Scenario Guide

Community Reception Center Simulation Program for Leveraging and Evaluating Resources (CRC SimPLER) helps radiation emergency planners understand their current capacity, forecast potential bottlenecks, and estimate additional resource needs when planning for population monitoring during response to a radiation emergency.

This interactive tool can also be used as a training tool for locations that are beginning to draft their population monitoring plans and those who have not conducted CRC full-scale exercises.

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Disclaimer

These instructions and the corresponding software, the CRC SimPLER (Community Reception Center Simulation Program for Leveraging and Evaluating Resources), are based on information obtained from real exercises and calculational models. Reasonable efforts have been made to present accurate and reliable information. The user, however, assumes responsibility for the consequences of using this information. Neither the Centers for Disease Control and Prevention, nor any of their employees, make any warranty, express or implied, or assume any legal responsibility for the accuracy or completeness of the information and instructions contained on this website and the CRC SimPLER software. Use of specific trade names and commercial sources does not constitute an endorsement by the authors or by the Centers for Disease Control and Prevention.

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Overview

Purpose

Population monitoring at Community Reception Centers (CRCs) is one of the most challenging activities that the local and state health departments will be involved in during response to a radiological event. Setting up and staffing CRCs requires extensive planning. The Community Reception Center Simulation Program for Leveraging and Evaluating Resources (CRC SimPLER) helps radiation emergency planners understand their current capacity, forecast potential bottlenecks, and estimate additional resource needs when planning for population monitoring during response to a radiation emergency. This software can also be used as a training tool for locations that are beginning to draft their population monitoring plans and those who have not conducted CRC full-scale exercises.

Key Features

- Accessible from any computer with internet access
- Simple interface with graphical outputs
- Ability to export data
- Links to references and resources

CRC SimPLER focuses on typical or anticipated activities that are needed to conduct population monitoring, such as contamination screening, decontamination, registration, and mental health counseling.

Design

This program was developed using modelling software and incorporates actual timing data collected from CRC exercises across the country, making predictions more accurate than ones used in similar products. In addition, CRC SimPLER has been tested with state and local planners to ensure that it is easy to use.

Scenario Walk Throughs

To assist new users, this document provides step-by-step walk throughs for using CRC SimPLER using different scenarios. If you need assistance running specific scenarios contact simpler@cdc.gov .

Scenario 1

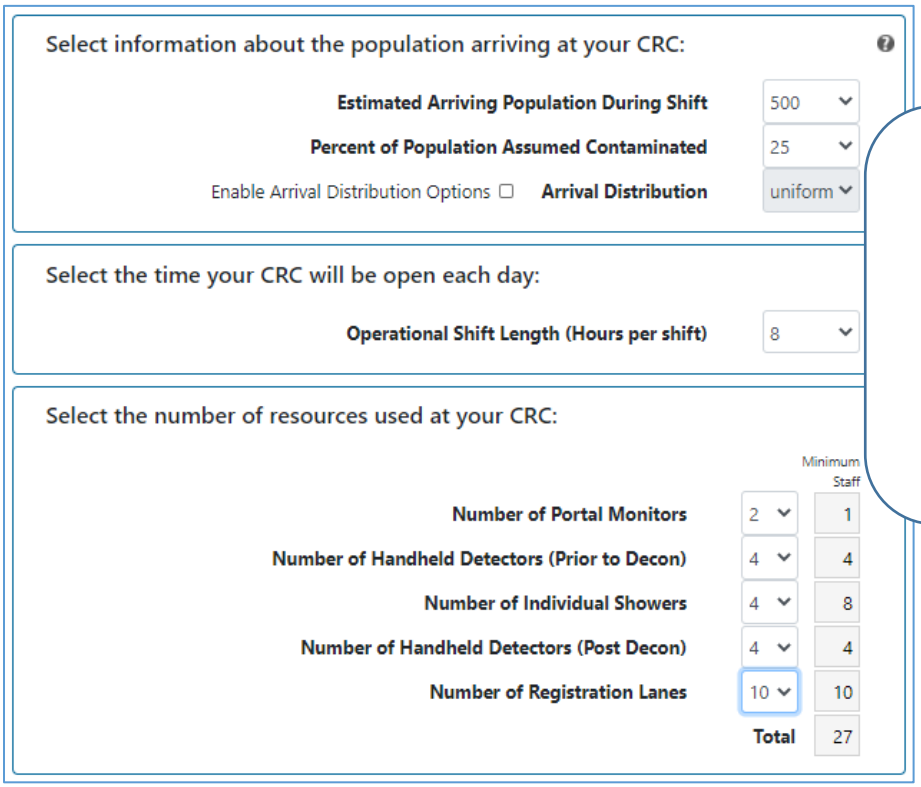
This scenario will start with basic inputs for CRC SimPLER based on a potentially high contamination event.

Narrative

A radioactive source is found at a waste site and the label has been removed. The waste site manager opens the source container and finds that the material inside is powder-like and has a bright, attractive color. Waste site manager takes the open source into the office and passes it around for staff to see and says they can take samples home to show their families. Several days later, several family members note that they are not feeling well. Fast forward to you getting a phone call from the state EOC and you have been tasked to set up a CRC to screen the families of waste site workers and their close neighbors for potential contamination.

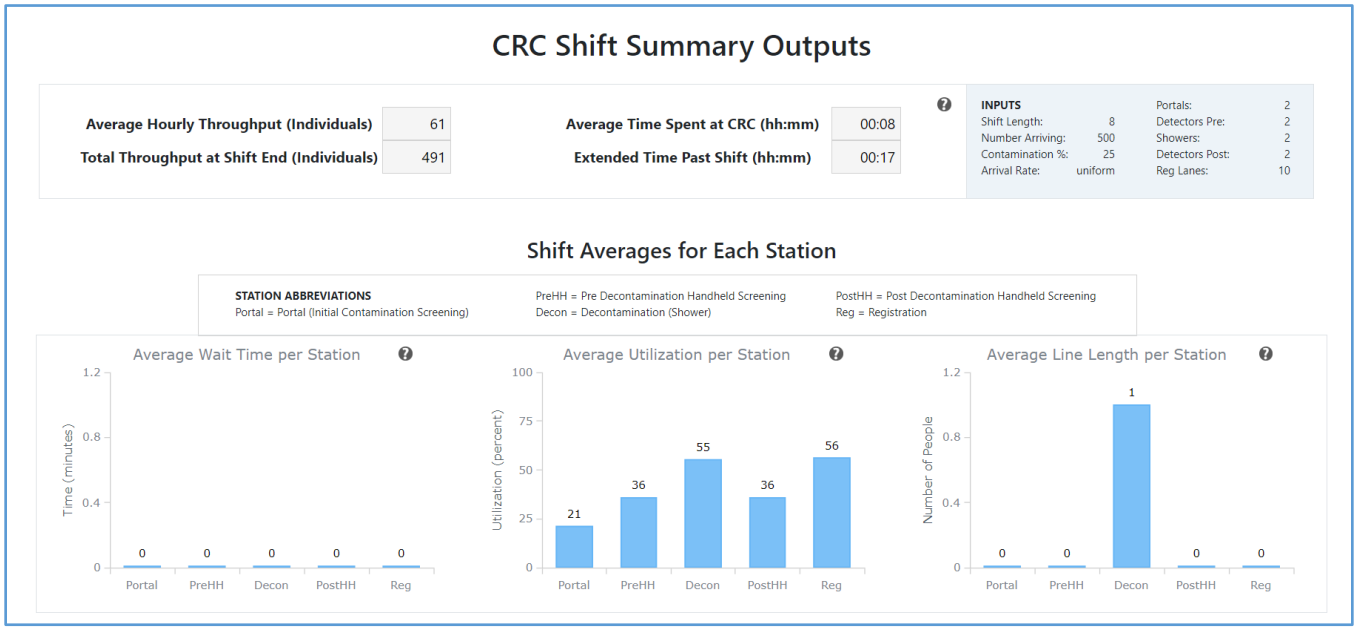
Including extended family members and neighbors, the anticipated population you will need to screen for contamination is approximately 500 individuals. After speaking with radiation control staff, they let you know that it is likely (25%) many individuals will be contaminated above the screening criteria they have set for the CRC. Your CRC will be set up at a local facility that has 4 showers. Two portal monitors (and staff), 8 handheld detectors (and staff) and 10 staff trained for registration are being deployed to your facility. You set an 8-hour shift for families to arrive. Will you be able to screen everyone in one eight-hour shift?

Given Inputs:



Shift length: 8 hours
# of people Arriving: 500
Percent Contaminated: 25%
Arrival Distribution: Uniform
# of Portals: 2
# of HH Pre Decon: 4
# of Showers: 4
# of HH Post Decon: 4
# of Registration Lanes: 10

Summary Output Screen



Takeaways from Summary Outputs

Looking at the Summary Outputs screen, we will walk through the questions from the "Using CRC SimPLER to Answer Specific Questions" section.

- <u>Can I achieve my throughput goals?</u>
  Yes, we can achieve our throughput goals with our current CRC setup and plans. **Total Throughput at Shift End** is 491. This is within 5-10% of our desired throughput of 500 individuals.

