ 8:00
Average Total Pre-Recovery Time	**9:38**	**7:49**
Recovery	15:00	15:00

- The use of CanIMMS significantly increased the speed of processing times between patients
- This was illustrated through data collection prior to and following the implementation of CanIMMs in the clinic setting
- This information informed changes to the model that allowed for analysis of how this would affect the system as a whole
  - *increased throughput to recovery, requiring an increased immunizer to recovery space ratio*

Modelling Results - Large Clinic Days

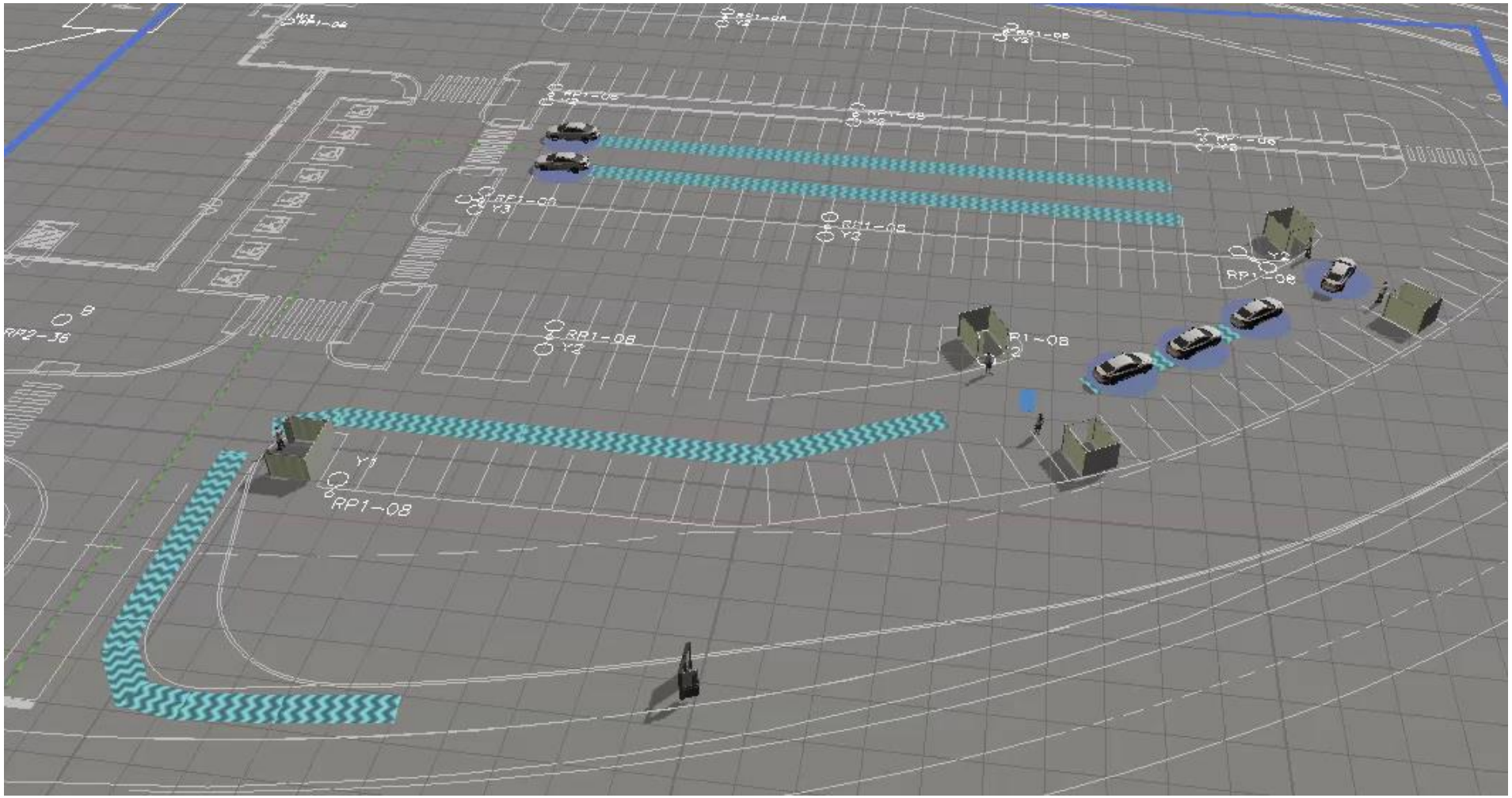
Booths	Reg	Appts/slot	Shots	Max Reg Line	Max Imm Wait Area	Max Recovery Area	Max System Census	Patient Utilization	Reg Utilization	RN Utilization	Immunizations Completed	% Immunizations Completed
50	11	50	**1900**	49	9	87	163	78%	69%	57%	1900	100%
45	11	45	1710	37	6	79	143	80%	63%	57%	1710	100%
40	11	40	1520	29	7	72	124	80%	56%	58%	1520	100%
35	11	35	1330	24	7	64	110	81%	50%	59%	1330	100%
30	11	30	1140	19	6	57	92	85%	42%	57%	1140	100%
25	11	25	950	17	7	48	76	87%	35%	56%	950	100%
20	11	20	760	15	6	39	61	89%	28%	56%	760	100%

