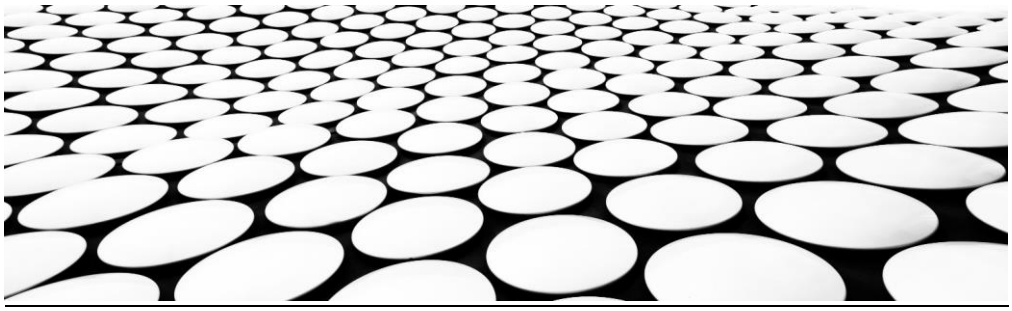
ProHawk Vision
Users Guide

ProHawk®

More Than Meets The Eye™



ProHawk®

Table of Contents

1 Introduction

ProHawk® Vision (Release 6.0.0)

The ProHawk® Vision Users Guide provides an overview for the ProHawk Vision Windows Application. We have tried to make this overview clear, easy to understand, and informative. We value the relationship that we have with our users and believe this guide will be valuable in expediting the setup.

ProHawk Vision receives video from a recorded file, live RTP/RTSP camera stream, or a Milestone XProtect VMS Server to improve. ProHawk Vision provides various preset and detailed enhancement parameters that can be changed by accessing the Windows User Interface. Automatic and One-Click filter preset radio buttons assist users in clarifying challenging visual conditions. ProHawk Vision advanced filters settings allow users to adjust the ProHawk parameters individually. These are specific adjustments that may have an impact on details to be revealed.

Once the video stream is selected, ProHawk Vision provides several options to view the original and/or improved picture or video: Improved; Original and improved picture or video side-by-side; Improved with original preview.

The current video frame or picture can be saved to the Windows clipboard and users Pictures\ProHawk folder on both video ProHawk improved and original stream types. The ProHawk Vision Windows Application provides media player controls for video control and record capabilities. This allows users to Play, Pause, Forward, Rewind, Stop, or Record the input video. The improved video can also be recorded to a file for future use.

This is the v6.0.0 release of ProHawk Vision.

2 System Requirements

Following are the systems requirements for ProHawk Vision to operate properly:

- 64-bit Multicore CPU
- 8GB RAM (16GB or more recommended)
- MS-Windows 7 or MS-Windows 10
- NVIDIA Quadro, Tesla, GRID, GeForce or RTX products with Kepler, Maxwell, Pascal, Turing, Volta or Ampere generation GPUs

ProHawk Vision includes and requires the following external libraries, which will automatically install:

- Microsoft Visual C++ 2015-2019 Redistributable (x64) runtime
- Microsoft .NET Framework 4.8 Redistributable
- NVIDIA CUDA 11.0
- OpenCV 4.4.0 – OpenCV 4.4.0 and lower versions are licensed under the 3-clause BSD license. See license information at https://opencv.org/license/
- FFMPEG - This software uses libraries of FFmpeg licensed under the LGPLv2.1

ProHawk Vision supports 64-bit (x64) architectures. ProHawk Vision does not support 32-bit (x86) architectures.

3 Directories & Files

There will be several directories created after extracting the ProHawk Vision installation. The application root folder is placed into the destination folder chosen during installation, typically your user account folder\ProHawk\Vision. If you selected the Sample Videos component to install, the sample videos will be placed into your user accounts Videos folder.

Listed below are the folders and their descriptions:

Folder	Description
Vision	A Vision folder containing ProHawk Vision and associated files.
Vision\docs	Documentation files: ProHawk Vision Users Guide.pdf and End User License Agreement.txt.
Vision\logo	Icon, image, and text files used by the ProHawk Vision.
{USERPROFILE}\Videos\original	A collection of sample unenhanced videos. The unenhanced videos are the direct untouched source video files without any enhancement from ProHawk Vision.
{USERPROFILE}\Videos\clarified	A collection of the same footage as the unenhanced (original) videos after they have been enhanced by ProHawk Vision.
ProHawk. InstantVisualClarity. Plugin	A folder containing the ProHawk Vision Milestone XProtect Smart Client Plugin and associated files and folders to run. This is typically located off the C:\Program Files\Milestone\XProtect Smart Client\MIPPlugins directory

4 ProHawk Vision Application

You can open and run ProHawk Vision by either *clicking* on the **desktop shortcut**, or the **start menu item**. (*Figure 1*)

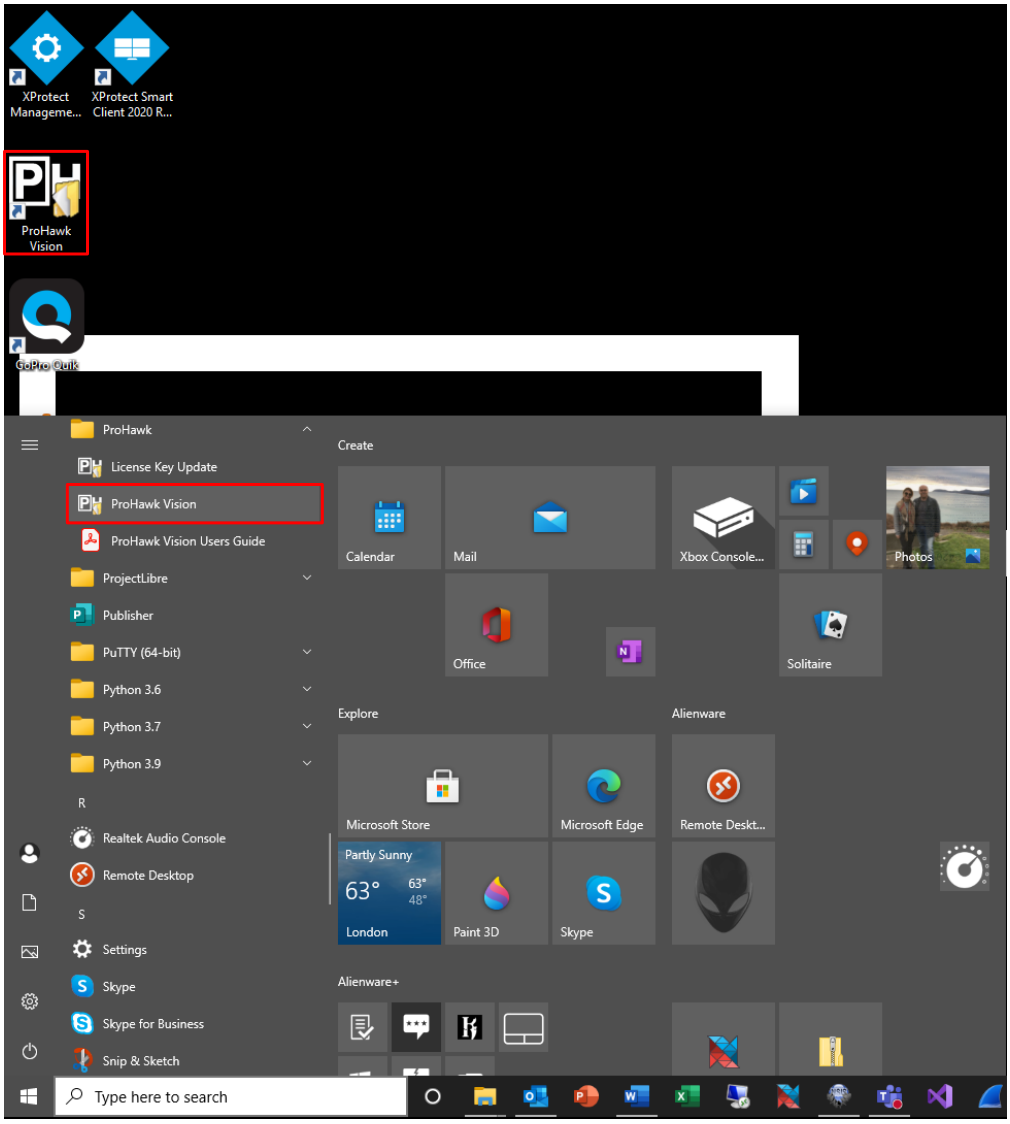


Figure 1

4.1 Media Menu

The **Media** menu provides four options to view live video streams or stored media files. The four **Media** menu options are:

- **Open File**
- **Open Milestone VMS Stream**
- **Open Network Stream**
- **Open Recording Folder**

Figure 2

This section of the ProHawk Vision Users Guide will describe the **Media** menu options above. (*Figure 2*)

4.1.1 **Open File**

To select a file to enhance in the application, *click* on the **Media** menu, then *click* on the **Open File** menu option to allow selection of the desired file. (*Figure 3*)

Figure 3

Select the file to enhance in the open file dialog box, then *click* on the **Open** button to load the desired file. (*Figure 4*)

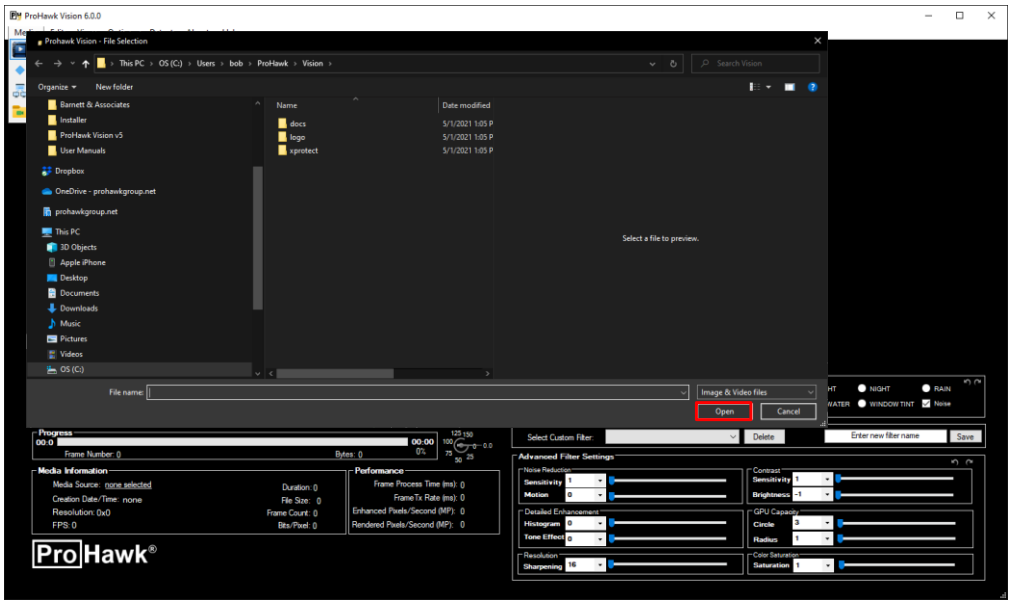


Figure 4

The file will load with a “File Preview loaded. Press Play to begin enhancement.” yellow message displayed in the lower left corner of the user interface. (*Figure 5*) *Click* on the **Play** button to begin ProHawk Vision enhancement on the file.

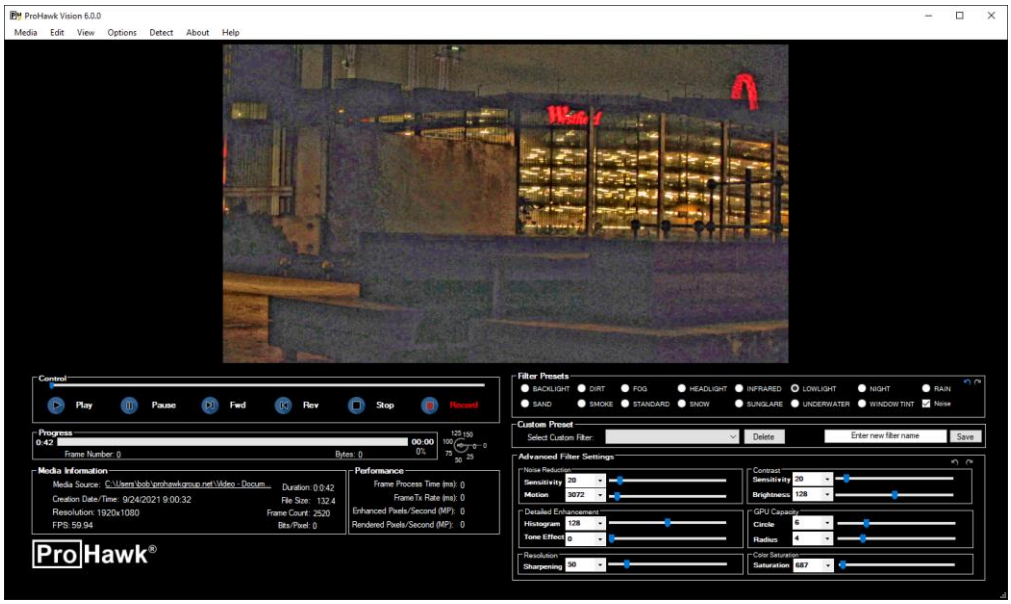


Figure 5

4.1.2 Open Milestone VMS Stream

To select a live Milestone XProtect VMS video stream to view in the application, *click* on the **Media** menu, then *click* on the on the **Open Milestone VMS Stream** menu option. (*Figure 6*)

Figure 6

This will open the **Open Media** dialog box on the **Milestone VMS** tab. *Select* the **Server address** from the dropdown list or *enter* the **Server address** of the Milestone XProtect VMS Server. (*Figure 7*)

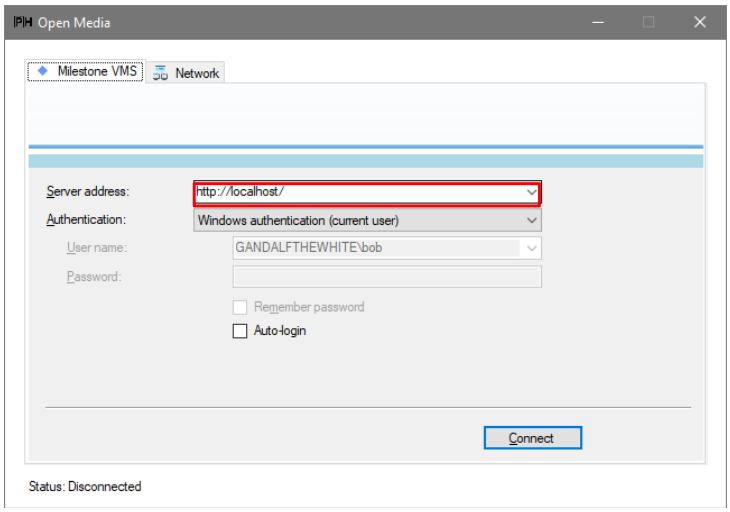


Figure 7

Next, *select* the **Authentication** method for accessing the Milestone XProtect VMS Server. (*Figure 8*) If you choose **Windows authentication (current user)** *click* on the **Connect** button to submit the security credentials to the Milestone XProtect VMS Server.

