



**Washington State
Department of Transportation**

2024 Graffiti Proviso

Graffiti Abatement And Reduction Pilot Program

Dec. 1, 2024

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PROVISO OVERVIEW

Substitute House Bill 1989 established a graffiti abatement and reduction pilot proviso program. The goal of the proviso was to evaluate the effectiveness of technology that identifies people who damage property with graffiti and to evaluate spray drone technology and other techniques for removing graffiti.

GRAFFITI TAGGER DETECTION

INTRODUCTION

This report was created to fulfill the terms of a legislative proviso passed during the 2024 Washington State Legislative session as part of [Substitute House Bill 1989](#). The proviso directed WSDOT's Transportation Operations program to evaluate current technologies for detecting graffiti taggers and notifying Traffic Management Centers.

WSDOT is divided into six regions, each containing a TMC. These centers primarily ensure safe and efficient travel on the state highway system, relying on tools such as closed-circuit television cameras (about 1,500 statewide) to monitor conditions and verify incidents. While these cameras are intended for traffic management, they can assist the Washington State Patrol with investigations, including graffiti cases. For instance, on August 12, 2024, the Vancouver-area TMC provided photographic evidence for a WSP graffiti case.

Before the proviso, identifying individuals damaging WSDOT property with graffiti relied on informal methods, such as phone calls, WSP requests and TMC personnel observations during traffic management duties. Graffiti removal costs approximately \$3,000 per tag, and WSDOT spends \$500,000 to \$1 million annually on removal efforts, which are limited by available time and resources. Despite the financial burden graffiti imposes on the state, WSDOT lacked the technology to detect taggers automatically. Beyond the costs, graffiti removal and enforcement take critical public safety efforts away from WSP and WSDOT maintenance workers and expose them to safety risks while working near high-speed traffic.

The proviso allocated \$1 million, effective July 1, 2024, and prioritized testing detection systems on Interstate 5 between Tacoma and Seattle and the North Spokane Corridor. This report documents WSDOT's efforts to meet the requirements, with the final report due on December 1, 2024.

BACKGROUND

In alignment with the proviso, locations were chosen in Tacoma and Spokane. The Tacoma site is located on I-5 immediately southwest of the I-705 interchange. This location was chosen because of its significant amount of graffiti on the sound walls and retaining walls around I-5, the infrastructure available to mount graffiti detection devices and the adequate line of site needed from the mounting locations to the graffiti. The Spokane locations included two sites: the southbound North Spokane Corridor on-ramp from Freya Street and the eastbound I-90 on-ramp from Hamilton Street. The North Spokane Corridor/Freya site contained graffiti, adequate site lines and was a priority location per the proviso. Although the I-90/Hamilton site was not on the North Spokane Corridor, it contained a significant amount of graffiti, had adequate sight lines and is near the future location of the North Spokane Corridor/I-90 interchange.

Once the systems were mounted, the devices would contact the TMC when a graffiti tagger was detected. The TMC visually checked the cameras to ensure the detection was accurate and then contacted WSP. To streamline data captures, WSP added a new Computer Automated Dispatch code and WSDOT added a new "event type" in the TMC documentation database for graffiti taggers. WSP was briefed on the proviso, because WSDOT anticipated a higher rate of tagger notifications being sent to WSP.

WSDOT identified five vendors with the necessary technology to develop a graffiti tagger notification system. Four of these vendors agreed to participate in the pilot program. The selection process did not favor any particular company; WSDOT was open to partnering with any vendor that met the proviso requirements. Due to time constraints, a formal request for proposal process could not be conducted.

Table 1 and Table 2 below list the vendors and testing dates for the proviso program.