- Results were produced for large clinic days (760-1900 shots/day)

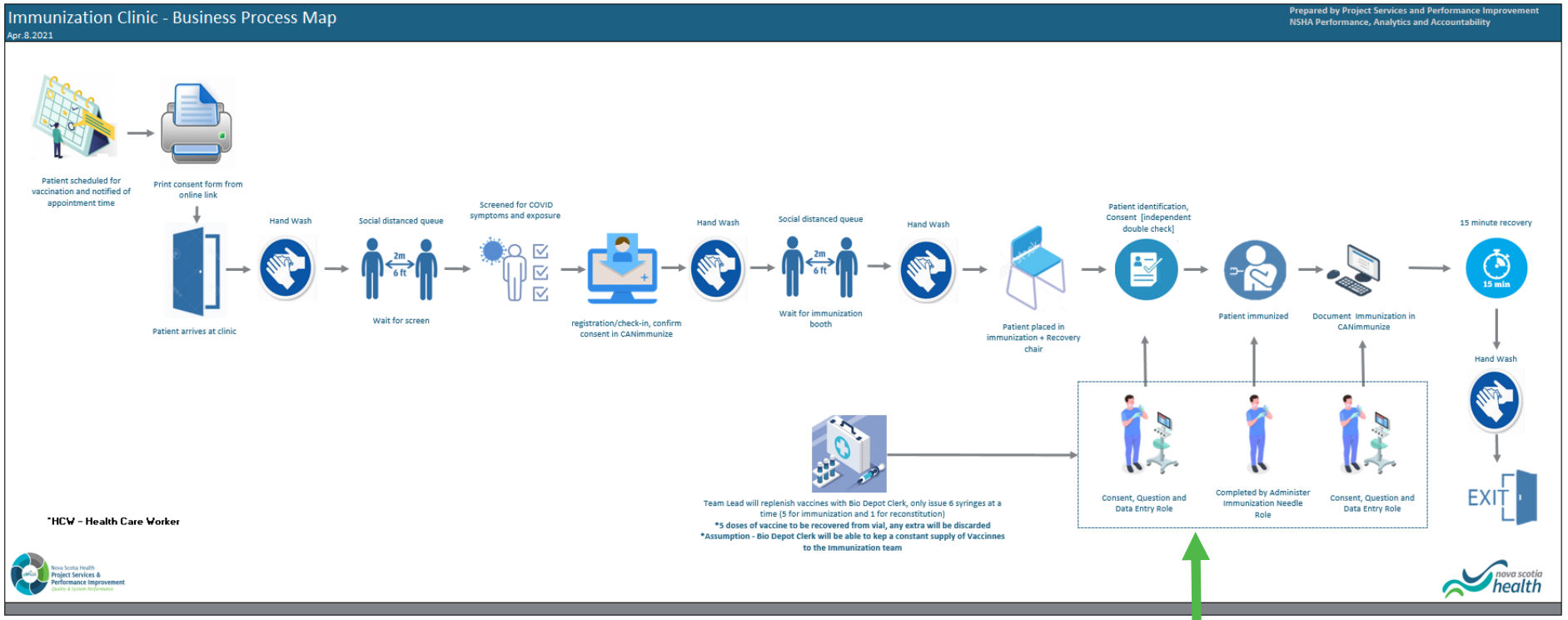
- Output indicates a fairly linear relationship between number of inoculations completed and required recovery space
  - As the number of inoculations increases a slightly greater amount of buffer is required to account for effects of variation