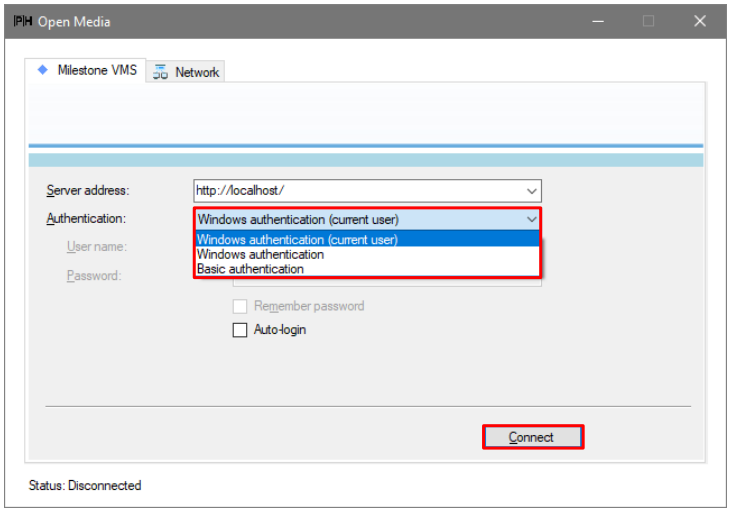


Figure 8

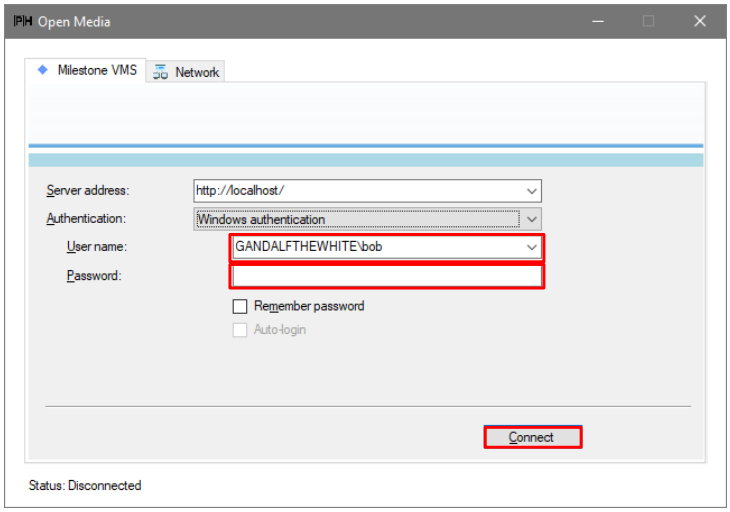


Figure 9

If you choose **Windows authentication** or **Basic authentication**, enter the **User name** and **Password** for your Milestone login credentials. Then *click* on the **Connect** button. (*Figure 9*)

4.1.3 Open Network Stream

To select a live video stream to view in the application, *click* on the **Media** menu, then *click* on the on the **Open Network Stream** option. (*Figure 10*)

Figure 10

The Network tab will be selected in the **Open Media** dialog box. In the Network Stream section, *enter* the **URL**, and if required, the **Username** and **Password** for the camera. Then *click* on the **Connect** button. (*Figure 11*)

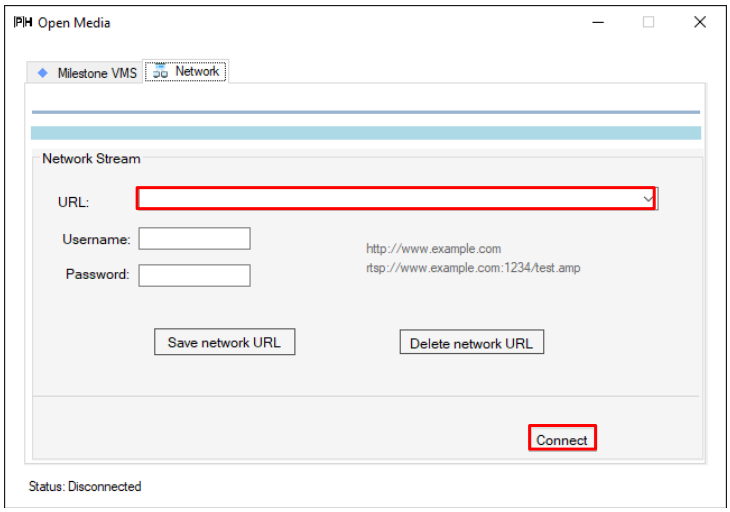


Figure 11

The camera URLs that have been entered can be saved or deleted through the **Save network URL** and **Delete network URL** buttons. Selecting the **Save network URL** button will add the currently entered **URL**, **Username**, and **Password** to the list. Selecting the **Delete Camera URL** button will delete the currently entered URL address from the address bar and the list. The list of saved URLs can be accessed and reselected by *clicking* on the **down arrow** at the right end of the address bar.

The camera live video stream will begin to play with ProHawk Vision restoration **On**. (*Figure 12*) *Click* on the **Play** button to begin ProHawk Vision enhancement on the file.

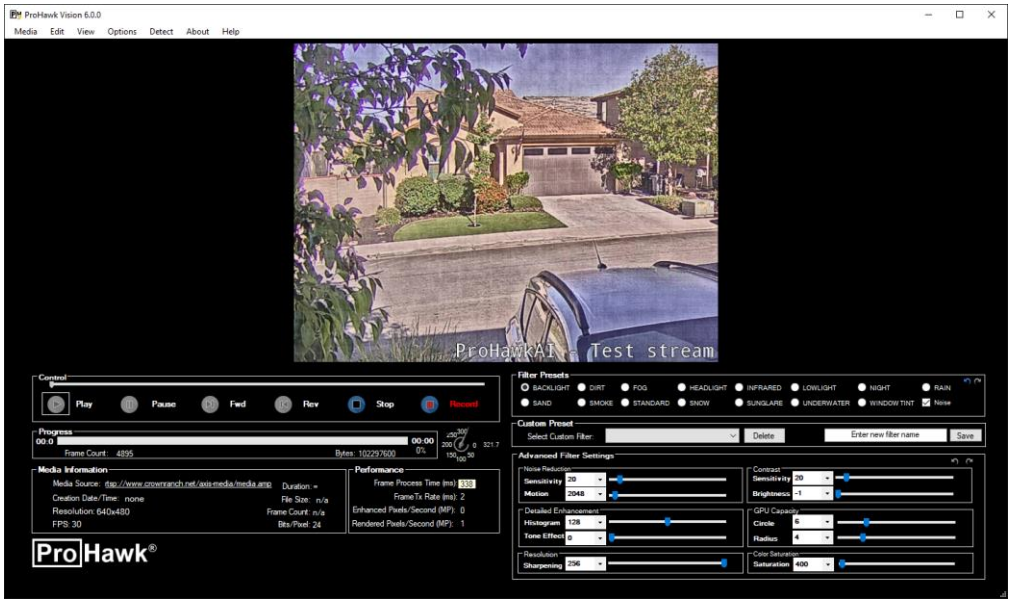


Figure 12

4.1.4 Open Recording Folder

To Open a previously recorded ProHawk Vision restored file, *click* on the **Media** menu, then *click* on the **Open Recording Folder** menu option to allow selection of the desired file. (*Figure 13*)

Figure 13

Double-click on the restored ProHawk Vision file in the file selection dialog box to load the desired file. (*Figure 14*)

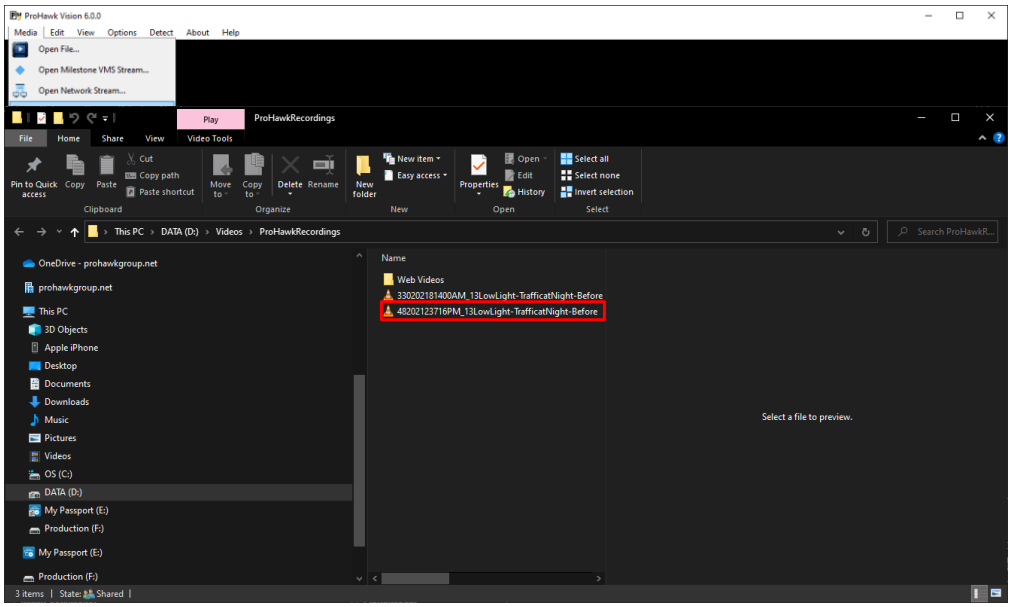


Figure 14

4.2 Edit Menu

The **Edit** menu allows you to copy the current video frame or picture to the Windows clipboard and users Pictures\ProHawk folder on both video ProHawk enhanced and original stream types. *Click* on the **Edit** menu, **Original** or **ProHawk** menu options to copy the current original or ProHawk restored video frame as an image file. (*Figure 15*)

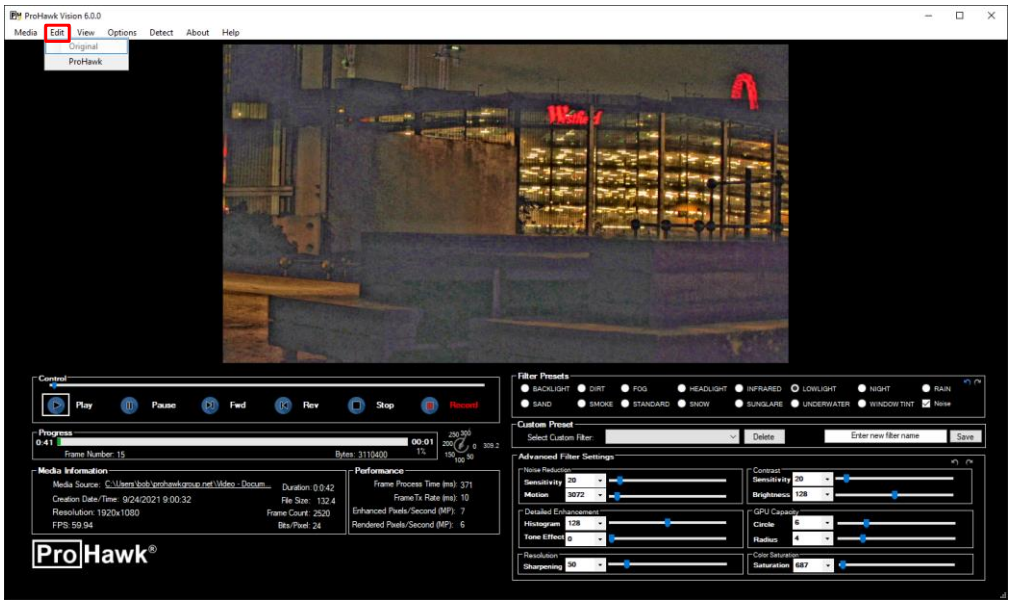


Figure 15

Original – Saves the displayed source image to the user clipboard and Pictures\ProHawk folder.

ProHawk – Saves the displayed enhanced image to the user clipboard and Pictures\ProHawk folder.

This section of the ProHawk Vision Users Guide will describe the **Edit** menu options above. (*Figure 15*)

4.3 View Menu

ProHawk Vision provides several viewing options accessible through the **View** menu (*Figure 16*). The available **View** menu options and their default View options settings are:

- **Advanced Filter Settings – Off**
- **Expert Filter Settings**
- **Enhanced View - On**
- **Side-by-Side View - Off**
- **External Enhanced View - Off**
- **Unenhanced External View – Off**

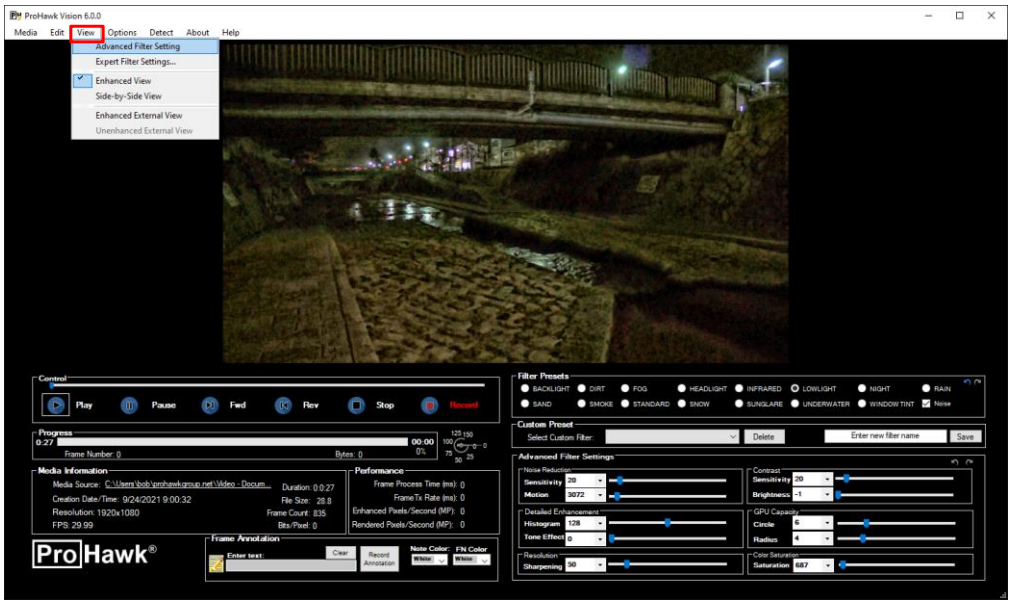


Figure 16

This section of the ProHawk Vision Users Guide will describe the **View** menu options above. (*Figure 33*)

4.3.1 Advanced Filter Settings

ProHawk Vision **Advanced Filters Settings** allows user to adjust the ProHawk parameters individually. To display and access the Advanced Filter Settings, *click* on the **View** menu, then *click* on the **Advanced Filter Settings** menu option (*Figure 17*).