- <u>How much longer will I need to stay open to process everyone at the CRC?</u>
  The **Extended Time Past Shift** is 18 minutes. The CRC should be able to finish processing most individuals within their shift time and only extend for about 30-45 minutes. Note that CRC SimPLER provides estimates based on modelling and values should be taken as approximations.

- <u>How long can individuals arriving at the CRC expect to be there?</u>
  The **Average Time Spent at CRC** by an individual is approximately 8 minutes. Looking at the station shift average graphs, we see that there are on average no lines or wait times which means that the individuals are flowing quickly through the CRC. The average time spent at the CRC by individuals in this instance is solely dependent on each station's processing time.

- <u>Which station is causing my bottlenecks?</u>
  For this CRC SimPLER estimate, there aren't any stations that would be considered major bottlenecks. The station with the highest utilization is **Registration** but since on average there no lines, we assume there are no bottlenecks to address.

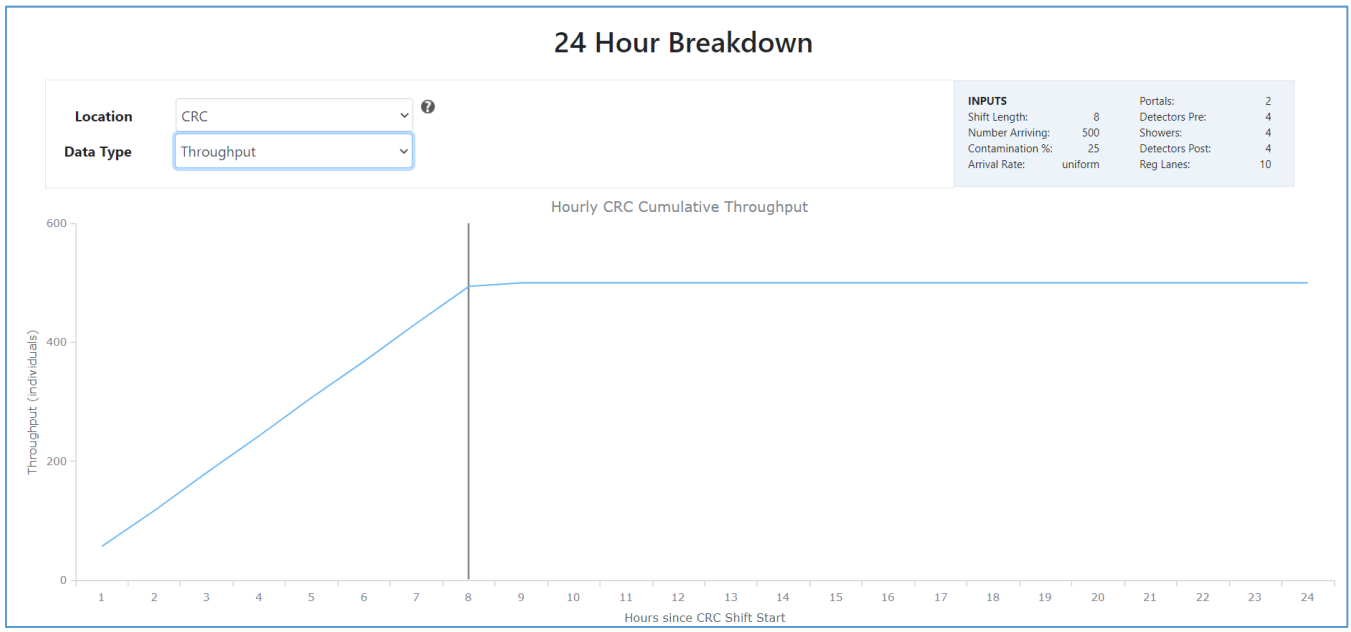
- <u>How quickly do bottlenecks appear?</u>
  Major bottlenecks do not appear in this CRC SimPLER Estimate.

- <u>Do I have enough space for when bottlenecks occur?</u>

Major bottlenecks do not appear in this CRC SimPLER Estimate so there should be enough space.

- <u>Where can I possibly pull additional resources?</u>
  Major bottlenecks do not appear in this CRC SimPLER Estimate but if we wanted to increase the Registration capacity, we would want to increase the number of lanes available at registration.

Hourly Output Screen



Key Takeaways from Hourly Output Screen

This CRC SimPLER estimate shows that our CRC had no major bottlenecks so we will check the 24 Hour Breakdown for the CRC Cumulative Throughput just to confirm that we complete processing of all individuals shortly after the end of the shift.

Suggested Actions

From looking at all information, we find that it is very possible that we will be able to process the arriving population with our current CRC plans and resources in an 8-hour shift. Other factors could come into play to slow down CRC processes but the utilization and wait times are low within CRC SimPLER so planners will have to adapt as the CRC is open and routinely maintain awareness of CRC operations.

Scenario 2

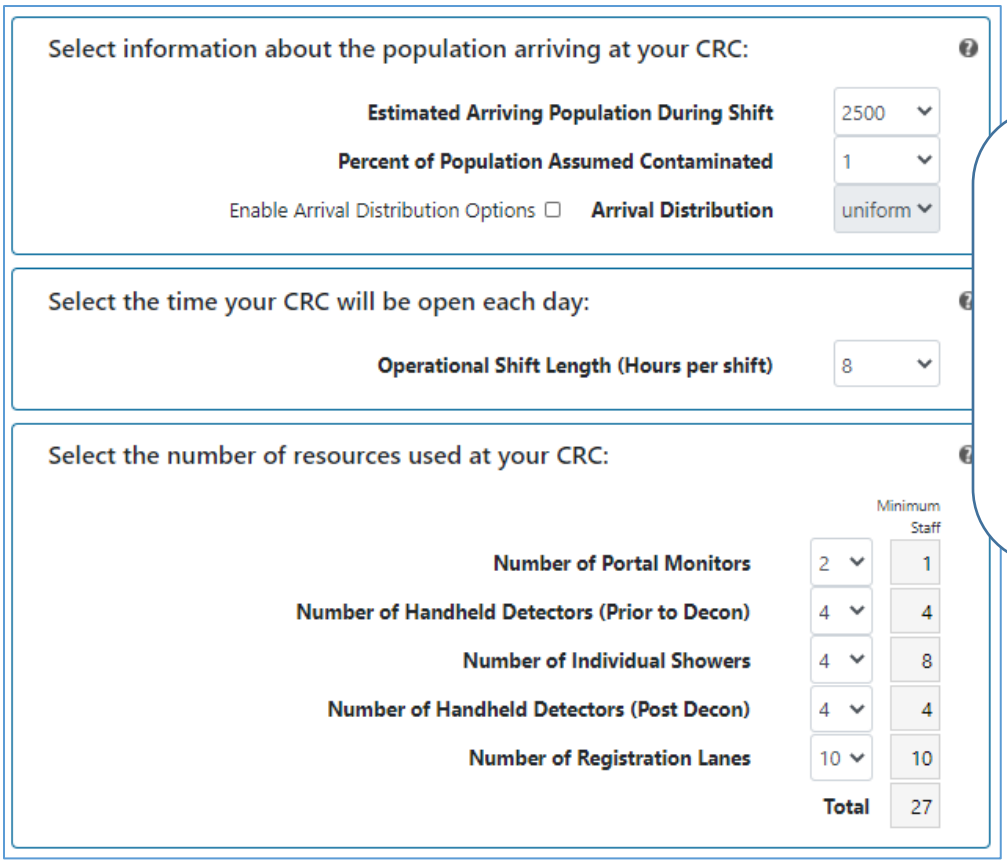
This scenario is the same scenario as above, but the population increases. At the direction of the Radiation Control Program, the CRC operator raises, the contamination screening criteria at the CRC, resulting in a decrease in the estimated percent of contaminated individuals. This is an example of how changing screening criteria for a CRC can impact the overall throughput of individuals.

Narrative

Several news media have reported on the contamination incident and individuals in many surrounding neighborhoods are concerned that they might have been contaminated. Based on the calls coming into the call center, you are informed that you should be prepared to receive approximately 2500 people but want to ensure you are prioritizing those who are very contaminated first. Working with your radiation program, you determine the screening criteria that will pull out highly contaminated individuals. You expect that since most individuals are coming from neighboring areas that were not contaminated, the likely percent of individuals that will be contaminated is 1%.