More data collection and Simulations for larger clinic planning… solving for recovery area and physical space

Truro Drive-Thru Clinic - Simulation Video



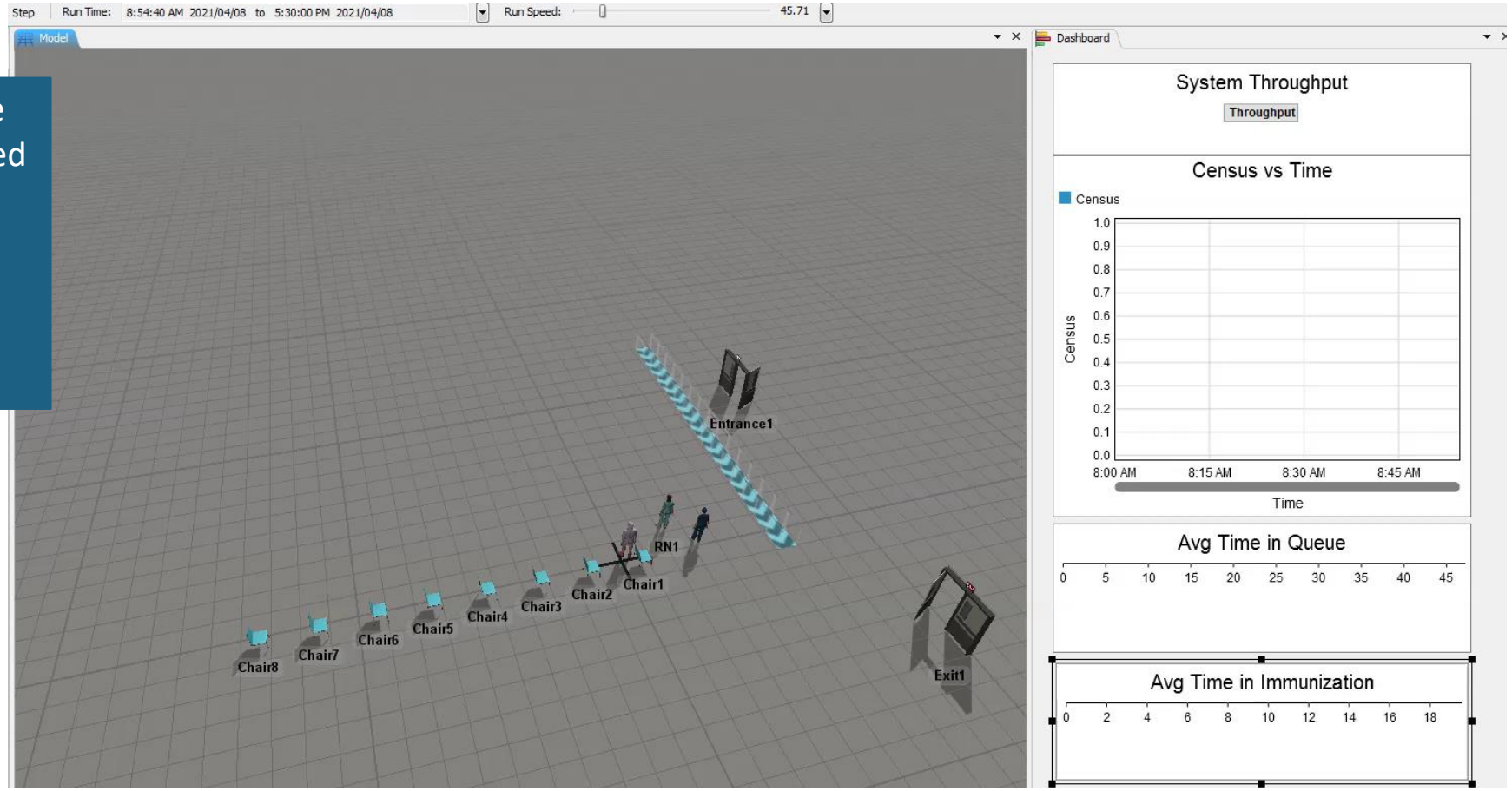
High Volume Immunization Clinic “Hockey Hub” Considerations