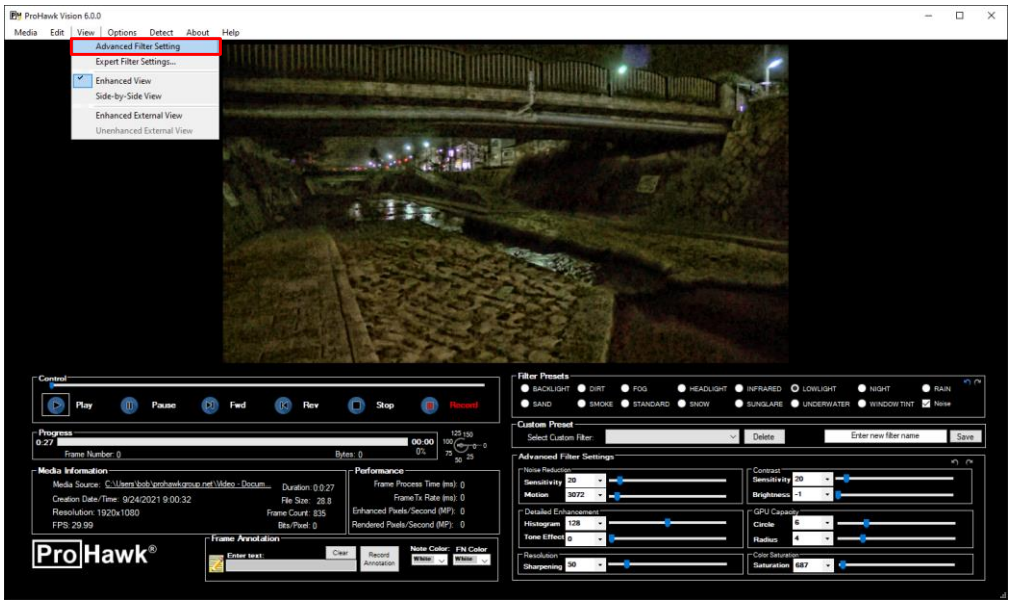


Figure 17

The **Advanced Filter Settings** section will be displayed that contains specific adjustments that may have an impact on details to be revealed. (*Figure 18*) Many times, when looking for specific details in compromised imagery or video, these parameters can be individually adjusted to achieve hidden details. The **Advanced Filter Settings** section contains these grouping and parameter adjustments:

- **Noise Reduction**
  - **Sensitivity**
  - **Motion**
- **Detailed Enhancement**
  - **Histogram**
  - **Tone Effect**
- **Resolution**
  - **Sharpening**
- **Contrast**
  - **Sensitivity**
  - **Brightness**
- **GPU Capacity**
  - **Circle**
  - **Radius**
- **Color Saturation**
  - **Saturation**

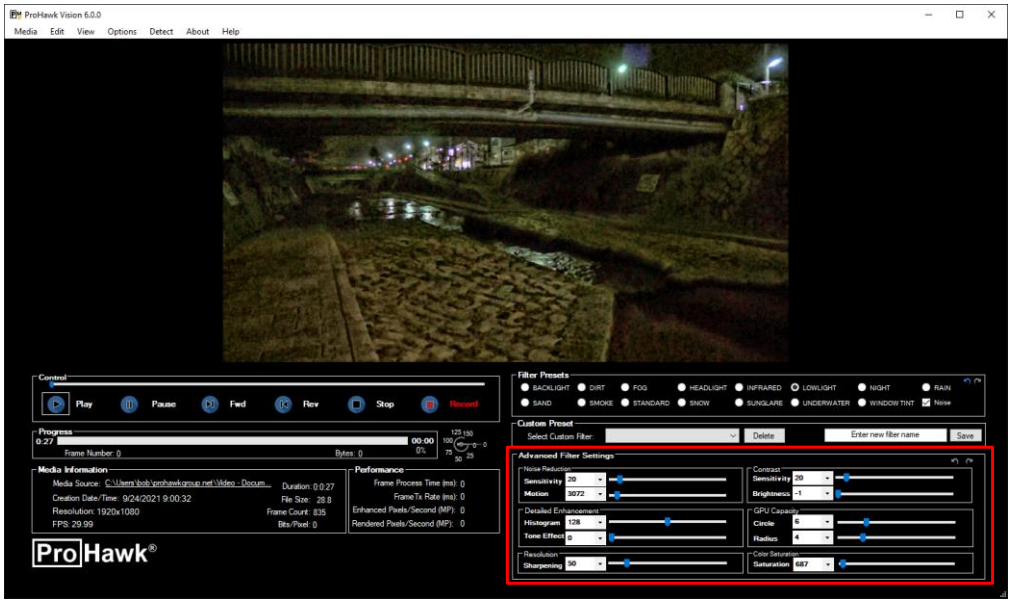


Figure 18

4.3.2 Expert Filter Settings

ProHawk Vision **Expert Filters Settings** allows user to adjust the ProHawk detailed parameters individually. To display and access the **Expert Filter Settings**, *click* on the **View** menu, then *click* on the **Expert Filter Settings** menu option. (*Figure 19*)

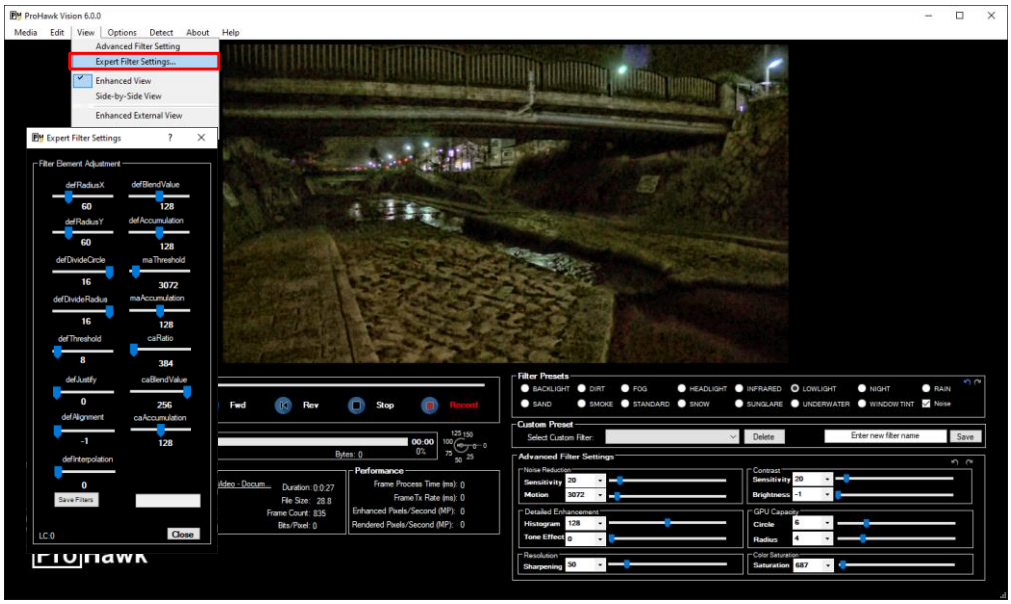


Figure 19

4.3.3 Enhanced View

The **View** menu **Enhanced View** menu option is turned **On** by default. (*Figure 20*) The **Enhanced View** menu option toggles the ProHawk Vision restoration filter **On** and **Off**. When the **Enhanced View** menu option is selected, it will toggle the **Enhanced View** menu option **Off**.

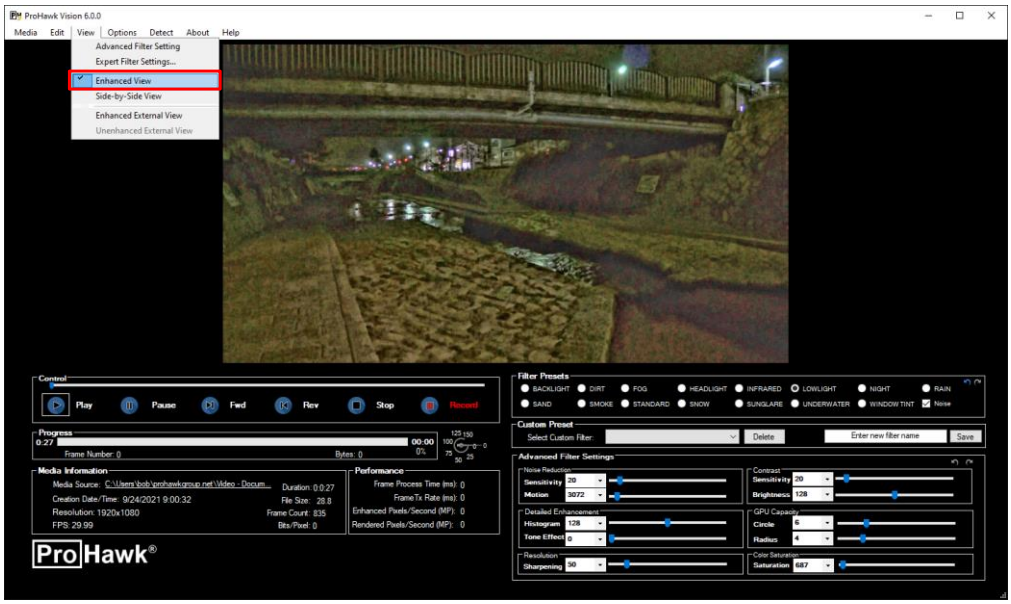


Figure 20

4.3.4 **Side-by-Side View**

Once the video stream is selected, ProHawk Vision will simultaneously display both the original (source) stream on the left and the restored (enhanced) stream on the right. The example below shows how the user interface displays the imagery side-by-side. (*Figure 21*)

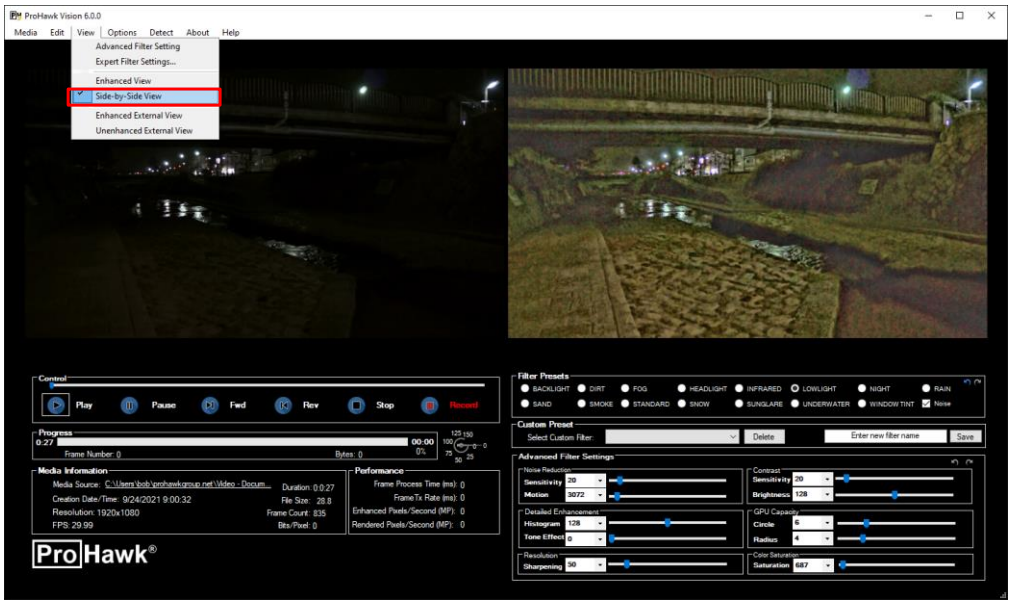


Figure 21

4.3.5 Enhanced External View

ProHawk Vision provides the **Enhanced External View, View** menu option, to open a separate window with only that ProHawk Vision enhanced imagery displayed. *Click* on the **Enhanced External View, View** menu option. This will allow you to view a ProHawk Vision enhanced video stream in full screen mode. (*Figure 22)*

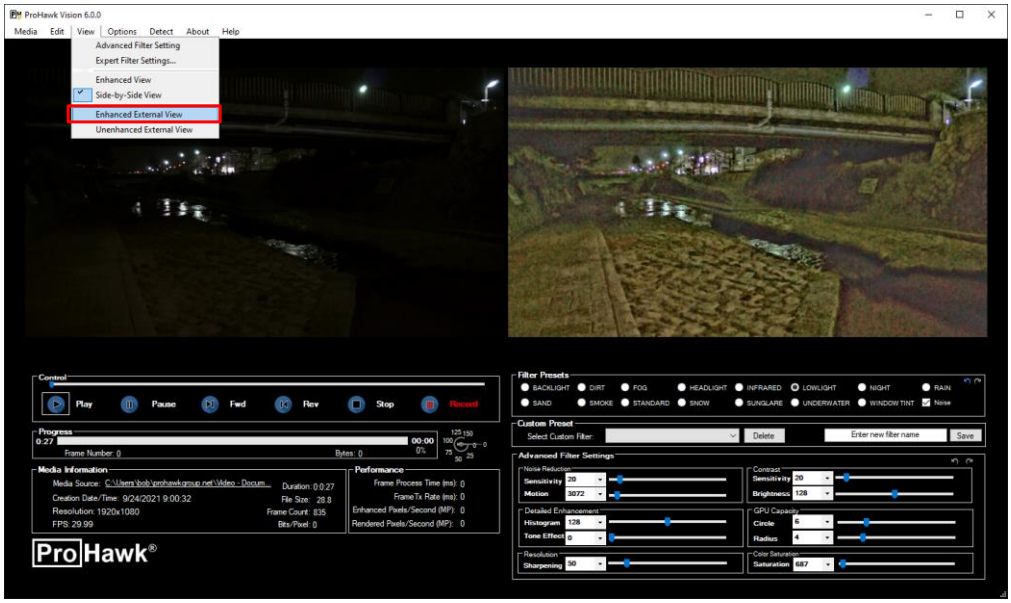


Figure 22

ProHawk Vision opens the **Enhanced External View** separate window with only the ProHawk Vision enhanced live video stream being displayed. (*Figure 23*)