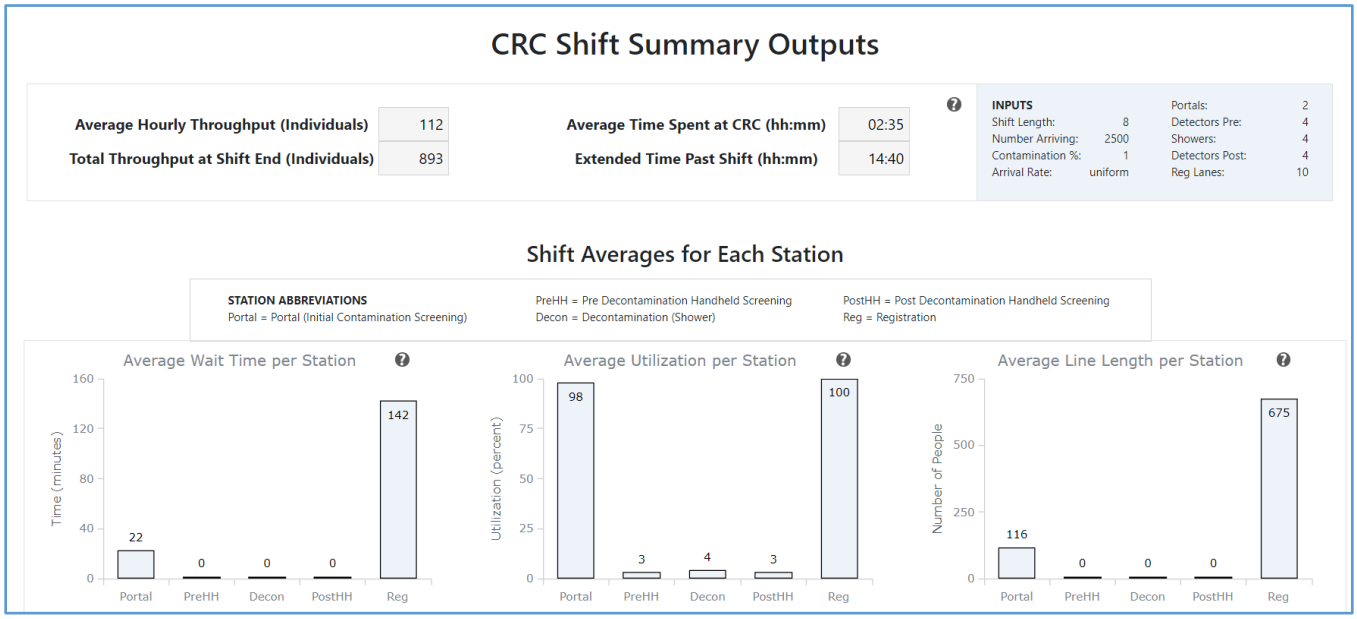
Your CRC will be set up at a local facility that has 4 showers. Two portal monitors (with staff), 8 handheld detectors (with staff) and 10 staff trained for registration are being deployed to your facility.

Given Inputs:



Shift length: 8 hours
# of people Arriving: 2500
Percent Contaminated: 1%
Arrival Distribution: Uniform
# of Portals: 2
# of HH Pre Decon: 4
# of Showers: 4
# of HH Post Decon: 4
# of Registration Lanes: 10

Summary Output Screen



Takeaways from Summary Outputs

Looking at this information, we initially notice that there are bottlenecks and we are not processing all individuals within our 8-hour shift. We will walk through the questions from the "Using CRC SimPLER to Answer Specific Questions" section.

- Can I achieve my throughput goals?
  No, we will not be able to achieve our throughput goal of 2500 individuals in 8-hours. The **Total Throughput at Shift End** is 893 individuals with is less than half of our throughput goal. This indicates there is at least one bottleneck in our CRC.

- How much longer will I need to stay open to process everyone at the CRC?
  The **Extended Time Past Shift** is 14 hours and 40 minutes. The CRC would need to stay open 1-2 additional shift lengths beyond the current shift to complete processing of all individuals. The CRC may not have the staffing capability to accomplish. Note that CRC SimPLER provides estimates based on modelling and values should be taken as approximations.

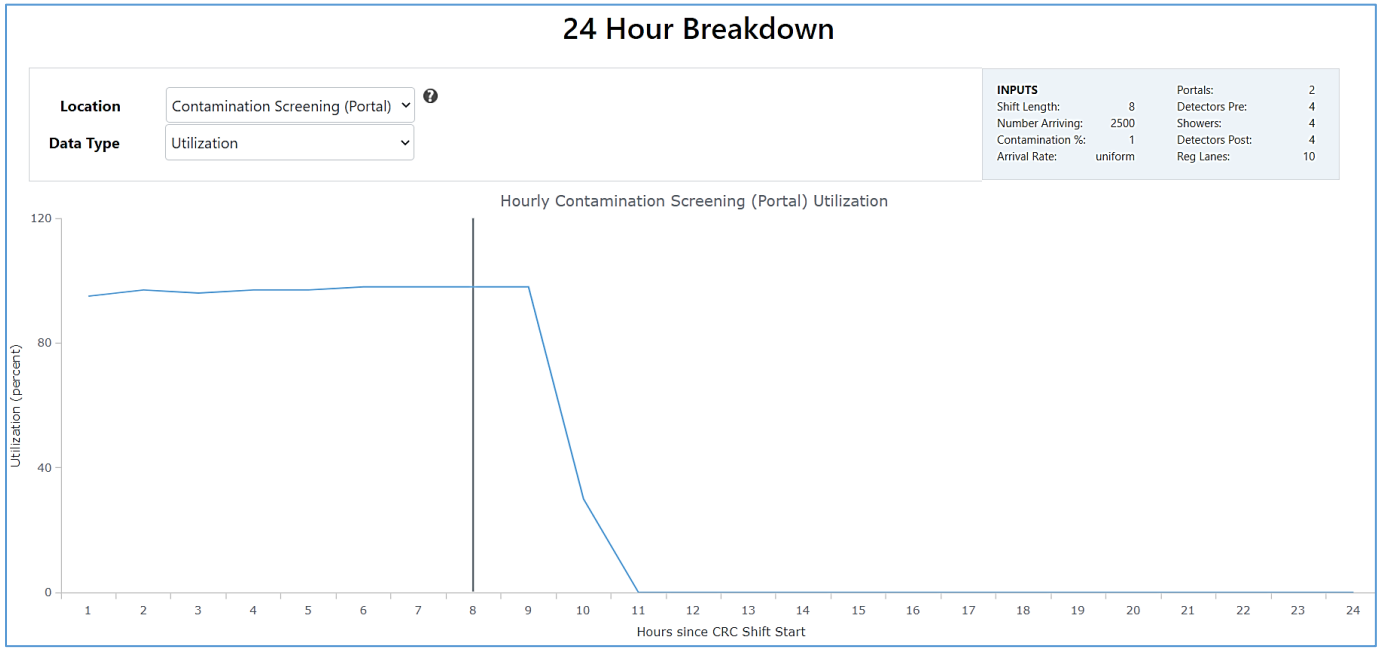
- How long can individuals arriving at the CRC expect to be there?
  The **Average Time Spent at CRC** by an individual is 2 hours and 35 minutes. For this example, we will say that we want individuals to be at the CRC less than an hour and a half. We will try to reduce bottlenecks and bring down the average individual processing time in additional CRC SimPLER estimates in this example.

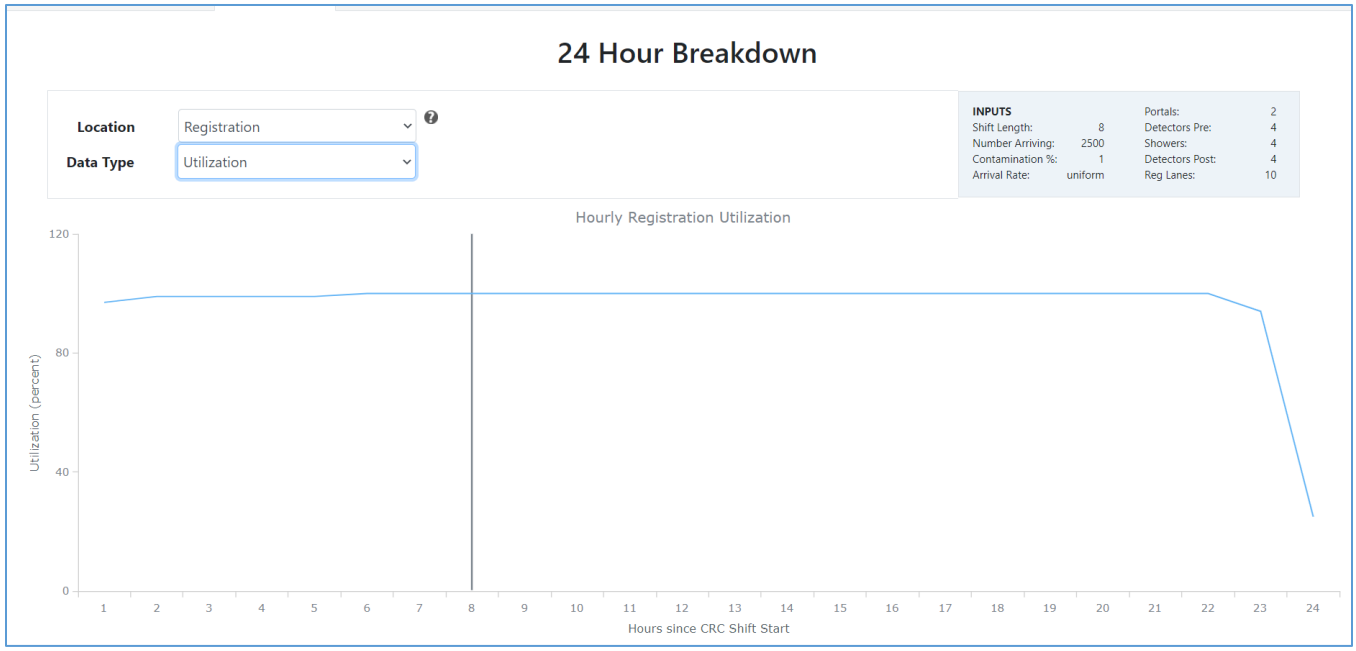
- Which station is causing my bottlenecks?
  Registration appears to be the main bottleneck with an average wait time of over 2 hours, average utilization of 100%, and average line length of 675 people. **Contamination Screening** has an average utilization of 98% which is also high. The wait time for Contamination Screening is about half an hour and has an average line length of 116 people. **Registration** is likely the station that if we add resources, we will see the greatest benefit.