Table 1. Spokane vendor participation

Spokane, WA				
Vendor	Site location	Date of install	Calibration	Pilot data collection
AIWaysion	I-90 eastbound on-ramp from SR290 (Hamilton Street)	09/19	09/19 - 10/08	10/09 - 10/15
Omnisight	I-90 eastbound on-ramp from SR290 (Hamilton Street)	09/26	09/26 - 10/08	10/09 - 10/15
Navtech	North Spokane Corridor southbound on-ramp from Freya Street	10/03	10/03 - 10/9	10/10 - 10/15

Figure 1. Spokane's AIWaysion and Omnisight installation location & tagger watch area



Figure 2. Spokane's Navtech installation location & tagger watch area



Table 2. Tacoma vendor participation

Tacoma, WA				
Vendor	Site location	Date of install	Calibration	Pilot data collection
AIWaysion	I-5 collector distributor northbound to City Center	09/18	09/19 – 10/08	10/09 – 11/05
Omnisight	I-5 collector distributor northbound to City Center	09/25	09/26 – 10/08	10/09 – 10/15
Navtech	I-5 southbound on-ramp from City Center/Pacific Ave./ SR 7	10/01	10/01 – 10/09	10/10 – 10/15
Aquiline Drones	I-5 northbound/SR16 westbound on-ramp from 38th Street	10/03	10/01 – 10/08	10/09 – 10/15

Figure 3. Tacoma's Aquiline Drones installation location & tagger watch area



Figure 4. Tacoma's Navtech installation location & tagger watch area



Figure 5. Tacoma's AIWaysion installation location & tagger watch area



Figure 6. Tacoma's Omnisight installation location & tagger watch area



USE OF FUNDING

Below is an outline on how the budget was allocated to date*. We will continue evaluating the systems and plan to spend the rest of the budget as the project continues.

- Vendors' graffiti detection equipment and services: \$112,175
 - \$21,960 (AIWaysion)
 - \$12,500 (Omnisight)
 - \$47,715 (Navtech)
 - \$30,000 (Aquiline Drones)
- WSDOT labor (researching, installing, etc.): \$10,325
 - 320.5 hours
- Total: \$122,500
 - * Participating vendors provided discounts as part of this pilot. These numbers are not necessarily reflective of contractor prices.

DETECTION FUNCTIONALITY

The four participating vendors use cameras and/or radar to detect graffiti taggers. They also use their own hardware devices (cameras and radar) for detection. The vendors then used their own software to determine if an object detected was a graffiti tagger. In most cases, the software for these systems used artificial intelligence/machine learning components to recognize a graffiti tagger. The systems then sent a notification to the TMC via email or text.

DETECTION RESULTS

The results of the program are indicated in the tables below. A tagger event is when at least one person damages WSDOT property with graffiti within one continuous time-period.

Figure 7. Combined tagger event detection results

	All tagger event detection (all vendors at all sites)				
Data collection:	Data through Oct. 15, 2024				
Site location:	All				
	# of notifications	# of correct notifications	% correct notifications	# of missed tagger events	% tagger events notified
	3	3	100%	2	60%
	Enforcement/WSP				
	# tagger events caught	% tagger events caught			
	1	33%			

Figure 8. Tagger event detection results by location and vendor

AIWaysion tagger detection - Spokane				
# of notifications	# of correct notifications	% correct notifications	# of missed tagger events	% tagger events notified
0	0	N/A	0	N/A
Enforcement/WSP				
# tagger events caught	% tagger events caught			
N/A	N/A			

AIWaysion tagger detection - Tacoma				
# of notifications	# of correct notifications	% correct notifications	# of missed tagger events	% tagger events notified
3	3	100%	2	60%
Enforcement/WSP				
# tagger events caught	% tagger events caught			
1	33%			