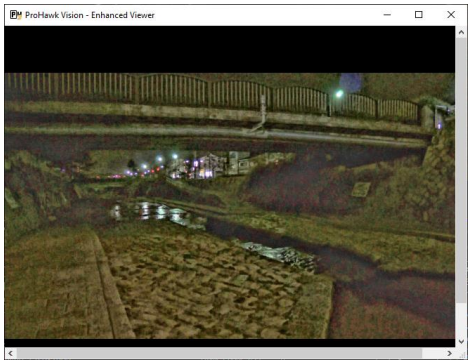


Figure 23

4.3.6 Unenhanced External View

ProHawk Vision provides the **Unenhanced External View, View** menu option, to open a separate window with only that original imagery displayed. *Click* on the **Unenhanced External View, View** menu option. This will allow you to view a ProHawk Vision original video stream in full screen mode. (*Figure 24)*

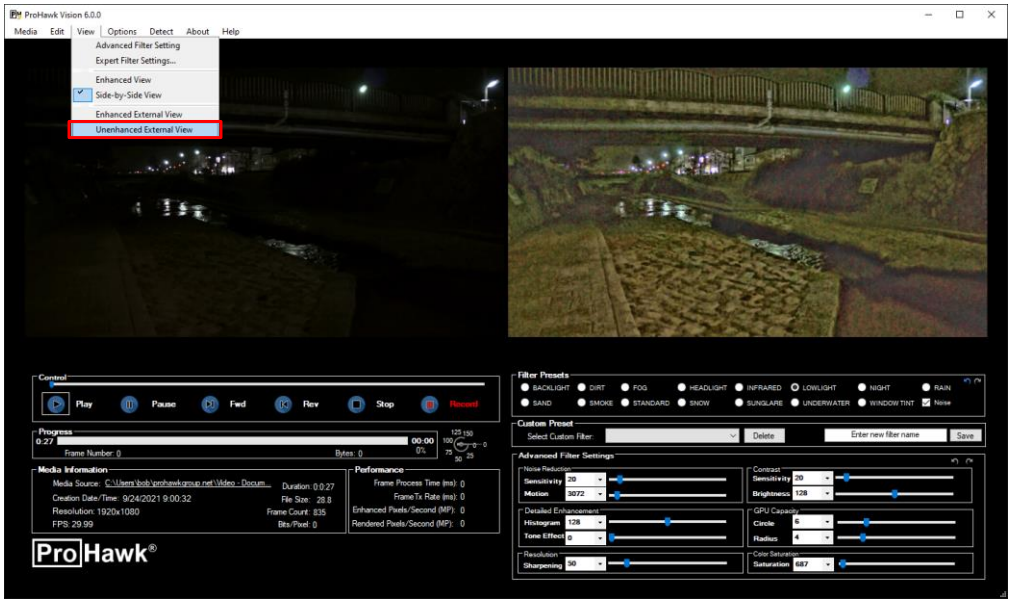


Figure 24

ProHawk Vision opens the **Unenhanced External View** separate window with only the original live video stream being displayed. (*Figure 25*)

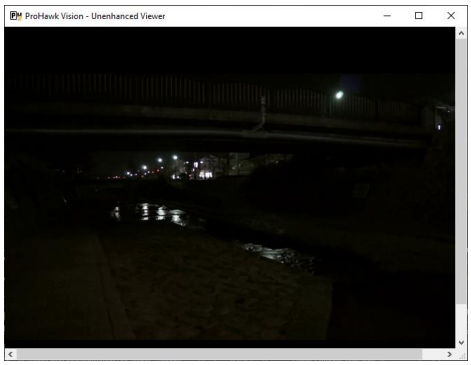


Figure 25

4.4 Options Menu

ProHawk Vision provides an **Options** menu to control enhancement, recording, voice commands, and default folders. The **Options** menu options and their default Options settings are:

- **Disable Enhancement** – **Enable/**Disable
- **Enable 2X Enhancement** – **Disable/**Enable
- **Auto Filter** - **Enable/**Disable
- **Region of Interest – Zoom – 1**-5
- **Create Side-by-Side View** – On/**Off**
- **Audio Re-mux** – **Enable/**Disable
- **Enable Frame Annotation** – **Disable/**Enable
- **Enable Voice Commands** - **Disable/**Enable
- **Set Default Image Source Directory** – Desktop

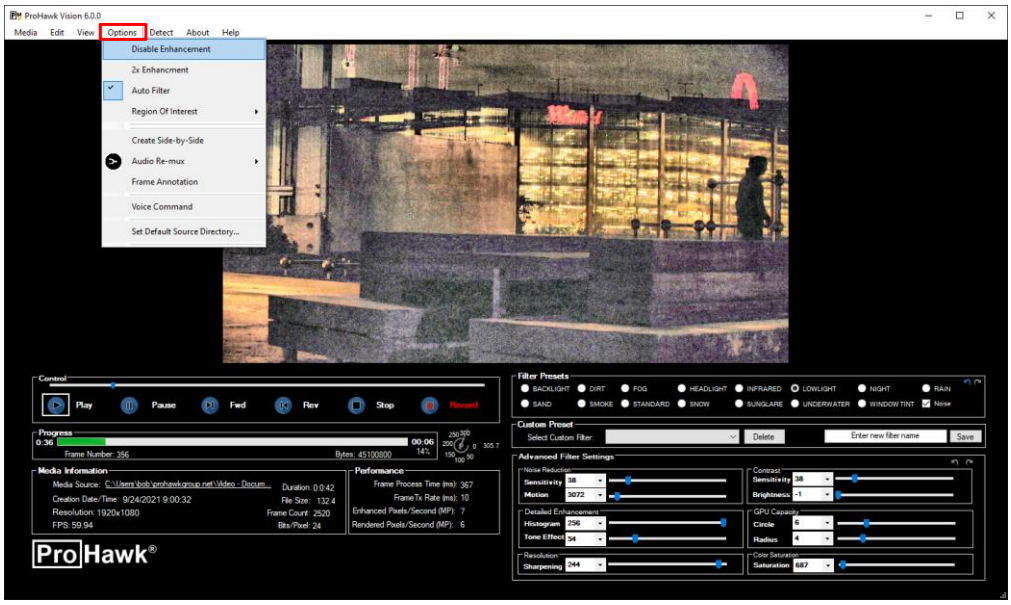


Figure 26

This section of the ProHawk Vision Users Guide will describe the **Options** menu item options above. (*Figure 26*)

4.4.1 Disable Enhancement

ProHawk Vision defaults to the **Disable Enhancement, Options** menu being unselected. This sets the ProHawk Vision engine **On**. When the **Disable Enhancement, Options** menu is unselected, there will be no checkmark next to the menu option. (*Figure 27*) To turn the ProHawk Vision engine **Off**, *click* on the **Disable Enhancement**, **Options** menu choice.

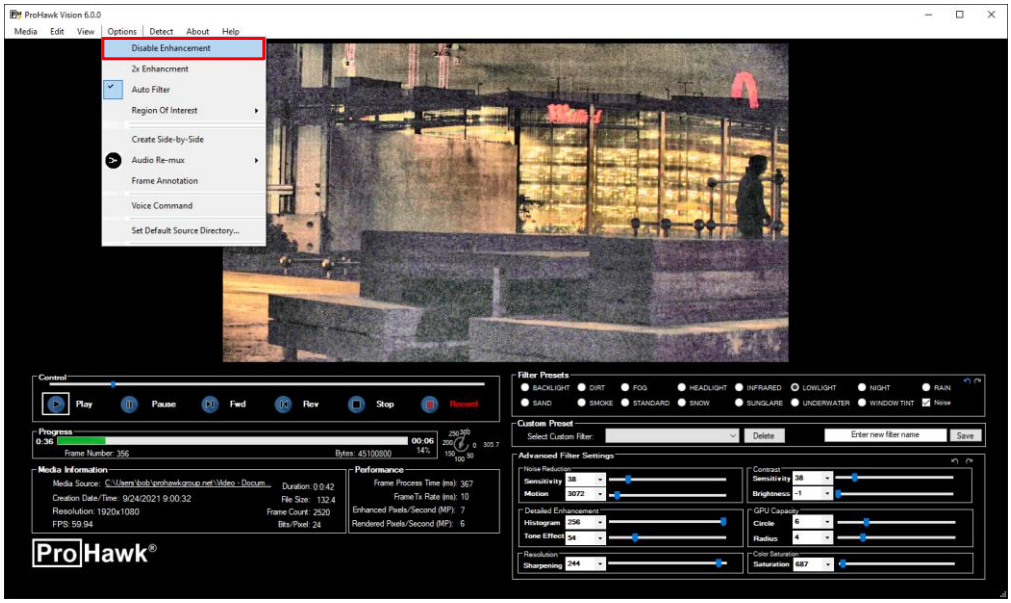


Figure 27

When the **Disable Enhancement, Options** menu is selected, it will display a checkmark next to the **Disable Enhancement, Options** menu choice. This sets the ProHawk Vision engine **Off**. (*Figure 18*) To turn the ProHawk Vision restoration engine **On**, *click* on the **Disable Enhancement**, **Options** menu choice. (*Figure 28*)

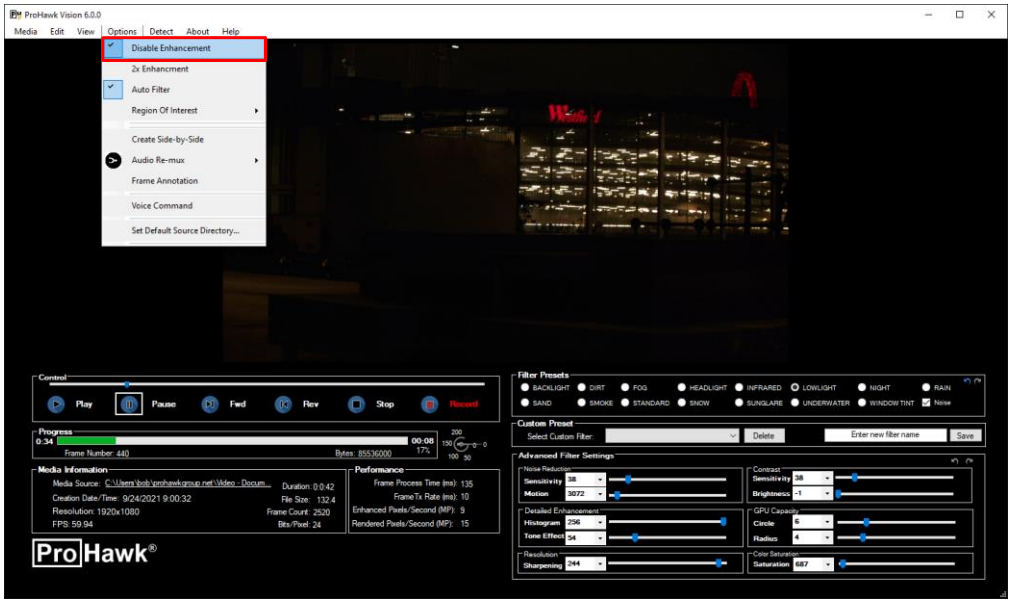


Figure 28

4.4.2 2x Enhancement

ProHawk Vision defaults to the **2x Enhancement, Options** menu being unselected. This sets the ProHawk Vision engine in a normal mode of operation. When the **2x Enhancement, Options** menu is unselected, there will be no checkmark next to the menu option. (*Figure 29*) To run the imagery through the ProHawk Vision engine twice, *click* on the **2x Enhancement**, **Options** menu choice.

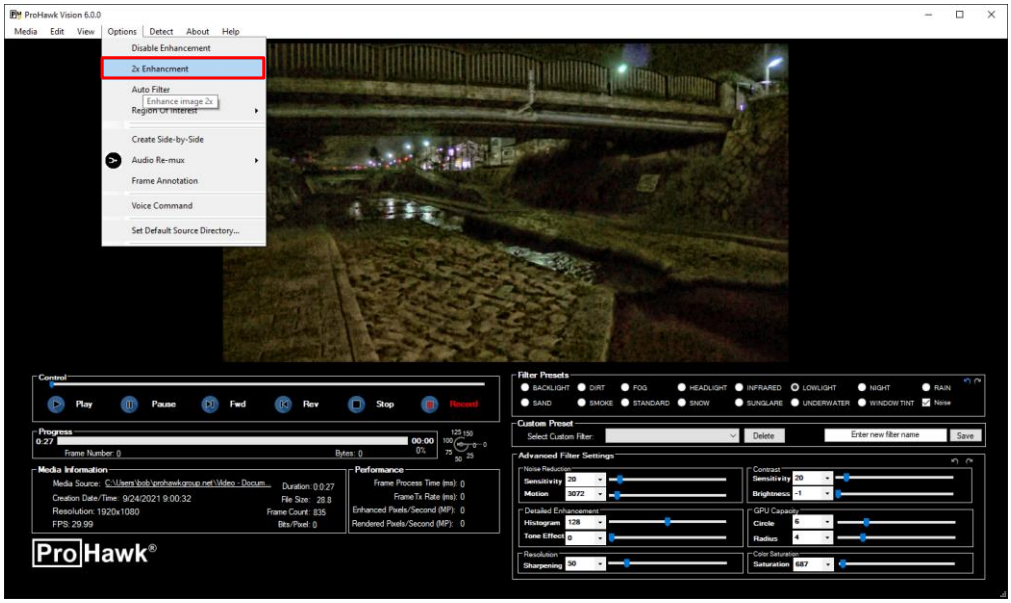


Figure 29

When the **2x Enhancement, Options** menu is selected, it will display a checkmark next to the **2x Enhancement, Options** menu choice. This sets the ProHawk Vision engine in a two-pass mode where the imagery is run twice through the ProHawk Vision engine. (*Figure 30*) To turn the ProHawk Vision two-pass mode **Off**, *click* on the **2x Enhancement**, **Options** menu choice.