- <u>Do I have enough space for when bottlenecks occur?</u>
  We do not have enough space for the bottleneck at **Registration.** The average line length for Registration during the shift is 675 people. Let us assume that the room that the Registration station is set up in has an occupancy of 500 people with chairs, standing room and tables to complete registration information. This would mean that we need to find a way to add resources or re-arrange resources to reduce the long lines building up at registration. We will check what the potential maximum line that Registration will grow to in the Hourly Output Screen Section to see how large we might expect the line to grow.
  We do have space for the line length of 116 individuals at **Contamination Screening** as the line can span through an open hallway and through other corridors in the building. We would want to keep an eye on the line length at this station since it is the first station in the CRC process and lines out the door could become a safety hazard due to weather or oncoming traffic.

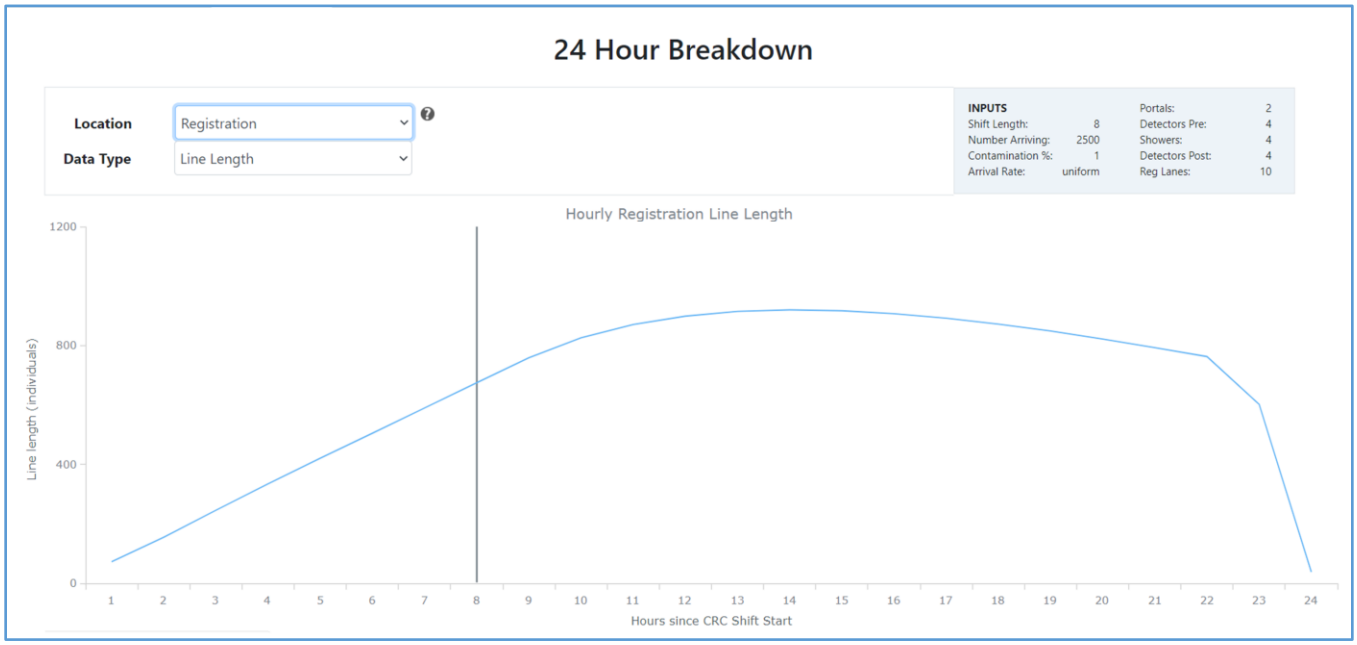
- <u>Where can I possibly pull additional resources?</u>
  Pre-Decon Handheld Screening, Decontamination (Showers) and Post-Decon Handheld screening all have very low utilization and no lines. These stations would be a potential place to move staff from to reduce the bottleneck at **Registration**. We can also see what the impact of

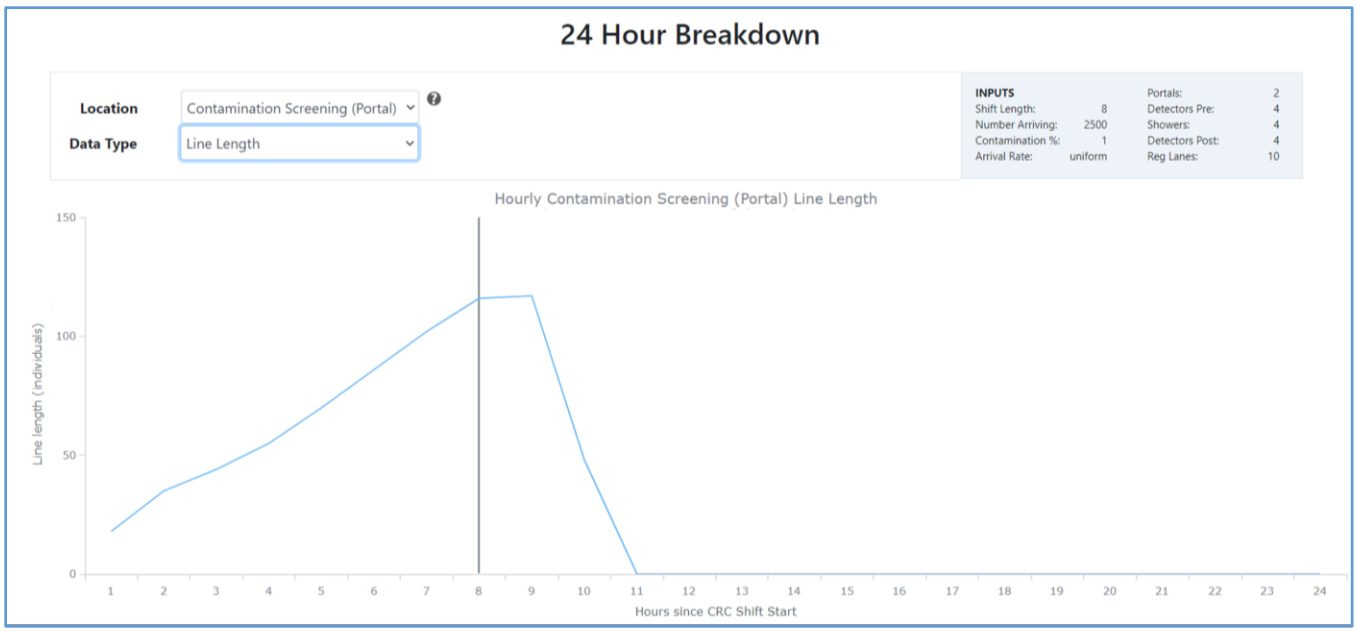
Hourly Output Screen





- How quickly do bottlenecks appear?
  Both **Contamination Screening** and **Registration** start with high utilization and stay at 90% or higher the entire shift. Registration continues to be 100% utilized until 14 hours after she shift end. Since both stations start with high utilization and are completely utilized the whole shift, these are both bottlenecks with Registration being a major limiting station for your CRC throughput.





- <u>Do I have enough space for when bottlenecks occur? Continued</u>
  We know that we do not have enough space for **Registration** and want to see how long the lines might grow while we continue to process all remaining individuals. The line length approaches 900 individuals after the shift end and does not begin to decrease until almost 8 hours after the shift end.
  Contamination Screening had an average line length of 116 individuals and does not grow much larger after the shift end. The line length dramatically decreases after an hour or so of the shift end.

