Note: This analysis will be placed in chapter 13 of the SAR. It also partially addresses draft RAI question 13-15.

Analysis for Blockage of Fuel Channel Potential

The chance for a foreign object or debris (FOD) to be dropped into the reactor tank is low but not zero. Working around the reactor tank while the reactor is operating is minimized in order to minimize worker dose and to minimize the risk of accidentally dropping FOD into the reactor tank. Should FOD be introduced into the reactor tank and it is observed by someone in the reactor room, the standard response is to SCRAM the reactor so the object can be retrieved.

Should the FOB land on top of the core structure while the reactor is operating, but is not noticed by anyone in the reactor room or the operator in the control room, the chance of core damage due to blockage of cooling channels is remote. Cross-flow between individual fuel coolant channels is very likely to be sufficient to prevent excessive heating of fuel elements should a small object come to rest on top of the core (causing a localized blockage of outlet cooling water) or drawn up next to the bottom grid plate (causing a localized blockage of inlet cooling water).

If a large piece of FOD were to land unnoticed on the top of the core structure or drawn up next to the bottom grid plate from underneath the core while the reactor was operating resulting the blockage of several cooling channels, the rise in temperature of several fuel elements would result in the addition of enough negative reactivity to be observed by the reactor operator (e.g. the regulatory rod would inexplicably start driving out to compensate). The standard response to this scenario would be for the operator to SCRAM the reactor as it would appear that the regulatory rod was malfunctioning.

The reactor core is inspected every 4 hours during operation and before and after every startup or shutdown, making the long term blockage of cooling channel from above the core not possible. Furthermore, due to the natural convection nature of the MNRC TRIGA reactor core there is likely not sufficient hydraulic force can cause a significant blockage of the inlet cooling water from below the core.