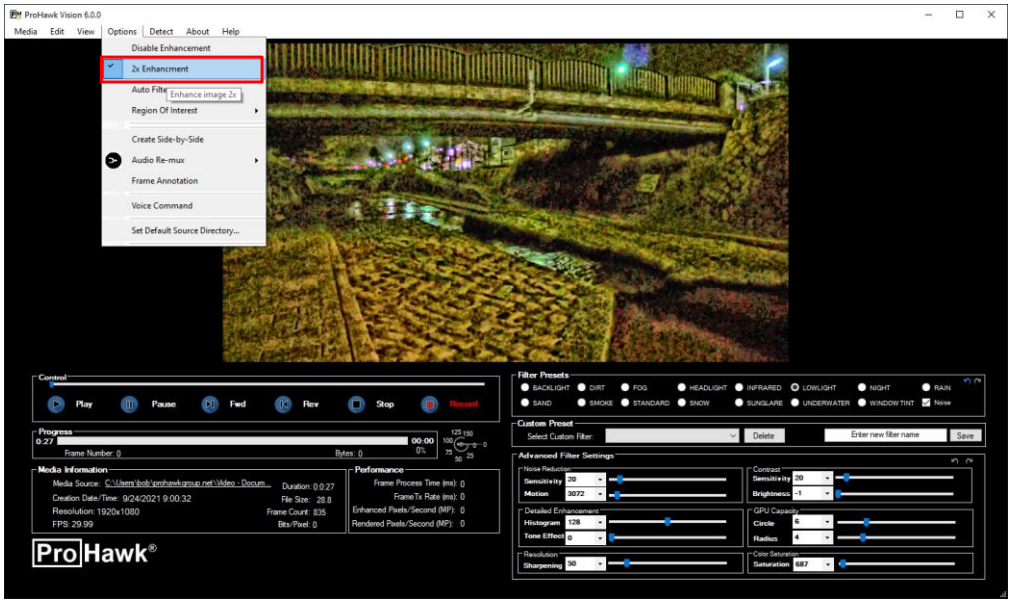


Figure 30

4.4.3 Auto Filter

AI based automatic filters enable the clearest imagery quickly, confidently, and efficiently. The automated computer vision filters provide clear video for systems to reach actionable results fast for a wide range of difficult live video environments. ProHawk improves poor low- or high-resolution live video interpreted by operators or AI. Auto Filters, when turned **ON**, provide the best clear video results for all compromised real-world environments. *Click* on the **Auto Filters** menu item to turn Auto Filters **ON**. (*Figure 31*) When **Auto Filters** is turned **ON**, there will be a check mark next to the **Auto Filter** menu option. Notice the difference between the Presets Filter for Lowlight and the Auto Filter determining the best visibility based on the video frame between *Figure 31* and *Figure 32*.

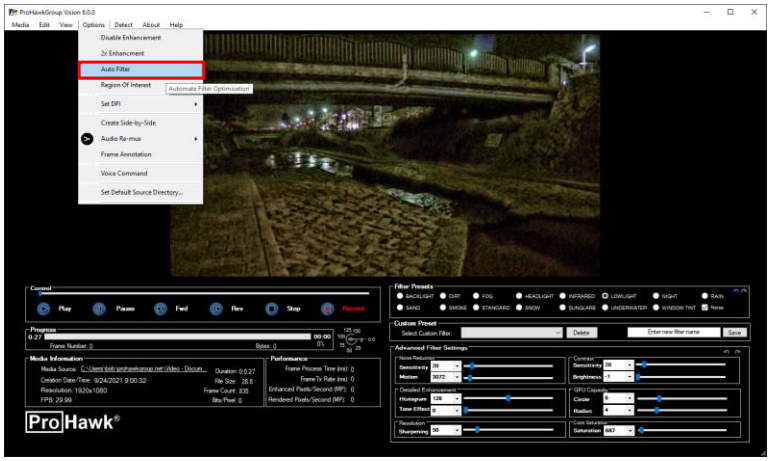


Figure 31

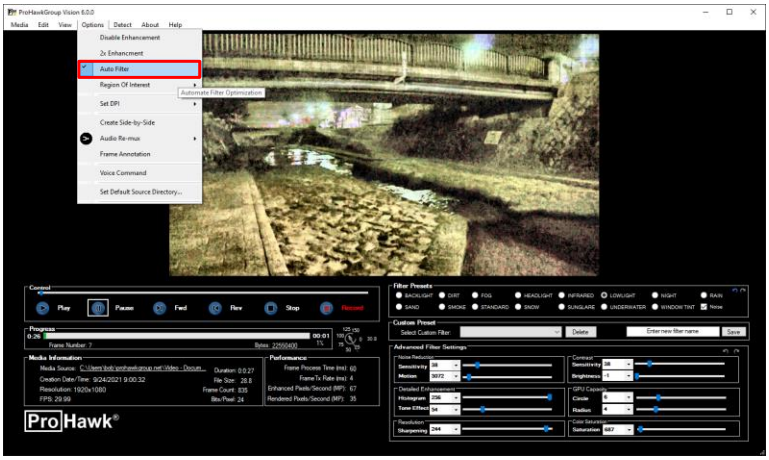


Figure 32

4.4.4 **Region of Interest**

The Region of Interest option provides functionality that focuses on a specific area in the image and zooms in on the images. To enable the Region of Interest function, select the Options menu, Region of Interest, Zoom and the associated zoom in value. (*Figure 33*)

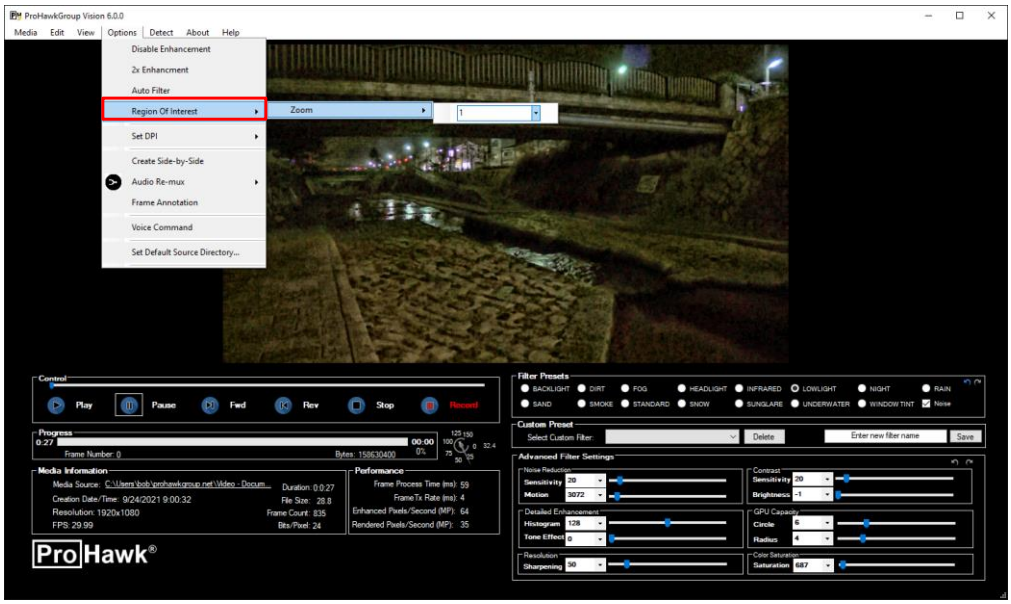


Figure 33

The example below shows the Region of Interest that is currently selected, and the zoom value is 3, which will zoom in and expand the pixels by 300% in the image. (*Figure 34*)

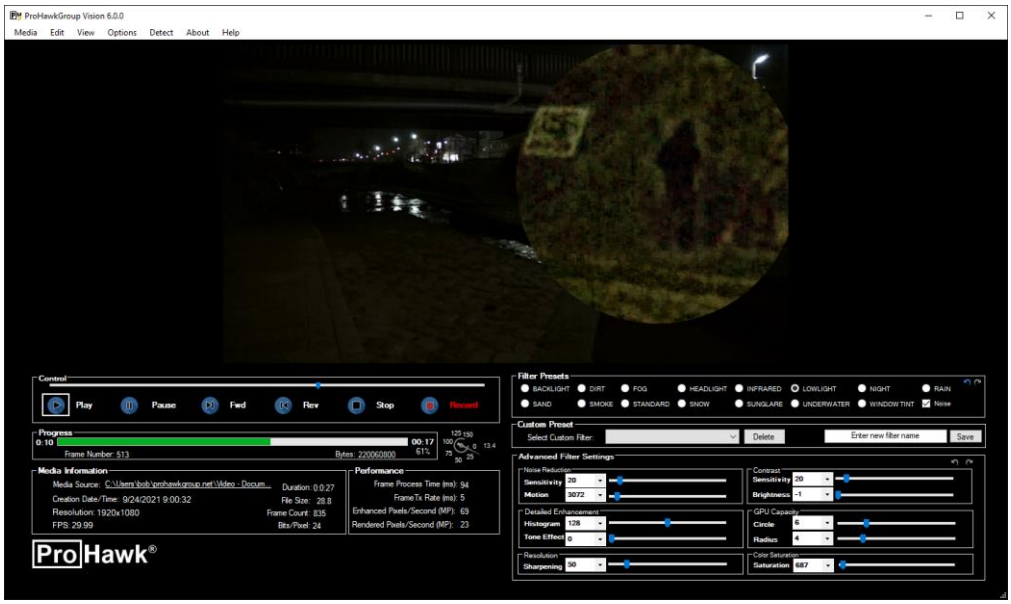


Figure 34

4.4.5 **Set DPI**

The Set DPI option allows output images to be formatted to the appropriate dots per inch setting for publishing applications. (*Figure 35*)

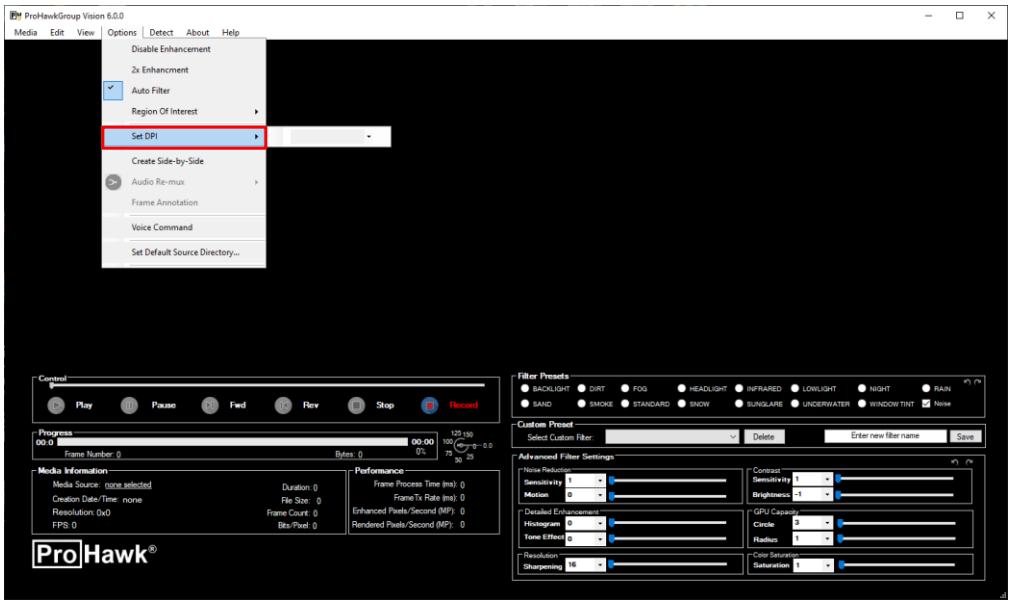


Figure 35

4.4.6 Create Side-by-Side

ProHawk Vision provides a **Create Side-by-Side, Options** menu being unselected. This sets the ProHawk Vision engine recording mode in a side-by-side output of the original and ProHawk Vision streams. When the **Create Side-by-Side, Option** menu is unselected, there will be no checkmark next to the menu option. (*Figure 36*) To create side-by-side recording files, *click* on the **Create Side-by-Side**, **Options** menu choice.

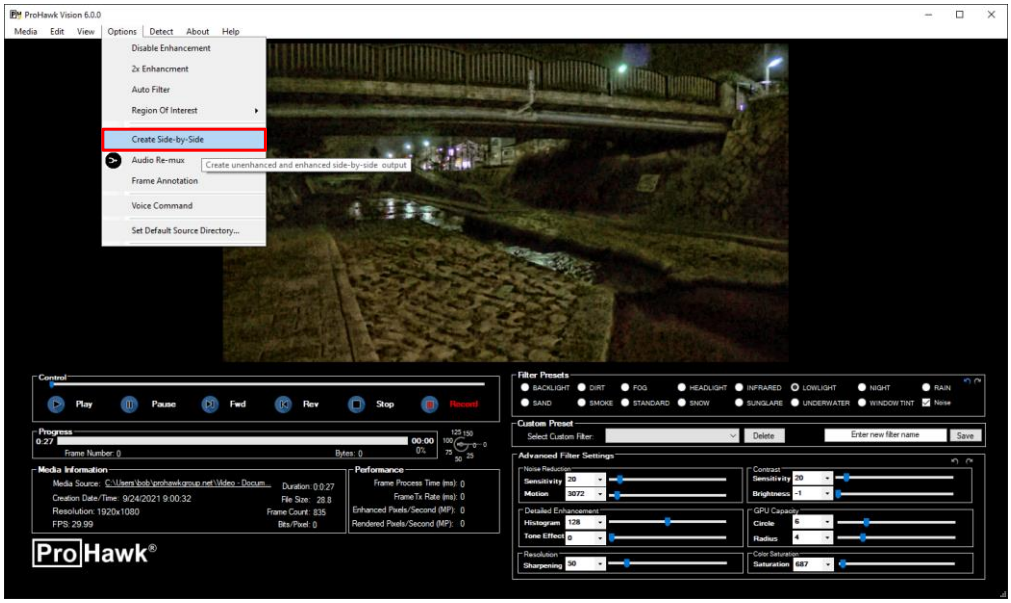


Figure 36

When the **Create Side-by-Side, Options** menu is selected, it will display a checkmark next to the **Create Side-by-Side, Options** menu choice. This sets the ProHawk Vision recorder in a side-by-side output mode where the original and ProHawk Vision imagery are recorded together. (*Figure 37*) To turn the side-by-side output mode **Off**, *click* on the **Create Side-by-Side**, **Options** menu choice.