Figure 8a. AIWaysion device installed



Figure 8b. AIWaysion identification

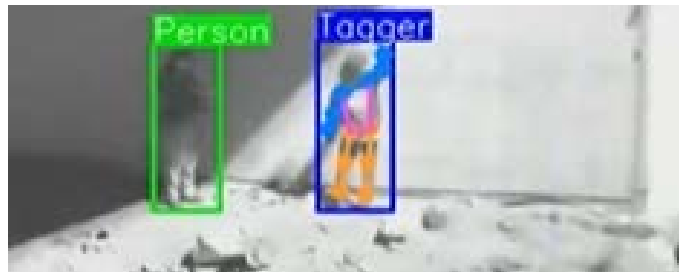


Figure 8c. AIWaysion confidence score



Since AIWaysion provided a positively identified tagger and an arrest, some additional information was included. Figure 8a shows the AIWaysion device installed in Tacoma. Figure 8b shows the system identifying a person and a tagger. Figure 8c shows the confidence score associated with the identifications of taggers. Note Figure 8b and 8c occurred during the calibration phase and are not any of the tagger events recorded in the table above.

Figure 8. Tagger event detection results by location and vendor (continued)

Omnisight tagger detection - Spokane				
# of notifications	# of correct notifications	% correct notifications	# of missed tagger events	% tagger events notified
0	0	N/A	0	N/A
Enforcement/WSP				
# tagger events caught	% tagger events caught			
N/A	N/A			

Omnisight tagger detection - Tacoma				
# of notifications	# of correct notifications	% correct notifications	# of missed tagger events	% tagger events notified
0	0	N/A	0	N/A
Enforcement/WSP				
# tagger events caught	% tagger events caught			
N/A	N/A			

Navtech tagger detection - Spokane				
# of notifications	# of correct notifications	% correct notifications	# of missed tagger events	% tagger events notified
0	0	N/A	0	N/A
Enforcement/WSP				
# tagger events caught	% tagger events caught			
N/A	N/A			

Navtech tagger detection - Tacoma				
# of notifications	# of correct notifications	% correct notifications	# of missed tagger events	% tagger events notified
0	0	N/A	0	N/A
Enforcement/WSP				
# tagger events caught	% tagger events caught			
N/A	N/A			

Figure 8. Tagger event detection results by location and vendor (continued)

Aquiline Drones tagger detection – Tacoma				
# of notifications	# of correct notifications	% correct notifications	# of missed tagger events	% tagger events notified
0	0	N/A	0	N/A
Enforcement/WSP				
# tagger events caught	% tagger events caught			
N/A	N/A			

RECOMMENDATIONS & DISCUSSION

Although the number of opportunities to detect taggers in this pilot was low due to the quick turnaround, the proviso provided evidence that the technology exists to detect graffiti taggers in real time and that the TMC can pass the notification onto the WSP for enforcement. This is evident from one of the vendors notifying the Tacoma area TMC about three tagger events (out of five) and resulted in one arrest. It was determined that one of the missed tagger events was on the edge of the detection zone and the lighting was poor, which hampered the identification. The machine learning aspects used in the system of this vendor is expected to improve the detection rate over time.

This project was limited based on the five-month turnaround. This prevented the use of a formal request for proposal, which possibly could have allowed additional vendors to participate in the pilot program. The quick turnaround also resulted in a small sample of opportunities to test the systems. **However, WSDOT will continue to collect data for several months and is prepared to provide up-to-date graffiti tagger event results upon request.**

Challenges

There are several challenges to graffiti abatement and reduction in Washington state, including:

- Funding – WSDOT does not have programmed funding to purchase additional graffiti detection devices, especially considering the number of devices needed to prevent tagging on all its highway infrastructure. Without broad installation graffiti taggers could simply move their activities to another area.
- Staffing – WSP does not have the staffing necessary to consistently respond to graffiti tagging activities. This has been an issue with traditional graffiti notifications, as well as this proviso project. Troopers are either not in the vicinity of the tagger or are responding to a higher priority and are unable to divert. Overall graffiti tagger apprehension rates are low. Out of the three tagger events identified in this pilot, WSP did not have units to respond to one event and the taggers left the scene before WSP arrived in another event.
- Prosecuting – WSP has indicated graffiti tagger property crimes have a low rate of being prosecuted. This can affect law enforcement response prioritization on such calls. Placing graffiti on WSDOT property by law (RCW 9A.48.070 – 9A.48.090) is malicious mischief and ranges from a gross misdemeanor to a class B felony.