- Lean Immunization Team configuration to maximize flow and throughput (Economic Theory of Scarce Resources)
- Recover in place to Minimize “booth” turnover and cleaning, as well as create faster more efficient flow
- Recover in place maximizes available space, eliminating immunization booth area

Scenario Test – Testing “Hockey Hub” clinic configuration with actual NS data

Hockey Hub Model (arrivals, service time and workflow) fails when tested with actual NS data… Actual NS Immunization time data is much higher and includes significant variation in comparison with the Hockey Hub assumptions



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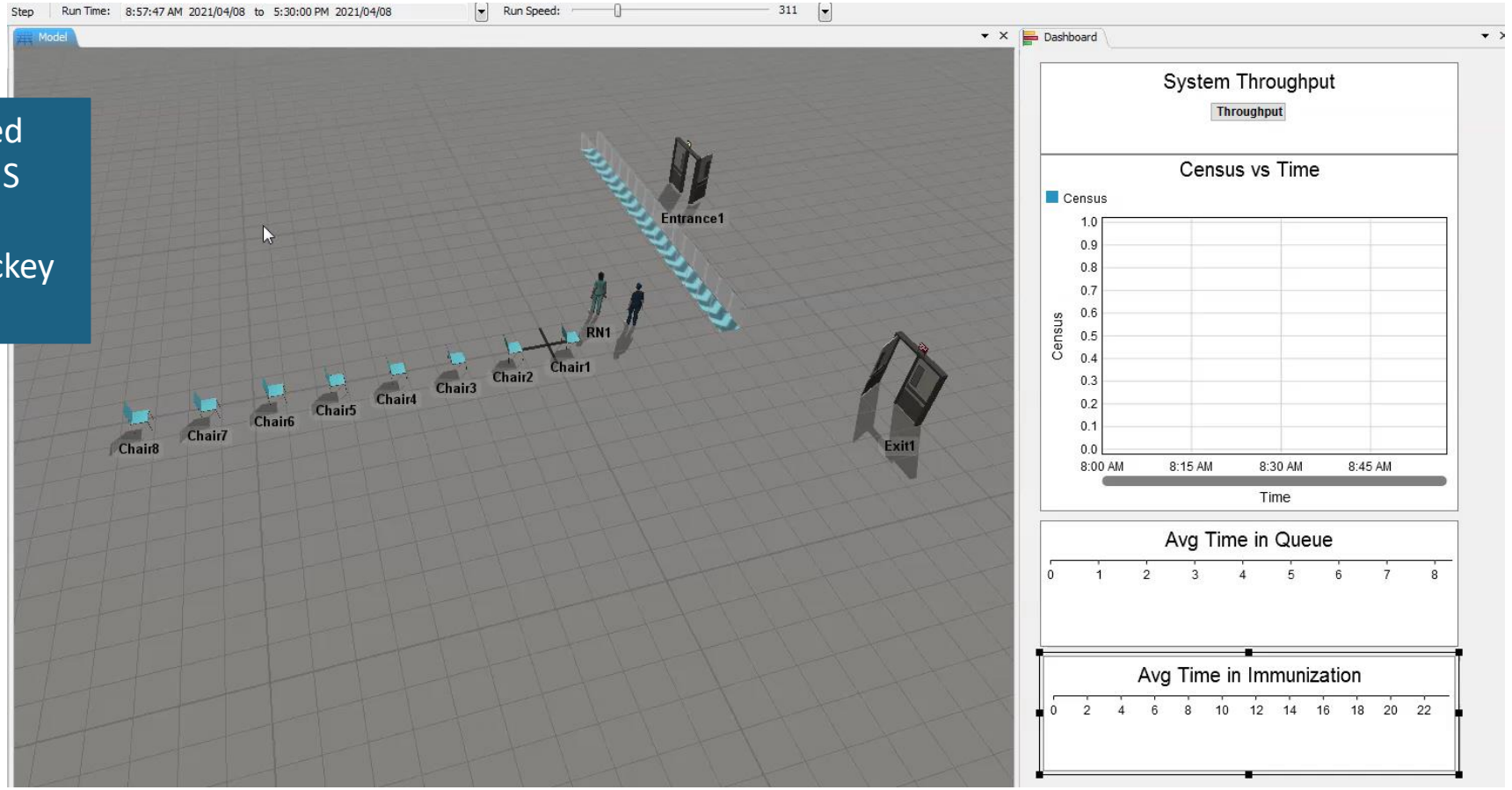
Scenario Test – Testing “Hockey Hub” clinic configuration with actual NS data and reduced arrivals