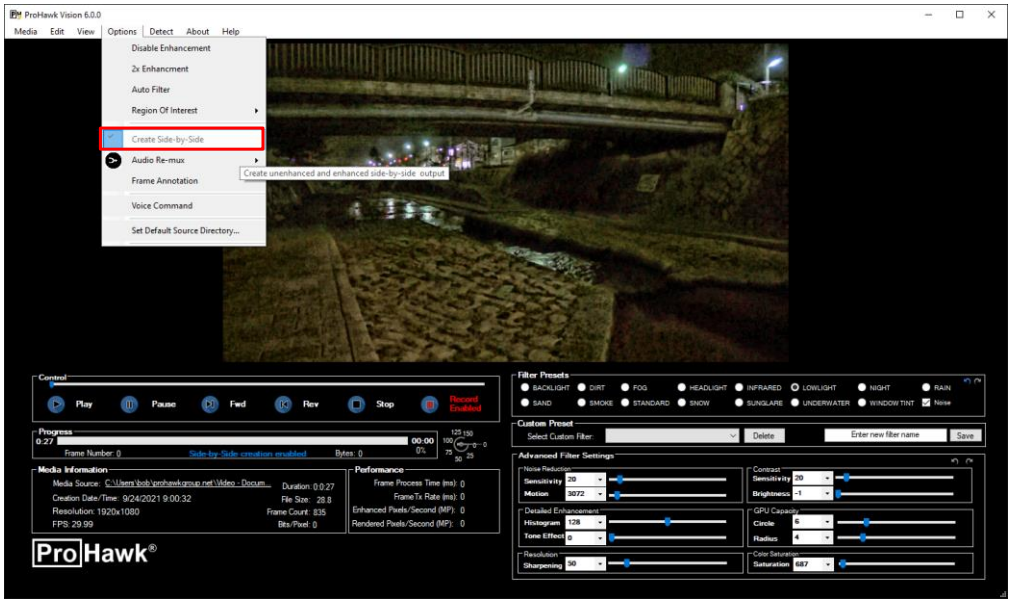


Figure 37

4.4.7 Audio Re-mux

ProHawk Vision handles audio tracks in video files through its **Enable Audio Re-mux, Options** menu choices. (*Figure 38*) There are two **Enable Audio Re-mux, Options** menu choices: **Re-mux Enhanced File**, and **Re-mux side-by-side File**. Audio tracks can be passed through to the ProHawk Vision enhanced output recording when the **Re-mux Enhanced File, Options** menu choice is selected. Audio tracks can be passed through to the ProHawk Vision side-by-side output recording when the **Re-mux side-by-side File**, **Options** menu choice is selected.

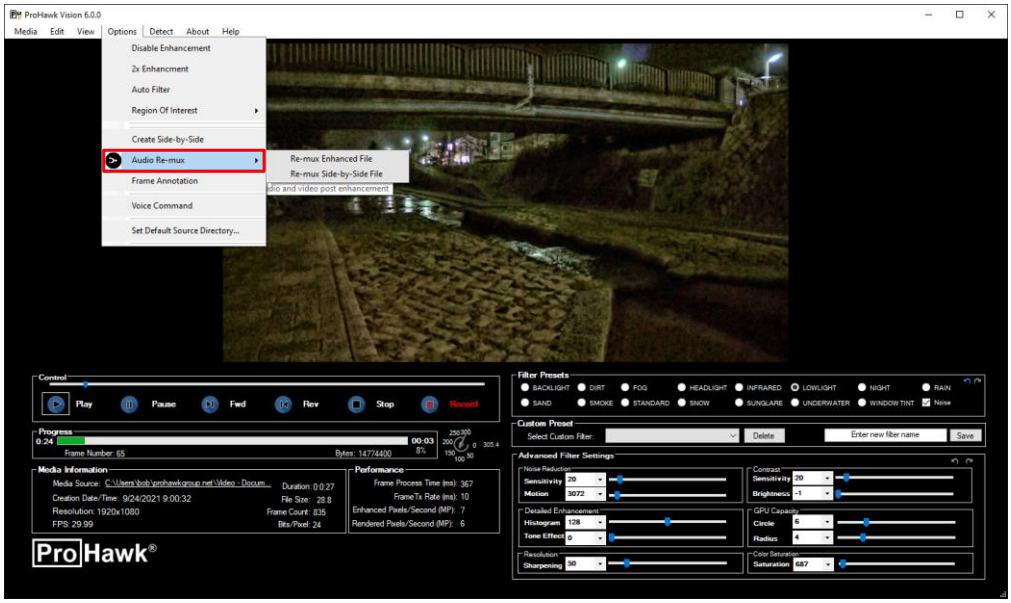


Figure 38

When the **Audio Re-mux, Options** menu **Re-mux Enhanced File** menu choice is selected, it will display a checkmark next to the **Audio Re-mux, Options** menu **Re-mux Enhanced File** menu choice. This sets the ProHawk Vision output mode to include audio from the original source and re-mux it back together in the ProHawk Vision enhanced recorded file. To turn the audio re-mux output mode **Off**, *click* on the **Audio Re-mux**, **Options** menu **Re-mux Enhanced File** menu choice. (*Figure 39*)

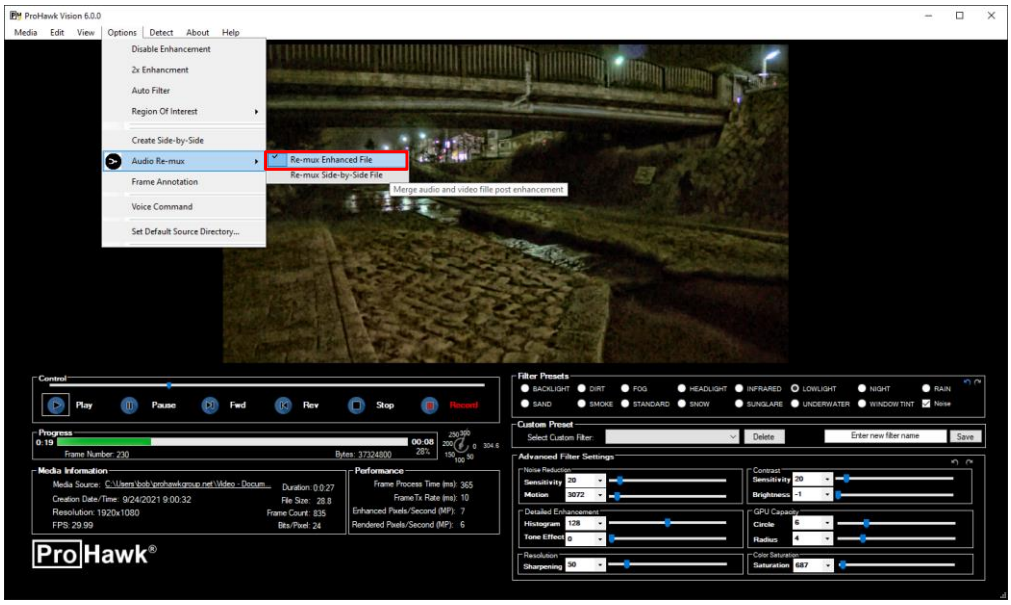


Figure 39

When the **Audio Re-mux, Options** menu **Re-mux Side-by-Side File** menu choice is selected, it will display a checkmark next to the **Audio Re-mux, Options** menu **Re-mux Side-by-Side File** menu choice. This sets the ProHawk Vision output mode to include audio from the original source and re-mux it back together in the ProHawk Vision side-by-side output recorded file. To turn the audio re-mux output mode **Off**, *click* on the **Audio Re-mux**, **Options** menu **Re-mux Side-by-Side File** menu choice. (*Figure 40*)

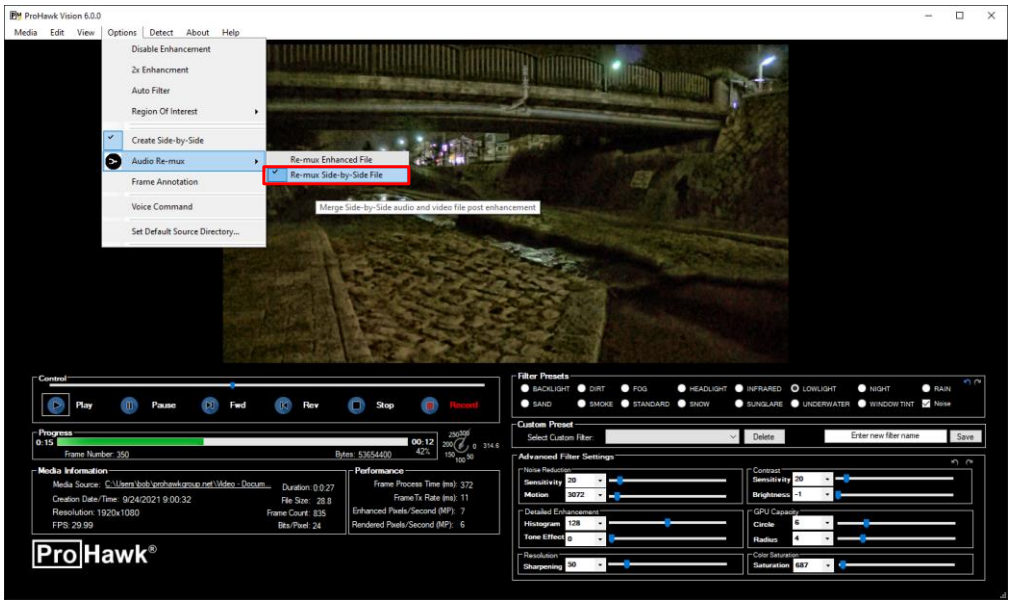


Figure 40

4.4.8 **Frame Annotation**

ProHawk Vision provides a feature to attached annotated notes to a frame of video or image. To activate the annotation capability, *click* on the **Frame Annotation, Options** menu choice. (*Figure 41*)

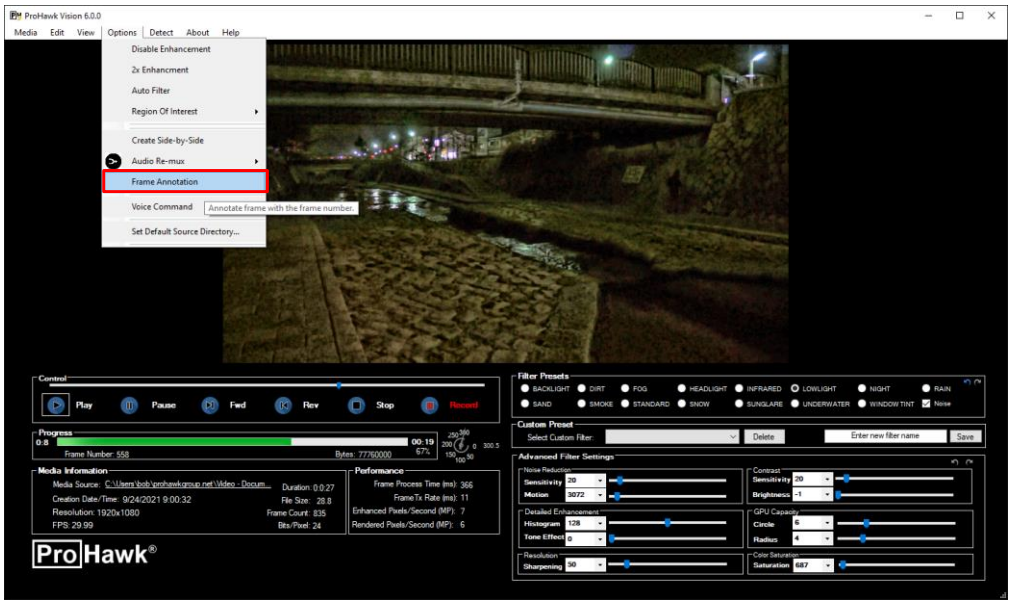


Figure 41

Notice the Frame Annotation section appears next to the ProHawk logo in the lower left corner if the ProHawk Vision user interface. (*Figure 42*) There are three options for Frame Annotation: **Note Text**, **Note Color**, and **Frame Number Color**. Enter the **text** into the **Enter Text** box, *select* the **Note Color**, select the **Frame Number Color**, and *click* **Record Annotation** button to attach it to a frame or image.

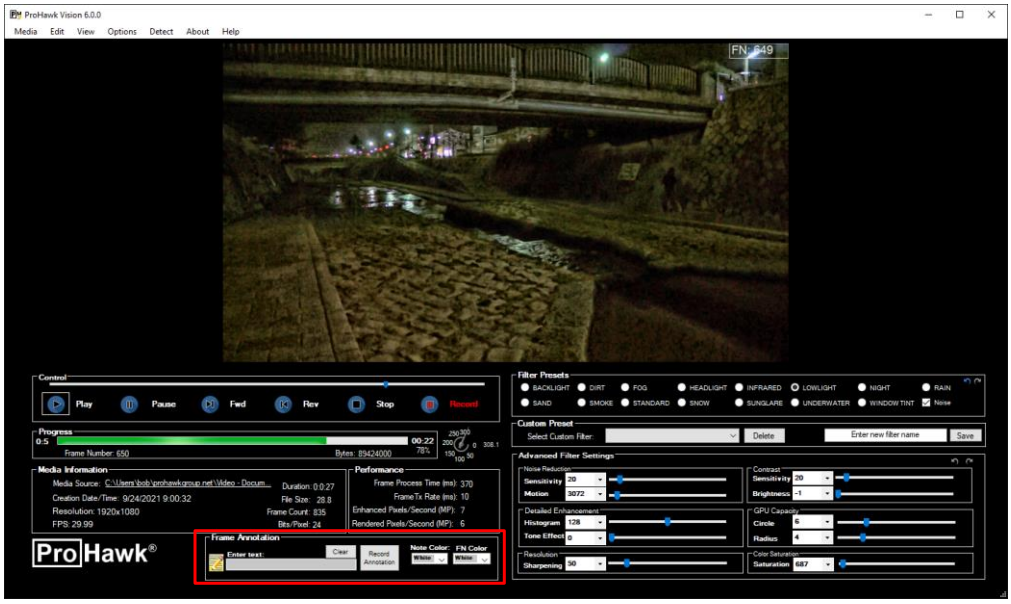


Figure 42

4.4.9 Voice Commands

ProHawk Vision can be controlled by voice commands. To activate voice commands, *click* on the **Voice Command, Options** menu choice. There are a total of 53 voice commands to control ProHawk Vision hands-free. The current Voice Command list can be found under the **Help** menu, **Voice Command List** menu option. (*Figure 43*)