Key Takeaways from Hourly Output Screen

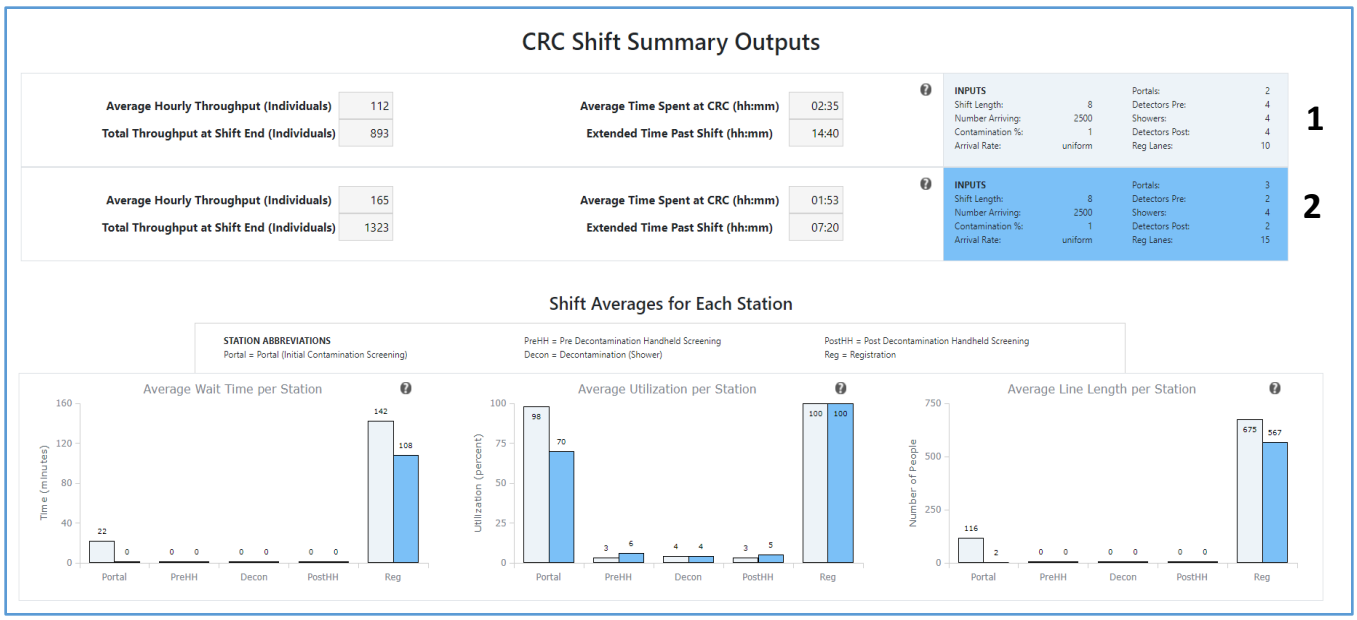
Registration is the largest bottleneck and **Contamination Screening** is the second largest bottleneck. We will run a few additional CRC SimPLER estimates in the next section to see what the impact of additional resources at each station would have on our throughput and total time needed to process all arriving individuals.

Suggested Actions

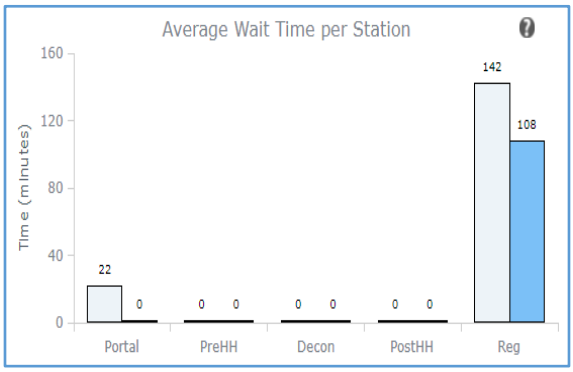
We will explore two CRC SimPLER estimates to evaluate the impact of additional resources at Registration and Contamination Screening.

CRC Estimate with the addition of 1 portal monitor and 5 registration lanes

First, we will try a CRC setup where we move staff from Pre- and Post-Decon to help with Registration. We also borrow one additional portal monitor from a neighboring jurisdiction and can provide a staff member to use the new portal monitor. We have 3 portals, 4 handheld detectors (2 Pre- and 2 Post- Decon), 4 showers and 15 lanes of registration all with appropriate staff. Using the “Toggle Comparison Tool”, we will add this new set up to our other scenario which will allow us to do a side-by-side comparison. Our original scenario is lighter colored information which is the top row for the CRC Summary data and the bars on the left in each bar graph pairing. The new estimate is represented by the darker colored box and bar graphs which are on the right in each bar graph pairing. For reference, the original estimate will be labelled 1 and 2 in the CRC Shift Summary Output page below.

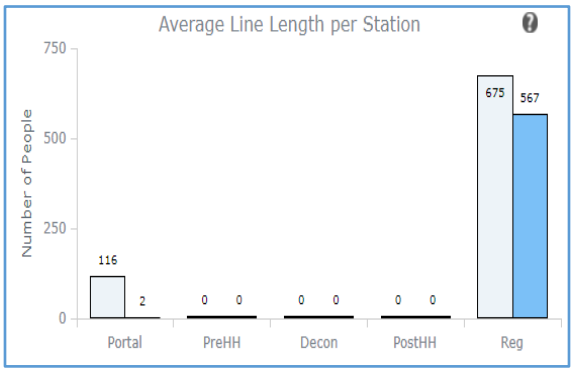


By moving 5 staff to Registration, increasing the available lanes from 10 to 15 and adding one portal monitor at Contamination Screening, we have increased our Total Throughput at Shift End to 1323 individuals which is a 50% increase from our original CRC set up. The Average Time Spent at the CRC by an individual has been reduced by half an hour and is now a little less than 2 hours. We now only need to stay open an additional 7-8 hours to finish processing individuals as opposed to the 15 hours. If we assume each shift for staff is 8 hours, this means we only need one additional shift of staff to assist with final monitoring and registering of those still in the CRC after closing.



Comparing the Average Wait Times per Station for Registration, we notice that we have decreased the wait time from over 2 hours to now a little over an hour and a half. This is still relatively long, and we will attempt to reduce this wait time even more in the next CRC SimPLER estimate.

Contamination Screening is no longer a bottleneck, and the average utilization has fallen to 70% which allows for occasional surges and flexibility. Adding portal monitors beyond the three in this estimate would likely not be of a benefit to the CRC throughput and additional costs and staff could be utilized elsewhere – most likely Registration.



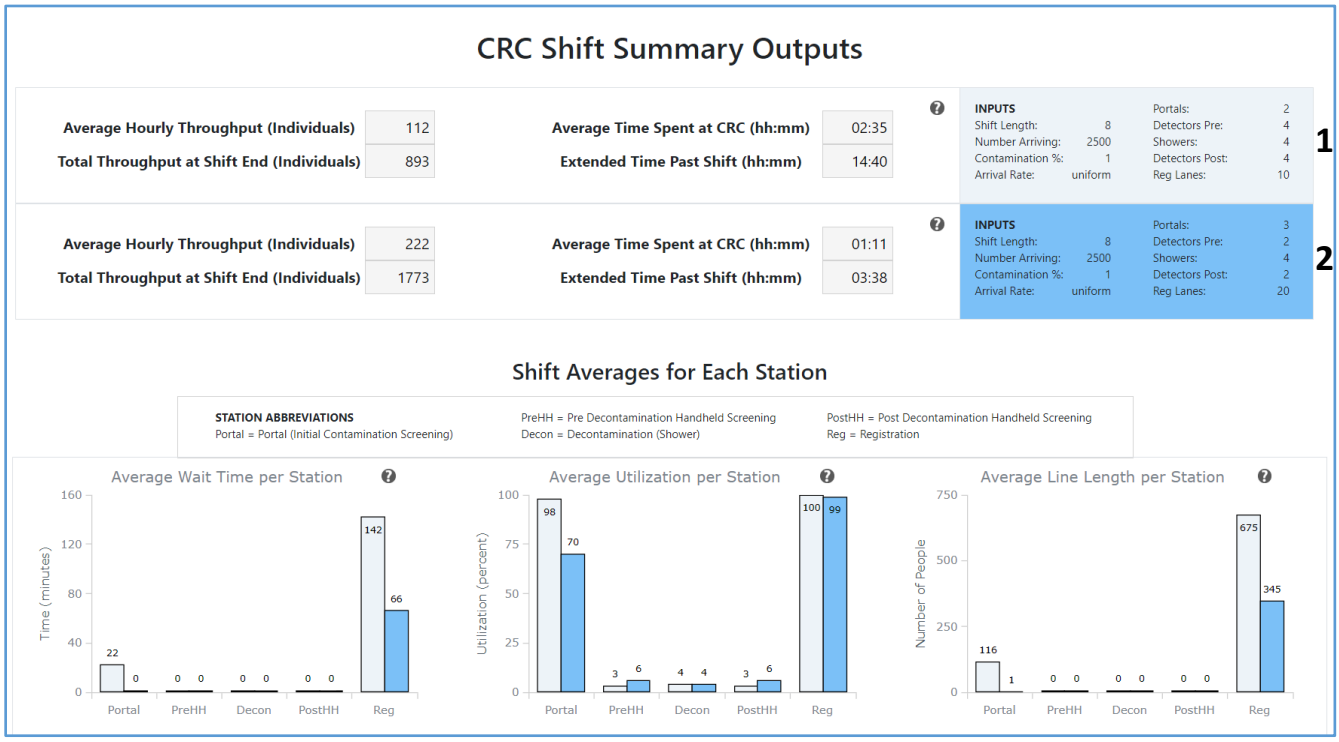
Comparing the Average Line Length per Station for Registration, we notice that we have decreased the line size from 675 individuals to 567. Decreasing the average line by 100 individuals is a huge improvement but due to space restrictions, we would like to decrease the size even more. Additional Registration lanes are needed to accomplish this.