Hockey Hub Model with reduced arrivals is feasible with actual NS data, but can not replicate the projected throughput from Hockey Hub



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Testing “Hockey Hub” Model Results

Scenario	Description	Planned throughput	Arrivals / 10 minutes	System Throughout	Remaining @ 17:30	Max system census	Max in Q	Average time in Q	Avg time in Imm.
1	Max theoretical throughput with Ideal (Average) Service time	240	5	204	36	52	44	46.63	19.35
2	Max theoretical throughput with Actual (variation) Service time	240	5	168	72	85	77	83.43	23.32
3	High throughput with Actual (variation) Service time	216	4.5	168	48	62	54	63.56	23.26
4	High/mid throughput with Actual (variation) Service time	192	4	168	24	39	31	39.93	23.26
5	Mid/high throughput with Actual (variation) Service time	168	3.5	168	0	15	7	9.62	23.26
6	Mid throughput with Actual (variation) Service time	144	3	144	0	11	3	0.36	22.78
7	Current NS throughput model equivalent	96	2	96	0	10	2	0.19	21.49

*Model results from FlexSim Discrete Event Simulation Software

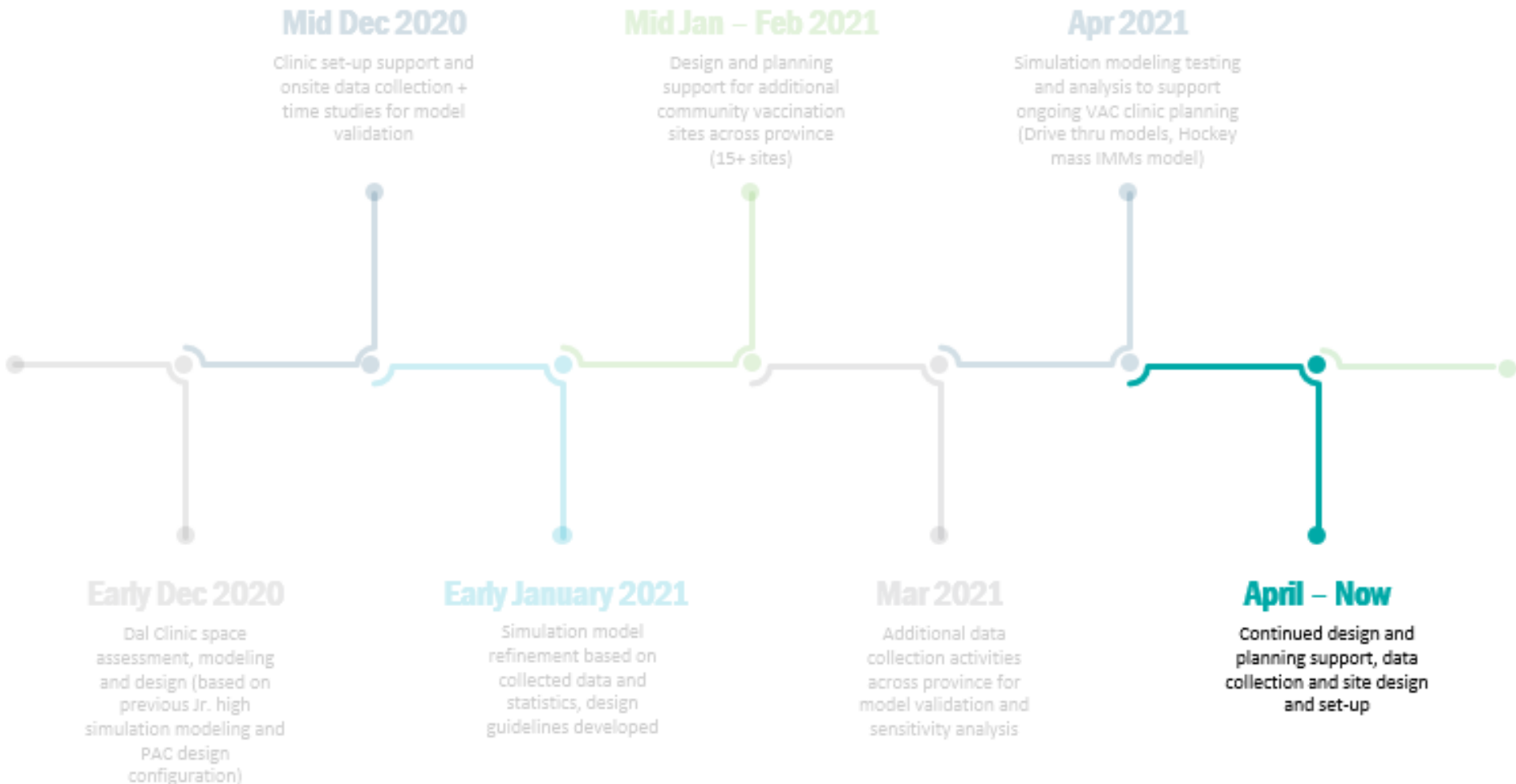
Based on the model configuration the system fails somewhere between 168 and 192 arrivals