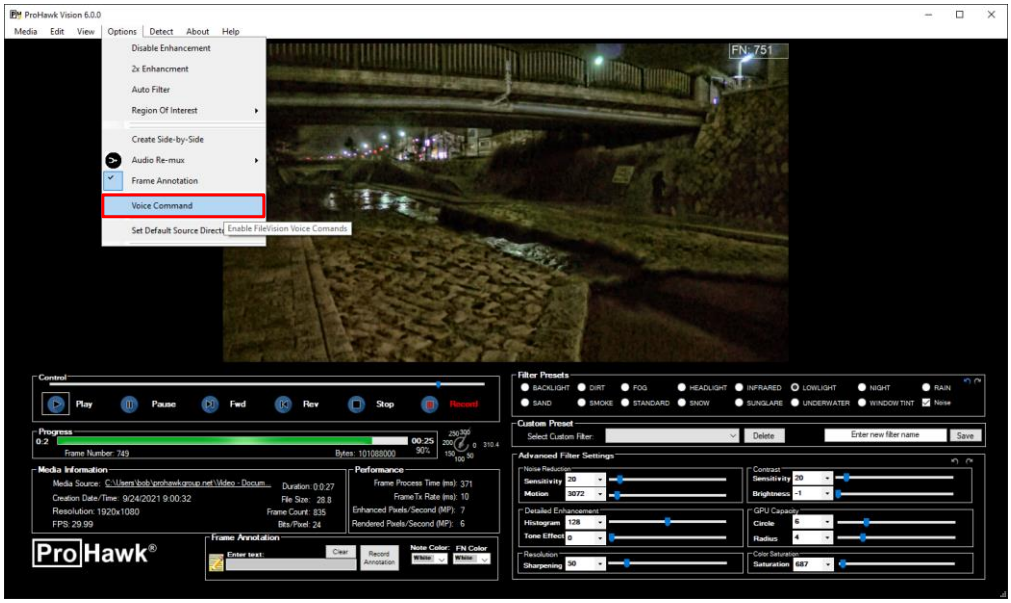


Figure 43

When the **Voice Commands, Options** menu choice is selected, a voice message through your audio speakers will indicate “Voice Command Enabled”. This will indicate that the voice command capabilities have been activated. (*Figure 44*)

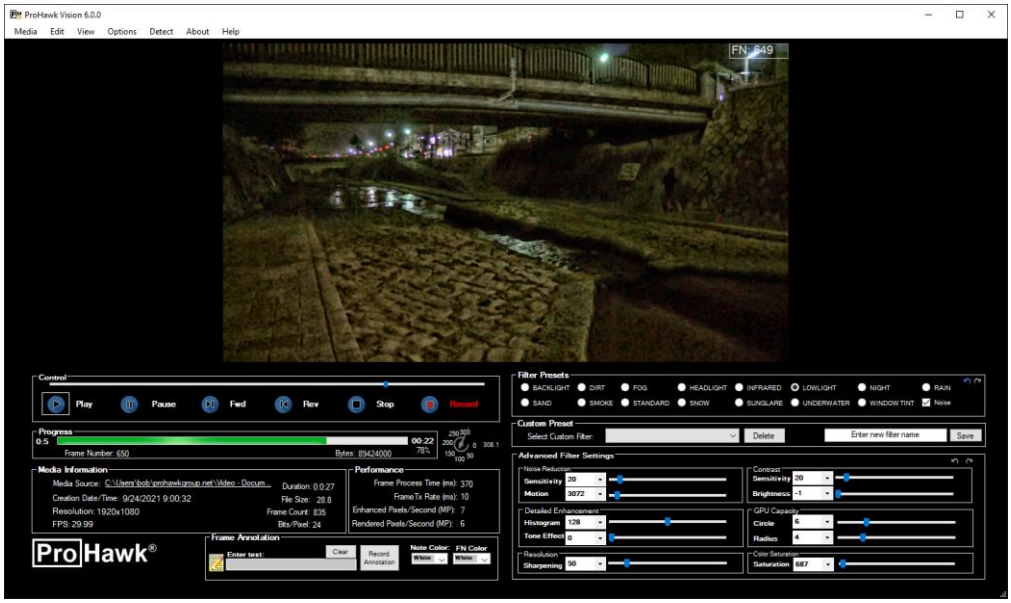


Figure 44

4.4.10 Set Default Image Source Directory

ProHawk Vision allows for the directory to be set for source file input. To set the default folder, *click* on the **Set Default Image Source Directory**, **Options** menu choice. (*Figure 45*)

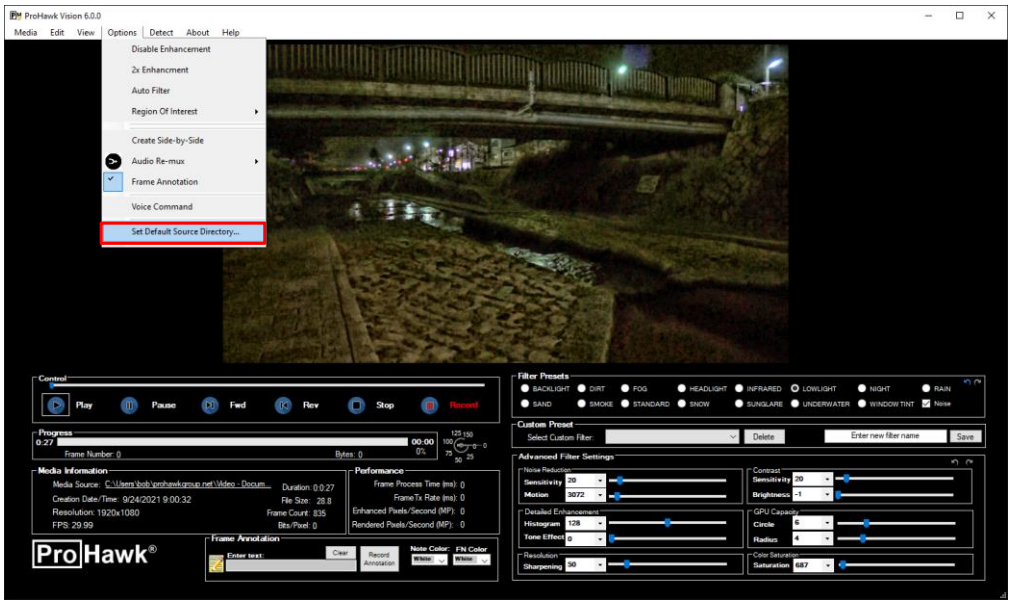


Figure 45

This will open the **Set Default Directory** dialog box. *Enter* or *select* the directory and *click* on the **Save** button. (*Figure 46*)

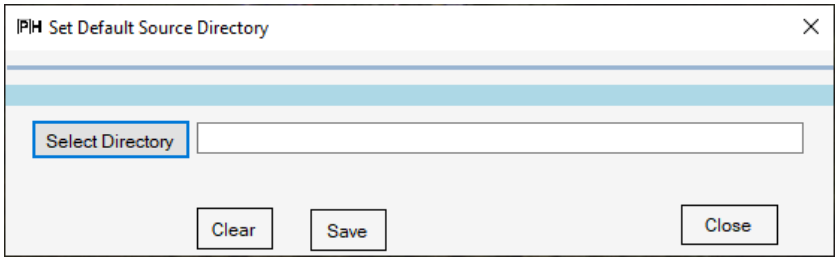


Figure 46

4.5 Detect Menu

The **Detect** menu controls the **Object Detection and Tracking** function of ProHawk Vision. (*Figure 47*)
The **Detect** menu options and their default settings are:

Enable – Off

Object Detection and Tracking

- **Agriculture - Unselected**
- **Insurance - Unselected**
- **Retail - Unselected**
- **Security - Unselected**
- **Transportation - Unselected**
- **Weapons - Unselected**

Configuration

- **Detection Confidence Score - 30**
- **Full Detection Dataset - Off**

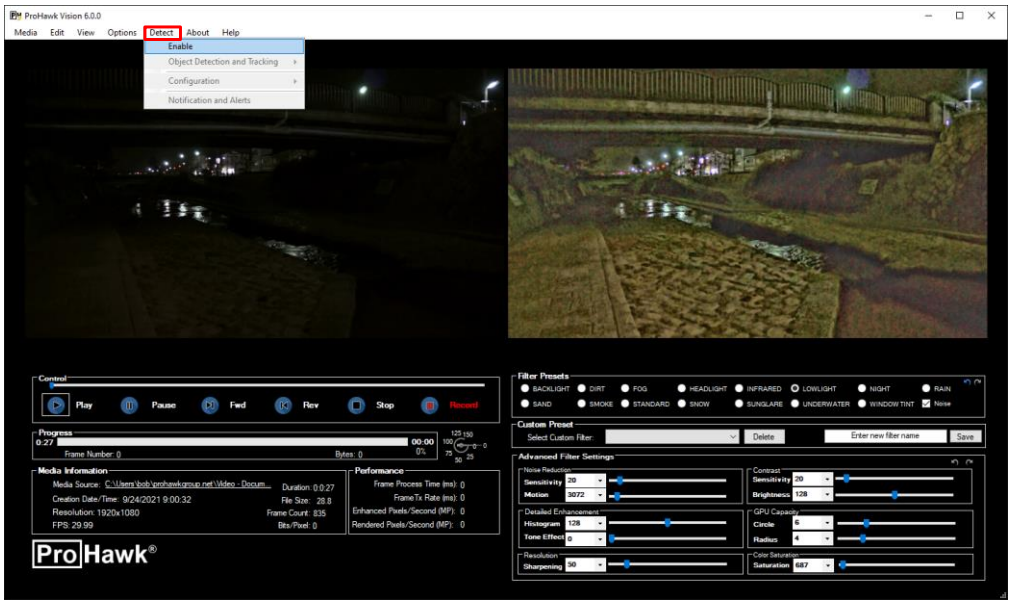


Figure 47

This section of the ProHawk Vision Users Guide will describe the **Detect** menu options above. (*Figure 47*)

4.5.1 Enable

The **Detect** menu, **Enable** menu option turns **Object Detection and Tracking** function **On** and **Off**. ProHawk Vision defaults **Object Detection and Tracking Off**. To activate **Object Detection and Tracking**, *click* on the **Enable** menu option. (*Figure 48*)

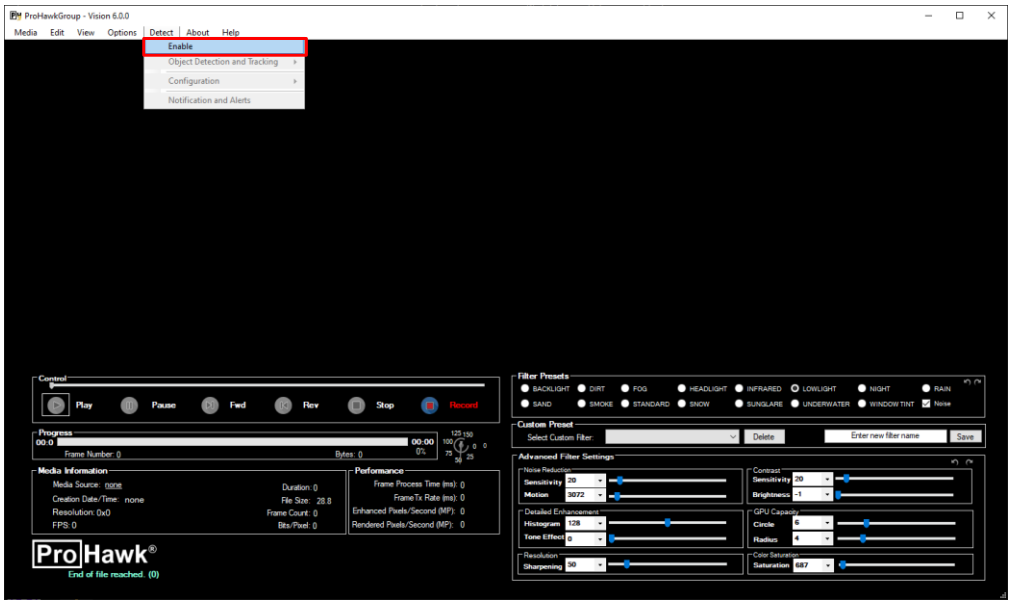


Figure 48

4.5.2 Object Detection and Tracking

Once **Detect** has been **Enabled**, the **Object Detection and Tracking** menu option will become accessible. ProHawk Vision will only monitor the object that you select. To *select* an object, *click* on the **Detect** menu, and *click* on the **Object Detection and Tracking** menu option. Next, *select* the category choice from the **Object Detection and Tracking** menu option list: **Agriculture**; **Insurance**, **Retail**, **Security**, or **Transportation**. Finally, select the specific object that you want ProHawk Vision to detect and track. (*Figure 49*)

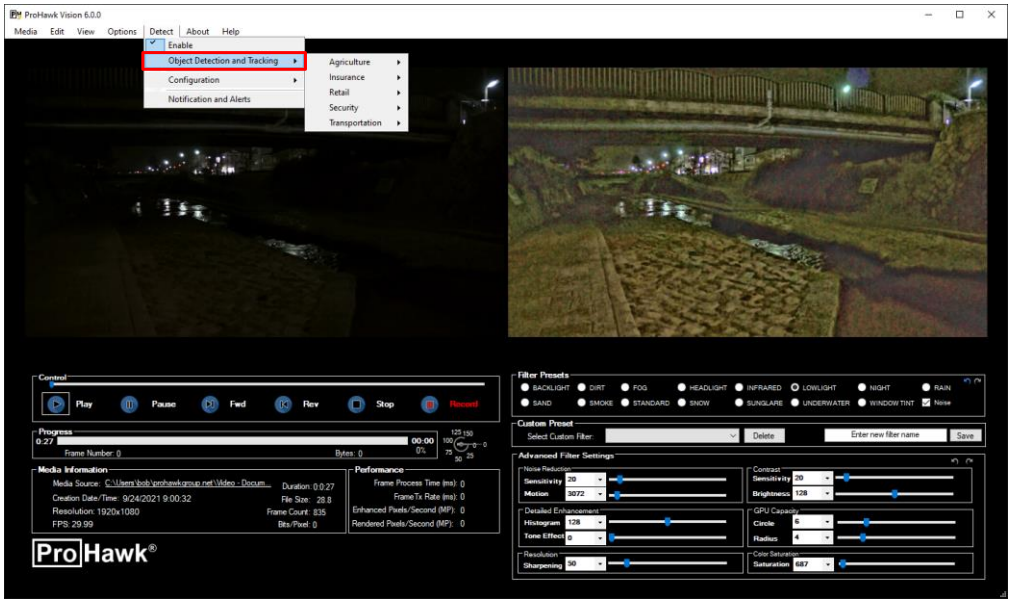


Figure 49

4.5.2.1 Agriculture

Once the **Object Detection and Tracking** menu option is accessible, the **Agriculture** menu option will be available. ProHawk Vision will only monitor the **Agriculture** object(s) that you select. To *select* an **Agriculture** object, *click* on the **Detect** menu, and *click* on the **Object Detection and Tracking** menu option. Next, *select* the **Agriculture** category from the **Object Detection and Tracking** menu option list. The available objects to detect and track in the **Agriculture** category that you can select include: **Apple**; **Banana**; **Broccoli**, **Carrot**, **Cow**, **Orange**, and **Sheep**. (*Figure 45*) This limited list can be extended by a trained expanded dataset.