CRC Estimate with the addition of 1 portal and 10 registration lanes

In addition to the staff, we were able to move from Pre- and Post-Decon to help with Registration, we can request 5 volunteer staff who will be given Just-In-Time training to help with Registration. We have borrowed one additional portal monitor from a neighboring jurisdiction and can provide a staff member to use the new portal monitor. We have 3 portals, 4 handheld detectors (2 Pre- and 2 Post- Decon), 4 showers and 20 lanes of registration all with appropriate staff. The original CRC Shift Summary Outputs are provided with the new scenario using the "Toggle Comparison Tool". The original CRC scenario will again be the lighter shade bar graphs on the left in each bar graph pairing and the top portion of information on output page. The new CRC setup will be the darker colored bar graphs on the right in each bar graph pairing and below the original CRC outputs on the top. For reference, the original estimate will be labelled 1 and 2 in the CRC Shift Summary Output page below. CRC SimPLER estimates where 15 Registration lanes were available is provided in boxes with dots (previous estimate).

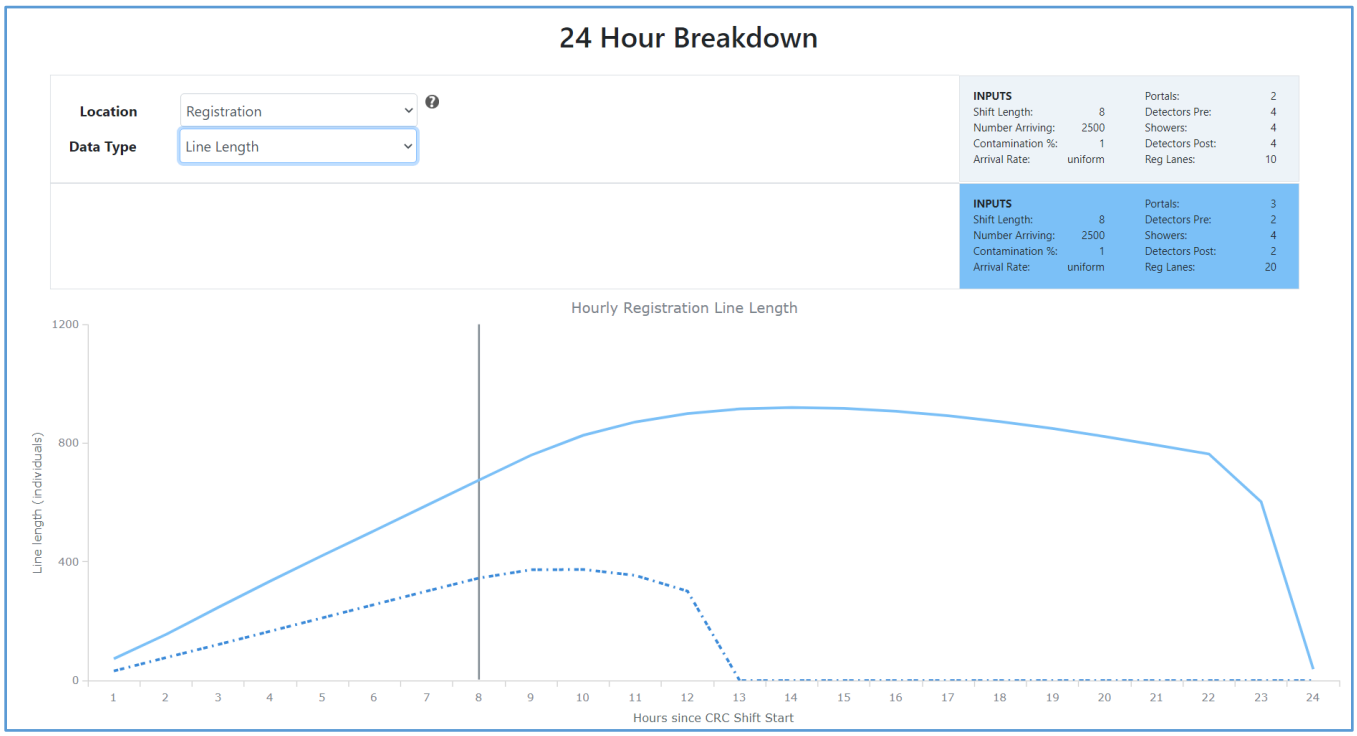
Average Hourly Throughput (Individuals)	165	Average Time Spent at CRC (hh:mm)	01:53
Total Throughput at Shift End (Individuals)	1323	Extended Time Past Shift (hh:mm)	07:20

INPUTS			
Shift Length:	8	Portals:	3
Number Arriving:	2500	Detectors Pre:	2
Contamination %:	1	Showers:	4
Arrival Rate:	uniform	Detectors Post:	2
		Reg Lanes:	15



By increasing the available lanes from 10 to 20 and adding one portal monitor at Contamination Screening, we have increased our Total Throughput at Shift End to 1773 individuals which is almost a 100% increase from our original CRC set up. The Average Time Spent at the CRC by an individual has been reduced to a little over an hour which is half of the original time an individual would be at the CRC. We now only need to stay open an additional 3-4 hours to finish processing individuals as opposed to the 15 hours in the original estimate or 7-8 hours in the estimate where we increased registration from 10 to 15 lanes. If we assume each shift for staff is 8 hours, this means we only need one additional shift of staff to assist with final monitoring and registering of those still in

the CRC after closing. This second shift staff could break down or reset the CRC setup with the left-over time in their shift since final processing will not take the entire 8 hours.



The original 24-Hour Breakdown for Registration Line Length (solid line) is overlayed over the new CRC setup (dashed line) with 20 lanes of registration. We can see how adding 10 lanes of registration not only decreased the total amount of time we would need to stay open to process all individuals from 24 hours to 13 hours, but also the size of the line that would be at registration. Remember that our largest line length at Registration was over 900 individuals developed after the shift end as individuals were arriving from other stations within the CRC. With the addition of 10 Registration lanes, we bring the maximum line length down to a little over 300 individuals. This new CRC setup with 20 lanes of Registration allows us to fall within our space constraints for the CRC location.

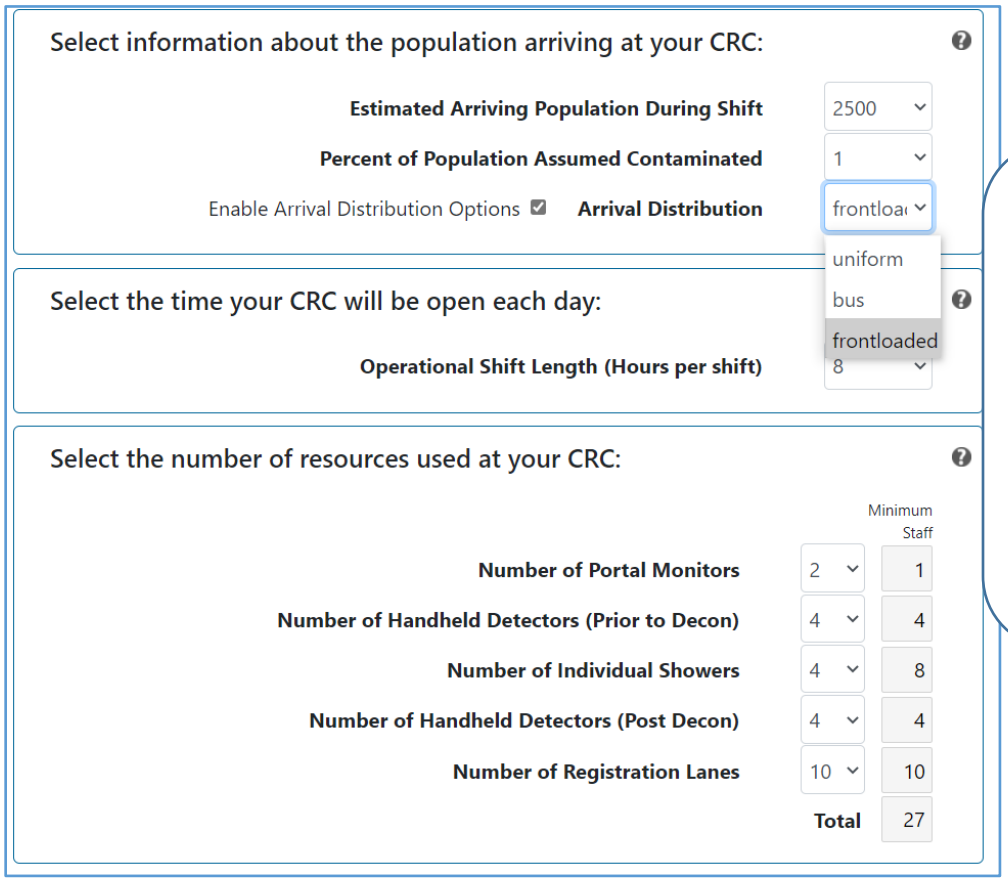
Scenario 3

This scenario shows how to use different types of arrival distributions for the same scenario we have been working through.