Potential additional benefits

Graffiti detection devices and systems tested during this pilot have the potential to benefit WSDOT operations in additional means. These include:

- Traffic studies (counts, volumes, classifications, pedestrian and bike counts)
- Traffic safety (wrong-way driving, near misses, incident detection, debris detection)
- Truck parking
- Wild-life detection

Other methods

The graffiti detection proviso only looked at camera and radar technology to detect taggers. Other methods of discouraging graffiti activity include:

- Sprinklers – The use of a sprinkler system that activates when a tagger is detected, causing the tagger and/or the wall to become wet. This could deter the tagger and make the wall more difficult to paint.
- Vegetation – The use of plants or obstructions to deter taggers making it more difficult to reach the wall.

CONCLUSION

WSDOT tested four vendor graffiti detection systems in support of this proviso. Areas with a significant amount of graffiti activity were chosen in Spokane and Tacoma, with the North Spokane Corridor and I-5 being prioritized per the proviso. The pilot showed evidence the technology exists to detect taggers in real time and its ability to alert the TMC who can verify the notification and pass it onto WSP for enforcement, but issues such as funding and WSP staffing levels remain.

GRAFFITI REMOVAL - DRONE AND TRADITIONAL METHODS

INTRODUCTION

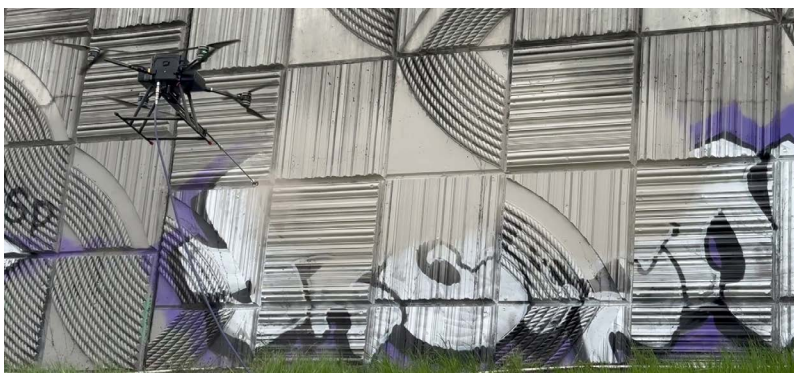
The legislative proviso requested WSDOT’s Maintenance team test different methods of graffiti removal. This was accomplished by field-testing spray drone technology for the purpose of graffiti removal/painting over graffiti as well as testing traditional graffiti removal methods.

The pilot program determined that the use of drones to remove graffiti is preferable in areas that pose a safety risk (tall heights, steep slopes, etc.) and areas where specialized equipment such as under bridge bucket trucks, would be required. However, the program used a tethered drone, which was determined to not be successful in locations where the tether could get caught, such as above a billboard. The drone used during the pilot was powered by batteries and a tether to pump the paint from the ground to the drone. WSDOT is actively working with the supplier of the drone to develop a self-contained unit that holds 1-2 gallons of paint and does not require a tether. This option would allow an untethered drone to reach difficult places without concerns of the tether getting caught.

The drone was purchased and tested shortly before the proviso program was implemented using \$86,000 in research grant funding. However, the proviso provided funding for the following:

- Training – Four full days of training for two pilots on graffiti drone operations. Both are now certified to operate the drone on WSDOT right of way without supervision.
- Graffiti mitigation operations – Removal of graffiti in the greater Tacoma area. Removal operations occurred on a wall on northbound I-5, north of 38th Street and on bridge girders and abutments under southbound I-5 near M Street. WSDOT also tested the drone, using other funding methods, in numerous locations. These included the eastbound Tacoma Narrows Bridge wall and the cable stay bridge girder on northbound SR 509.
- Equipment added to existing drone aircraft included:
 1. Commercial grade high volume/ low pressure airless paint sprayer
 2. High output 220-volt Clear Cine generator
 3. Single axle trailer for mobile graffiti operations
- Supplies and parts for future operations
 1. Paint
 2. Propellers

Figure 9. Drone painting over graffiti



USE OF FUNDING

Per SHB 1989, the Maintenance Operations program performed field testing of spray drone technology to determine if it was more efficient in painting over existing graffiti along state highway right of way. The drone program has spent \$22,000 to date and will continue testing and improving the drone equipment through June 2025 bringing the total cost for the proviso drone pilot program to \$60,000.

