VERMONT
AGENCY OF TRANSPORTATION

FACT SHEET

2018 Research Symposium & STIC Annual Meeting

HIVE Implementation

INNOVATION TITLE
HIVE Implementation

STUDY TIMELINE
March 2018 – June 2018

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MORE INFORMATION
POSTER

RELATED PAPER submitted to 2019 Transportation Research Board Annual Meeting.

This fact sheet was prepared for the 2018 VTrans Research and Innovation Symposium & STIC Annual Meeting held at the State House in Montpelier, VT, on **September 12, 2018** from **8:00 am– 1:00 pm**.

Fact sheets can be found for additional projects featured at the 2018 Symposium at http://vtrans.vermont.gov/planning/research/2018symposium

Additional information about the **VTrans Research Program** can be found at http://vtrans.vermont.gov/planning/research

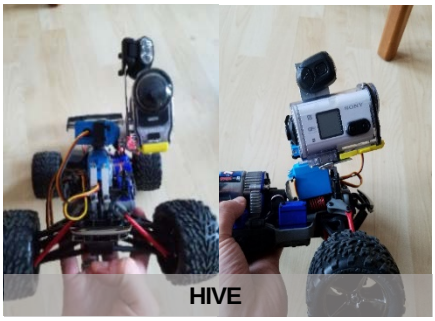
Additional information about the **VTrans STIC Program** can be found at http://vtrans.vermont.gov/boards-councils/stic

Introduction


Failed Culvert

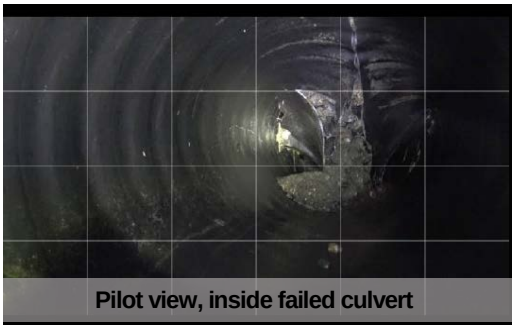
The Vermont Agency of Transportation owns 48,581 small culverts. Each year culvert failures occur which can result in unplanned roadway closures which are costly to both the Agency and its customers. The Agency has recognized the risk this population of culverts pose and recognized the need to collect more accurate information on culvert condition to improve decision making. Commercially available enhanced culvert inspection equipment is typically expensive, time consuming to use, and cost prohibitive when considered for use at the network level. The Implementation of the HIVE, a robotic inspection tool initially developed by the Minnesota DOT, was a pilot project to determine if the HIVE balanced the benefits of enhanced culvert inspection with the demand on resources such as time and money.

Action Taken


HIVE

To demonstrate the use of HIVE for small culvert inspections in Vermont, a subset of 141 culverts representing 4,153 Interstate cross culverts were selected. The 141 culverts are the highest risk culverts which are cross pipes that are greater than 30" in diameter, have less than 10' of fill over top of them, and have a combination of poor, critical, or unknown conditions. One inspection team was able to demonstrate the use of the HIVE on the 141 culverts in a three-week period in June 2018.

Conclusions


Pilot view, inside failed culvert

The HIVE is a great inexpensive tool that we can use to get video images of 80-90% of our network. For the last 10-20% of the culverts we can use an expensive video crawler. Given the lower HIVE cost, it is bound to have limitations since it was not made for commercial applications. However all video inspection crawlers can get stuck, and our Agency would prefer to lose an $800 video inspection tool than an $80,000 video inspection tool. The lower risk aspect of the HIVE is attractive.

Potential Impacts and VTrans Benefits

The technology has the capacity to have multiple uses. It can be leveraged by Operations staff as part of the annual culvert inspection program, by Hydraulics to support data collection, Asset Management to validate pre-candidate lists, and by Design to determine treatment recommendations and support the Engineers' Estimate. If leveraged appropriately it will help to prioritize funding appropriated for drainage improvements with the hope of reducing the number of emergent needs each year.