Summary and Comparisons

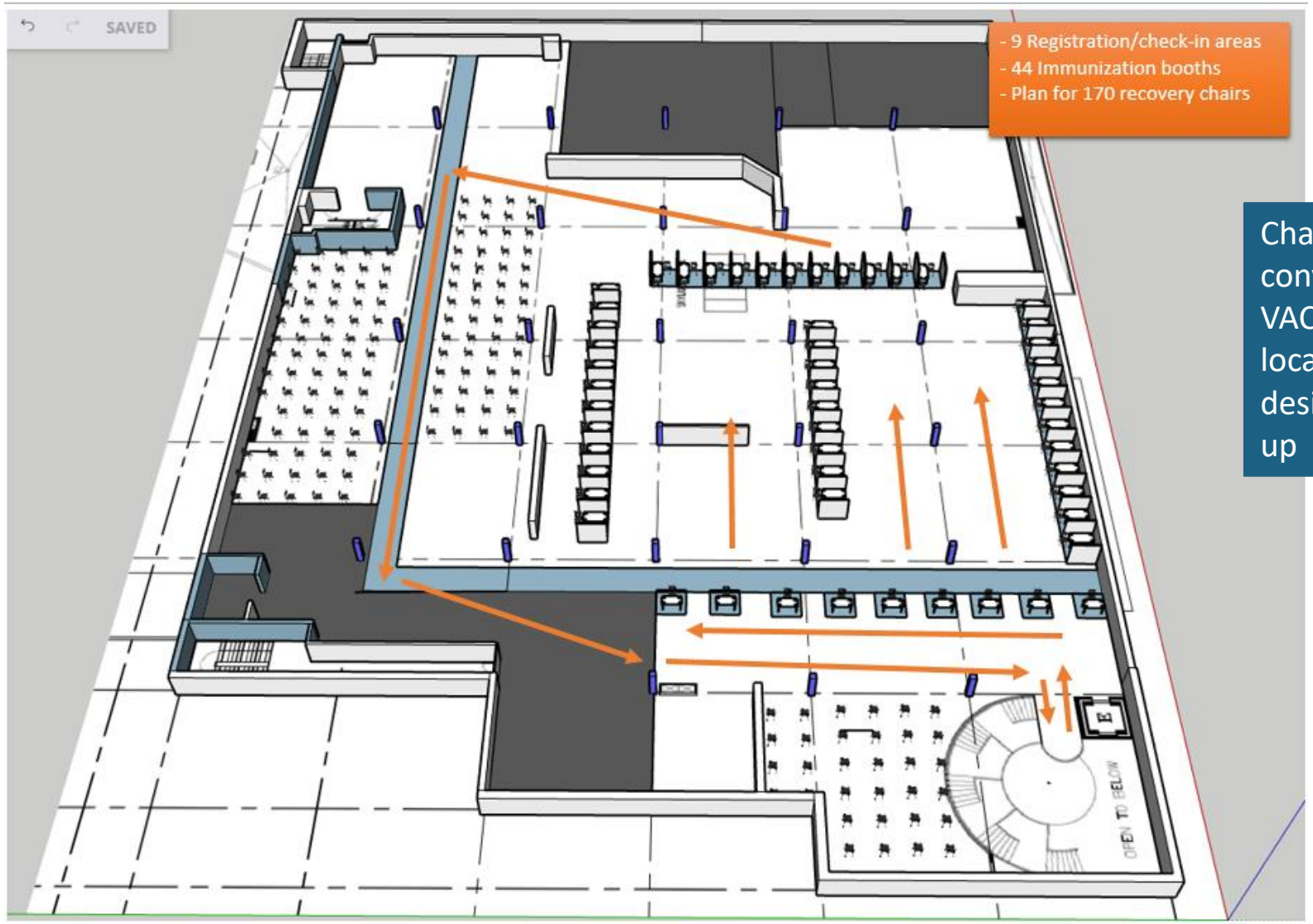
Consideration	A Grey Bruce Hockey Hub	B NSH with Hockey Hub applied	C NSH Current with uninterupted 10 hour day	Notes
Consent & Question + Document (s)	60	125	*250	• NSH data split equally between the 2 immunizaiton roles for [B] • NSH data combined and perofmed by 1 iimmunzation role [C]
Administer Needle Time (s)	40	125	*250	• NSH data split equally between the 2 immunizaiton roles for [B] • NSH data combined and perofmed by 1 iimmunzation role [C]
Daily Throughput / Immunizer Team (10 hour shift no travel, breaks, set-up or clean-up)	900	210	120	• Immunizer team consists of 2 staff roles - 1 Consent, Question, Document and 1 Administer Immnization Needle • [B] adjusted for 10 day form model results • Daily throughput doubled to align with 2 staff team configuration [C]
Increase over current Planned Throughput NS context	650%	75%	0%	

- Based on the simulation model results…
  - In the Nova Scotia context the throughput highlighted in the Hockey Hub model is not feasible
  - The service times and variation observed through data collection across local NSH clinics does not align with the Hockey Hub service time assumptions
  - The application of the Hockey Hub logic is effective in increasing throughput in the Nova Scotia context (almost double)

PSPI Industrial Engineering Vaccine Clinic Support Timeline



Bayer’s Lake Former Brick Community Clinic



Changing Priorities led to converting existing PAC into a VAC (Bayer’s Lake Former Brick location), this included layout design, planning and onsite set-up

Highlights

- Supported Public Health in standing up Immunization sites in a time sensitive and constantly evolving COVID environment
- Leveraged best available relevant project work and data as a starting point (Fall 2019 Jr. High Immunization clinic simulating modeling, PAC clinic Design and Planning Support)
- Significant on-site data collection (100+ hours) for analysis model input, design and validation
- Validated Simulation modeling developed in FlexSim for efficient design and configuration plans, and ongoing adjustment to keep up with changes in a dynamic environment
- Design considerations were made for physical space constraints, parking, inclement weather, elderly population needs, vaccine and staff supply, social distancing and other OCIVD policy requirements
- Site based layout and configuration options developed and provided to site leads for access, flow and capacity considerations (15+ sites)
- On-site support for clinic set-up and configuration
- Highly collaborative team effort with many departments within Nova Scotia Health when designing and setting up these clinics, including Facilities Management, Public Health, IPAC, Emergency Preparedness, OHS, and others

Final Thoughts

- The work we do is highly dependent on having relevant useful data about clinical operations

- Thank you to all the health team members that support the health informatics efforts in Nova Scotia Health!

Questions