The remaining portion of the SHB 1989 graffiti removal funding was directed to graffiti removal efforts on the I-5 Puget Sound region from Tacoma to Seattle and the North Spokane Corridor using a traditional method of manually painting over graffiti. Funding for these efforts was allocated in the following manner:

- \$70,000 spent on I-5 between Tacoma and Seattle in the first three months of the proviso
- \$102,000 for maintenance operations on I-5 between Tacoma and Seattle to be spent before the end of June 2025

Figure 10. I-5 milepost 170 before/after traditional graffiti removal



- \$6,000 spent along the North Spokane Corridor in the first three months of the proviso
- \$70,000 will be spent along the North Spokane Corridor by June 2025

Table 3. Maintenance graffiti proviso expenditures

Expenditure:	To date:	Planned:
I-5 graffiti removal	\$69,640	\$102,447
North Spokane Corridor	\$6,870	\$70,000
Drone graffiti removal	\$21,543	\$59,500
Total:	\$98,053	\$231,947

RECOMMENDATIONS & DISCUSSION

The Maintenance Operations program recommends continuing the drone program, purchasing additional drones and providing training for drone pilots to perform this work.

There were several lessons learned from the drone program:

1. Changing the settings from forward looking to multi-directional collision avoidance greatly assisted with aircraft positioning awareness in GPS declined locations. This made the aircraft more stable and controlled.
2. Updating the preflight check list to require that the aircraft is in “Loiter” mode during all-paint operations was helpful. Also, using “Altitude Hold” mode disengaged the GPS causing a lack of special orientation. This led to a lack of directional control.
3. Adding a dual GPS receiver increased the ability to get a GPS lock in GPS declined locations.
4. Using recycled paint to cover graffiti caused clogging issues that required the aircraft to land to clear the clog. The drone performed better when the paint was upgraded to a mid-quality non-recycled paint.

The proviso also resulted in suggestions for future aircraft including:

1. The aircraft should have folding or retractable motor arms. The current configuration has removable arms and when the arms/motors are attached, it is difficult to transport the aircraft. There’s also an issue of wearing down the connections each time the drone is assembled and disassembled.
2. The entire aircraft should be coated with a hydrophobic coating. This helps with removing paint from the aircraft after each flight.
3. The system MUST meet all U.S. State Department criteria for “The Blue List.” This is a pre-approved list of systems for data collection regarding national security. Currently there are no Chinese manufacturers that meet the criteria.
4. The system should be equipped with a dual GPS receiver to increase pilot control of the drone while the drone is producing thrust from spraying paint.
5. The system should be equipped with a multi-directional collision avoidance system with adjustable ranging capabilities.
6. Tethered payloads should be removable and use a common spray tip that can be purchased at hardware store or paint supplier.
7. A self-contained non tethered payload option should be mandatory.

CONCLUSION

The drone program provides a very effective additional tool for graffiti removal in locations that mitigate the risk of employee injury due to the graffiti's precarious locations. It also provides a more cost-effective way to handle graffiti removal from locations where specialized equipment is required.

The use of drones to remove graffiti in dangerous and difficult locations is also a better use of resources. It takes less time to remove the graffiti with a drone compared to traditional methods, which deters "retagging." While drones are a cost-effective additional tool, graffiti removal is and will remain a challenge for the agency based on available funding, staffing and resources and the many other Maintenance Operations required duties such as guardrail and pothole replacement, storm response, etc. As a result, allocating resources to remove graffiti is challenging, even with the added benefits drones provide.

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