Narrative

The Joint Information Center has been pushing out notifications of where and when the CRC will be set up. Since you anticipate that people will be eager to be screened early, there is likely a line that will form before the facility opens. You want to evaluate your current resources and the impact a line at the start of the shift will have on your throughput. You are expecting 2500 individuals and a low possibility of contamination (1%). Your CRC is equipped with 2 portal monitors (with staff), 8 handheld detectors (with staff), 4 showers and 10 staff who will be running registration. Will your current set up be able to handle the initial surge from the long line at opening? If not, for which stations should you request additional resources?

Given Inputs:

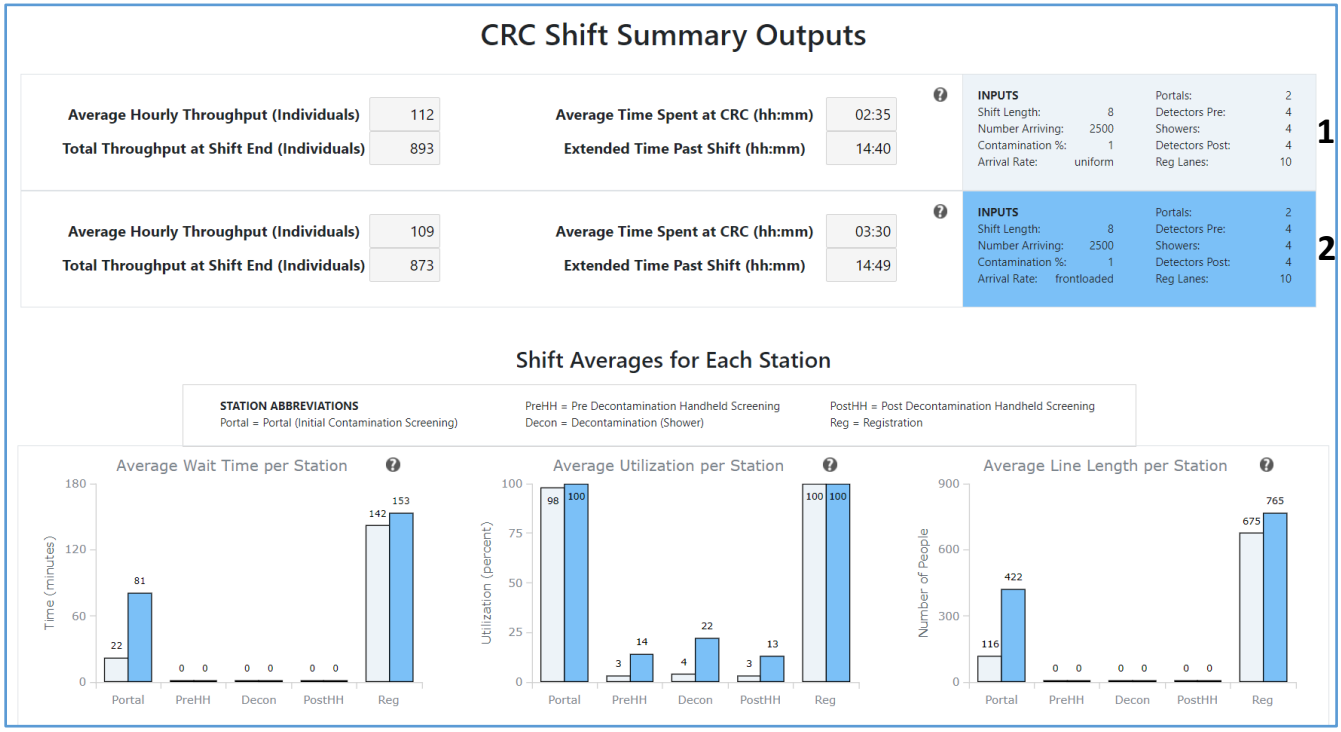


Shift length: 8 hours
# of people Arriving: 2500
Percent Contaminated: 1%
Arrival Distribution:
Front Loaded
# of Portals: 2
# of HH Pre Decon: 4
# of Showers: 4
# of HH Post Decon: 4
# of Registration Lanes: 10

Summary Output Screen

This example will focus on comparing how different arrival distributions may affect throughput.

CRC Shift Summary Outputs from the previous example using “Uniform” arrival distribution are provided alongside the “Front Loaded” arrival distribution to make it easier to compare new CRC SimPLER estimates. “Uniform” is shown in the lighter colored boxes on top and bars on the left labeled 1. “Front Loaded” is shown in the darker colored boxes on top and bars on the right labeled 2.

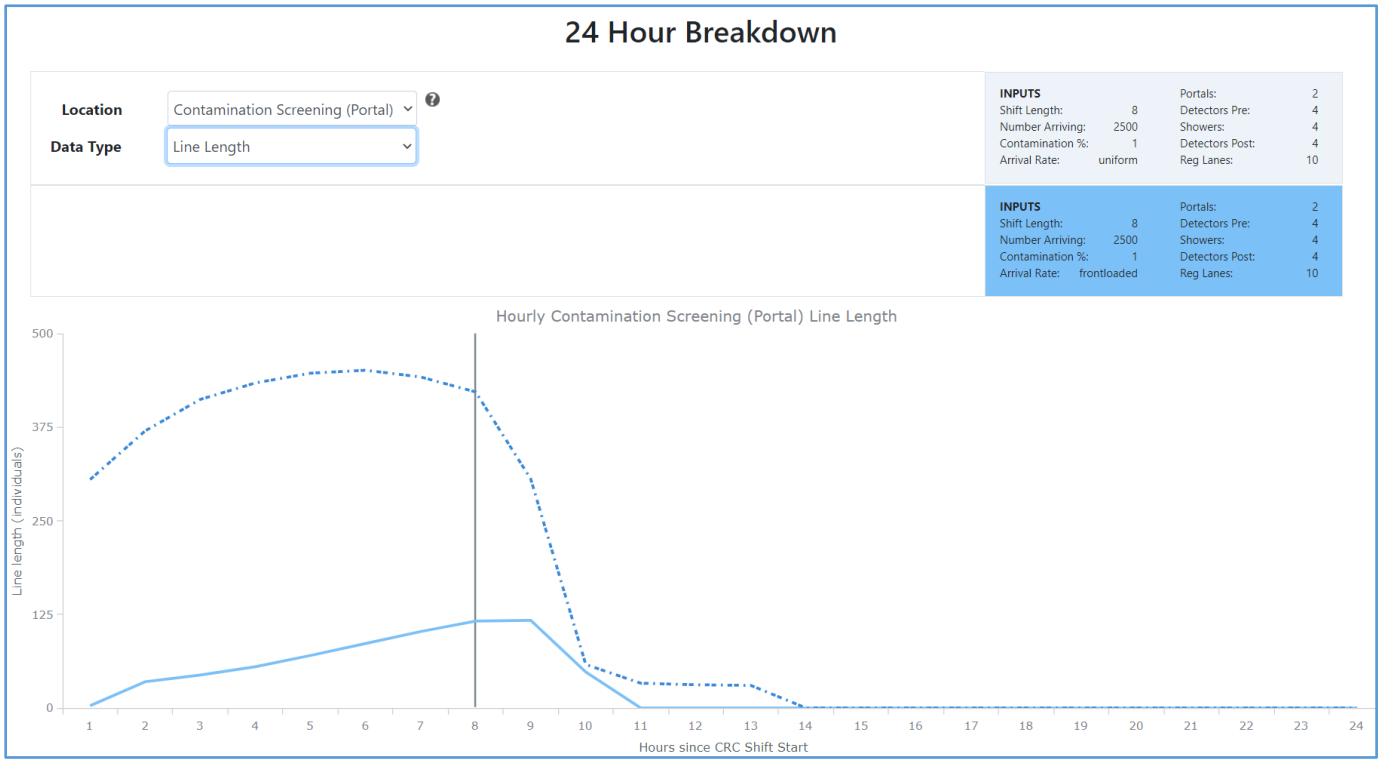


Takeaways from Summary Outputs

Looking at both Summary Outputs, we notice that the overall the **Total Throughput at Shift End** is approximately the same as well as the **Extended Time Past Shift**. The Station Averages for Each Station show that there is an increase in Average Wait Times and Line Lengths for both **Contamination Screening** and **Registration** with the initial surge of individuals arriving at the CRC. The station most impacted by the surge is **Contamination Screening**.

We will use the **Hourly Output Tab** to see how our CRC setup handles the initial surge of individuals arriving at the CRC.

Hourly Output Screen



Key Takeaways from Hourly Output Screen

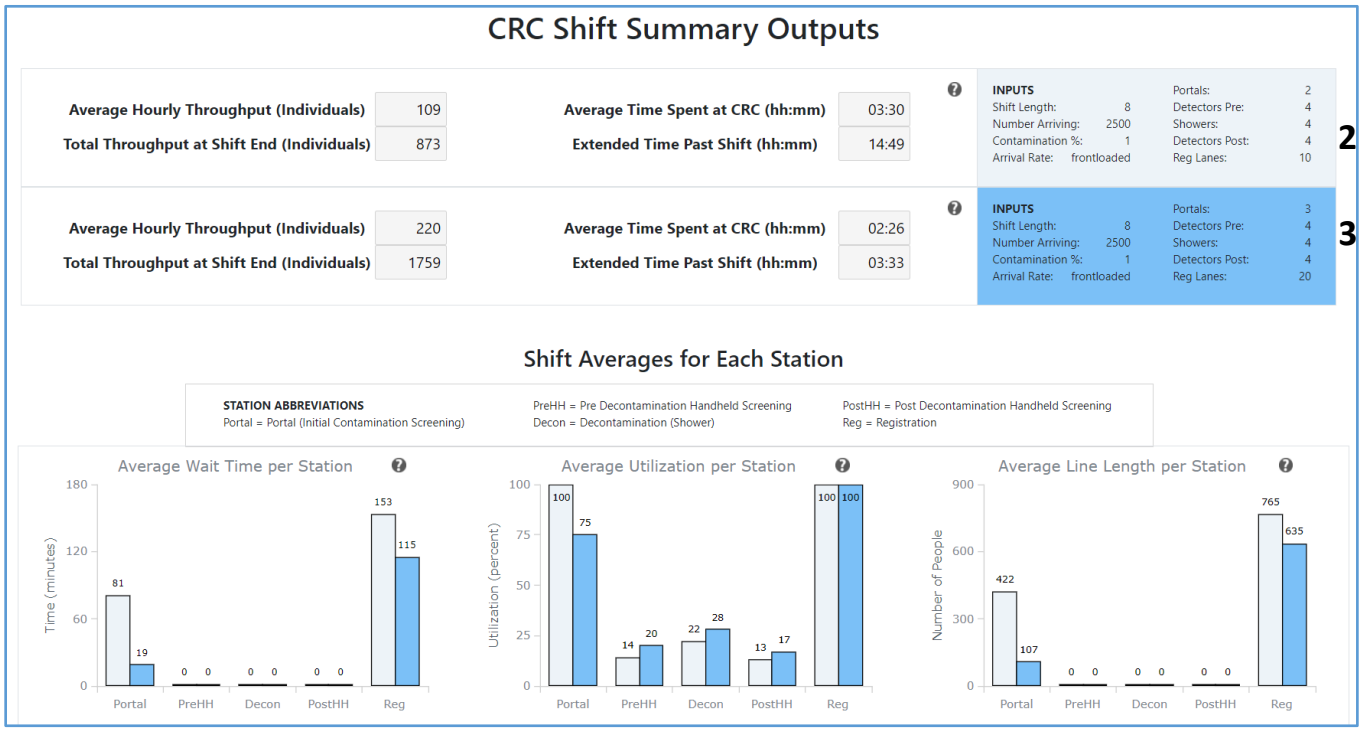
The Hourly Output Screen for Contamination Screening Line Length from the "Uniform" arrival distribution is presented with the "Front-Loaded" arrival distribution we chose for this scenario. "Uniform" arrival is shown with the solid line and "Front-Loaded" is shown with the dashed line. We see that the **Contamination Screening** station quickly has large lines from the initial surge and continues to have large lines until the shift end. The reason this did not happen in the "Uniform" scenario is because individuals were arriving at a rate that allowed lines to slowly develop versus the initial line and bottleneck that occurs with a "Front-Loaded" arrival.
As our CRC setup currently stands, we will not be able to handle the initial surge of arriving individuals.

Suggested Actions

We know that due to the initial surge in individuals arriving at the CRC, **Contamination Screening** becomes the main bottleneck. From Scenario 2, we also know that **Registration** tends to be a bottleneck. We will attempt to alleviate both bottlenecks with additional CRC SimPLER Estimates.

CRC Estimate with the addition of 1 portal monitor and 10 registration lanes

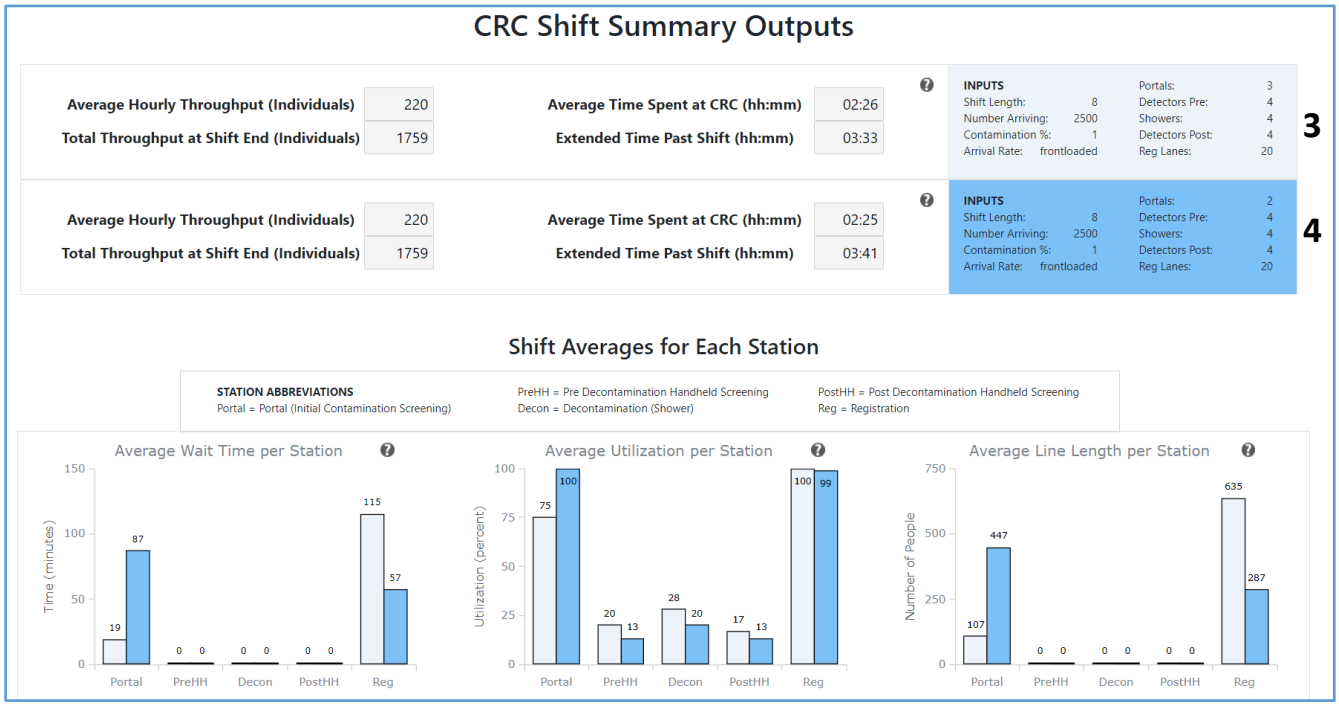
First, we will try a similar setup that alleviated our bottlenecks in Scenario 2, but we will keep staff at Pre- and Post-Decon. Additional staff will be provided for Registration and the portal monitor. We have 3 portal monitors, 8 handheld detectors, 4 showers, and 20 lanes of registration. The original estimate for this scenario is shown in the lighter colored bars and labeled 2. The new estimate is shown in the darker colored bars on the right and labeled 3.



By increasing the available lanes from 10 to 20 and adding one portal monitor at Contamination Screening, we have increased our Total Throughput at Shift End to 1689 individuals which is a 91% increase from our original CRC set up. The Average Time Spent at the CRC by an individual has been reduced by an hour and is now a little more than 2 hours. We now only need to stay open an additional 4 hours to finish processing individuals as opposed to the 15 hours. Registration is still a bottleneck at the Average Line Length is almost 600 individuals and Average Wait Time of almost 2 hours. Since Contamination Screening is the first station in the CRC, alleviating the bottleneck will allow more individuals to flow into Registration, which creates another bottleneck. We want to make sure we do not have too many individuals waiting at Registration such that we have more than the 500 allowed in our Registration space. In the next CRC SimPLER estimate, we will see how only adding additional lanes of registration may impact our CRC throughput.

CRC Estimate with the addition of only 10 registration lanes

Even though we added 10 lanes of registration, by adding the additional portal monitor to Contamination Screening, we saw minimal impact on the registration bottleneck and we are at our occupancy limits we had set for our registration room of 500 individuals. Let us look at how only increasing Registration lanes might affect our throughput. We have 2 portal monitors, 8 handheld detectors, 4 showers, and 20 lanes of registration. New CRC estimates for this set up are shown in the darker colored bar graphs on the right and labeled 4. The previous estimate for adding 1 portal monitor and 10 lanes of registration is shown in the lighter colored bars on the left and labeled 3.



With the addition of only Registration lanes, we did not alleviate the bottleneck at Contamination screening, but we did achieve almost the same overall CRC throughput results. The Extended Time Past Shift is almost 4 hours in each new CRC setup and the Total Throughput at Shift End is slightly better for the CRC setup with no additional portal monitor. This CRC SimPLER estimate allows us to see the impact if we were unable to attain an attritional portal monitor but still wanted to improve our CRC Setup to accommodate a large surge in arrivals. It is important to see the impacts that alleviating one bottleneck might have on the rest of the CRC process.

Each CRC setup has its benefits and bottlenecks. Planners can use CRC SimPLER to visualize and decide which outcome is best for adapting their CRC plans. Looking at different CRC setups is important to determine which setup might be best for the scenario and location of the CRC.