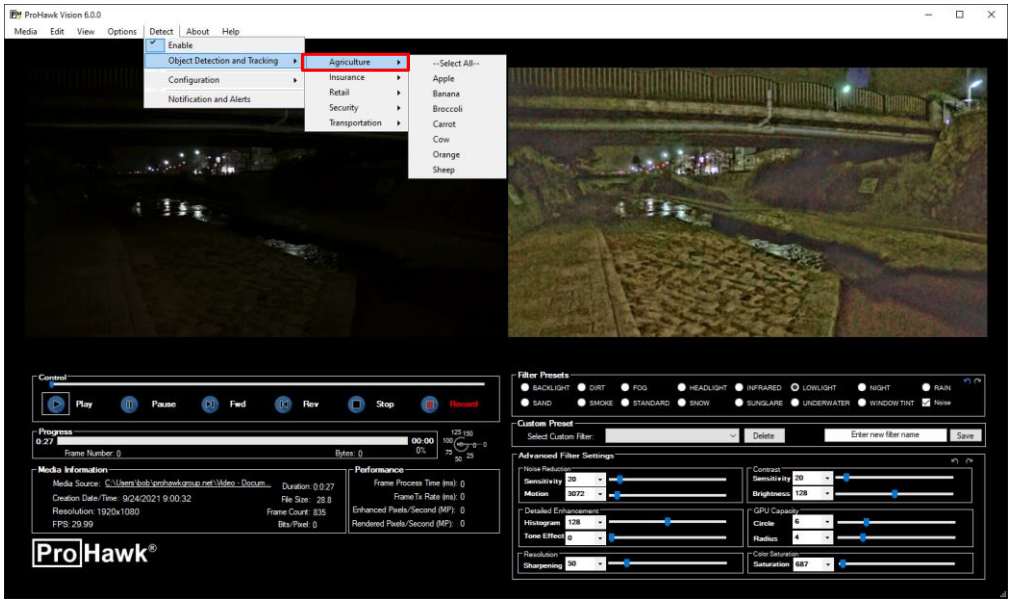


Figure 50

4.5.2.2 Insurance

Once the **Object Detection and Tracking** menu option is accessible, the **Insurance** menu option will be available. ProHawk Vision will only monitor the **Insurance** object(s) that you select. To *select* an **Insurance** object, *click* on the **Detect** menu, and *click* on the **Object Detection and Tracking** menu option. Next, *select* the **Insurance** category from the **Object Detection and Tracking** menu option list. The available objects to detect and track in the **Insurance** category that you can select include: **Bed**; **Bench**; **Book**, **Chair**, **Cell Phone**, **Clock**, **Dining Table**, **Sofa**, **Keyboard**, **Microwave**, **Mouse**, **Potted Plan**, **Refrigerator**, **Remote**, **Sink**, **Toaster**, **Toilet**, **Oven**, **TV Monitor**, and **Vase**. (*Figure 46*) This limited list can be extended by a trained expanded dataset.

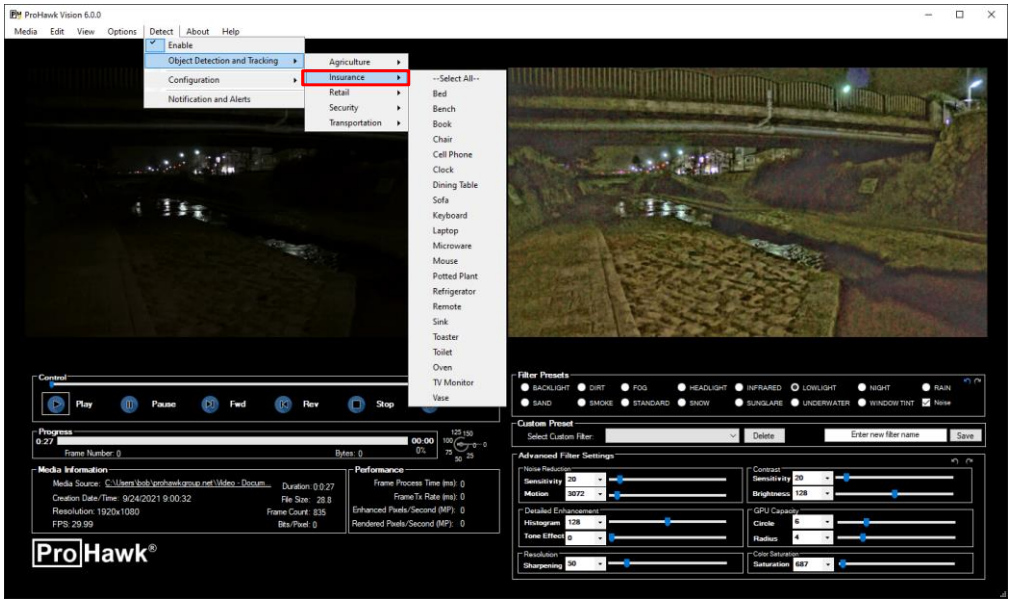


Figure 51

4.5.2.3 Retail

Once the **Object Detection and Tracking** menu option is accessible, the **Retail** menu option will be available. ProHawk Vision will only monitor the **Retail** object(s) that you select. To *select* a **Retail** object, *click* on the **Detect** menu, and *click* on the **Object Detection and Tracking** menu option. Next, *select* the **Retail** category from the **Object Detection and Tracking** menu option list. The available objects to detect and track in the **Retail** category that you can select include: **Baseball Bat**; **Baseball Glove**; **Bowl**, **Cake**, **Cup**, **Donut**, **Frisbee**, **Hot Dog**, **Kite**, **Pizza**, **Sandwich**, **Skateboard**, **Skis**, **Snowboard**, **Sprots Ball**, **Tennis Racket**, **Tie**, and **Wine Glass**. (*Figure 47*) This limited list can be extended by a trained expanded dataset.

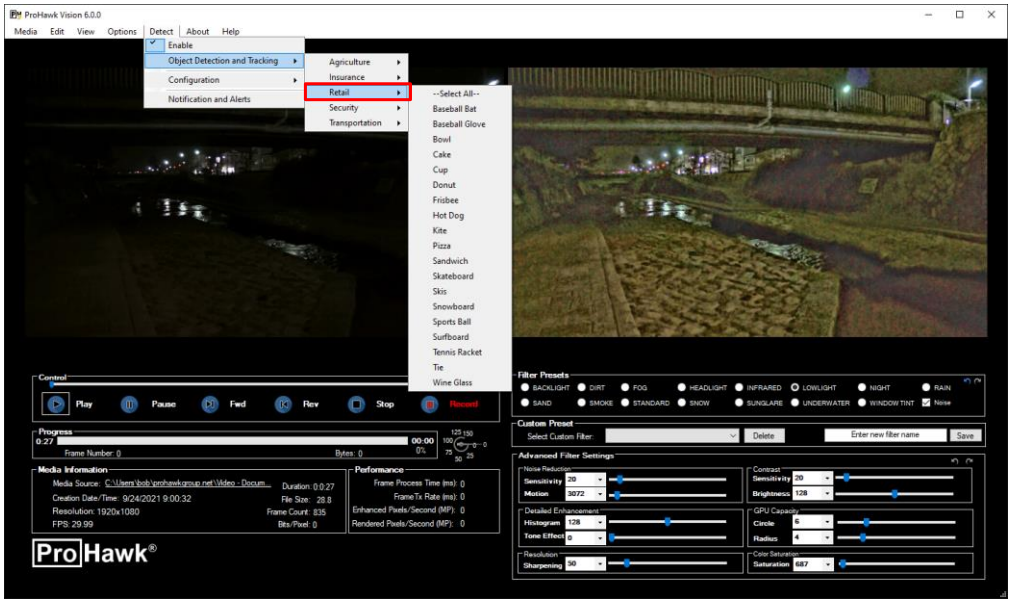


Figure 52

4.5.2.4 Security

Once the **Object Detection and Tracking** menu option is accessible, the **Security** menu option will be available. ProHawk Vision will only monitor the **Security** object(s) that you select. To *select* a **Security** object, *click* on the **Detect** menu, and *click* on the **Object Detection and Tracking** menu option. Next, *select* the **Security** category from the **Object Detection and Tracking** menu option list. The available objects to detect and track in the **Security** category that you can select include: **Backpack**; **Bear**; **Bird**, **Bottle**, **Cat**, **Dog**, **Fork**, **Handbag**, **Horse**, **Knife**, **Person**, **Scissors**, **Spoon**, **Suitcase**, and **Umbrella**. (*Figure 48*) This limited list can be extended by a trained expanded dataset.

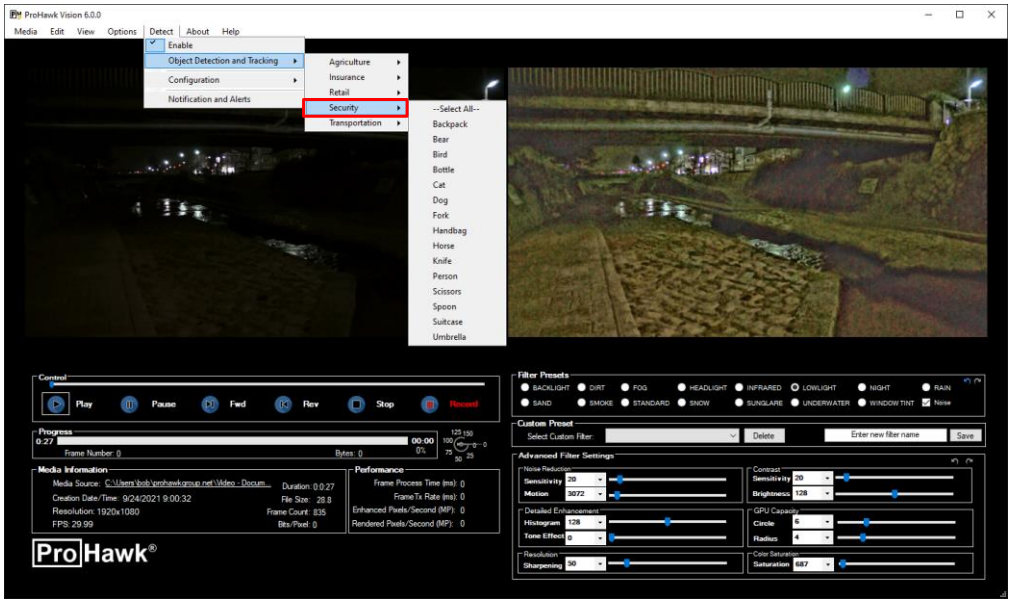


Figure 53

4.5.2.5 Transportation

Once the **Object Detection and Tracking** menu option is accessible, the **Transportation** menu option will be available. ProHawk Vision will only monitor the **Transportation** object(s) that you select. To *select* a **Transportation** object, *click* on the **Detect** menu, and *click* on the **Object Detection and Tracking** menu option. Next, *select* the **Transportation** category from the **Object Detection and Tracking** menu option list. The available objects to detect and track in the **Transportation** category that you can select include: **Bicycle**; **Boat**; **Bus**, **Cars**, **Fire Hydrant**, **Motorcycle**, **Parking Meter**, **Stop Sign**, **Traffic Light**, **Train**, and **Truck**. (*Figure 49*) This limited list can be extended by a trained expanded dataset.

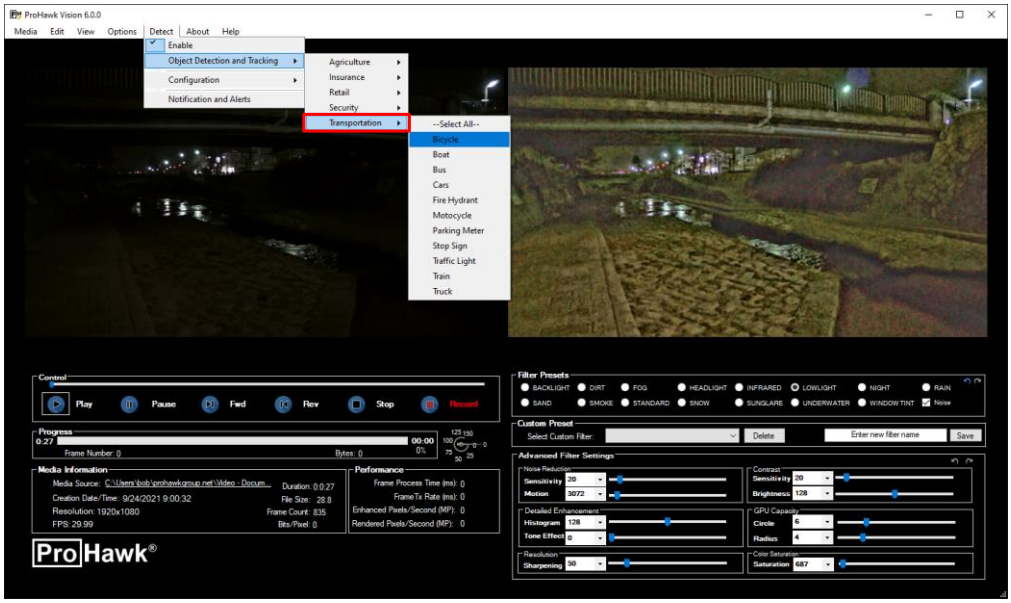


Figure 54

4.5.3 Configuration

Once **Detect** has been **Enabled**, the **Configuration** menu option will become accessible. (*Figure 50*) ProHawk Vision allows you to control the **Detection Confidence Score** for operation. This provides the object percentage confidence for recognition to be set within the detection system when monitoring the object(s) that you selected. ProHawk Vision also provides a **Full Detection Dataset** menu option, that enables a larger number of convolutional layers in the Yolo/Coco dataset for the deep neural network to process to identify objects. This results in a much higher level of recognition, detection, and tracking, but requires additional computational resources.

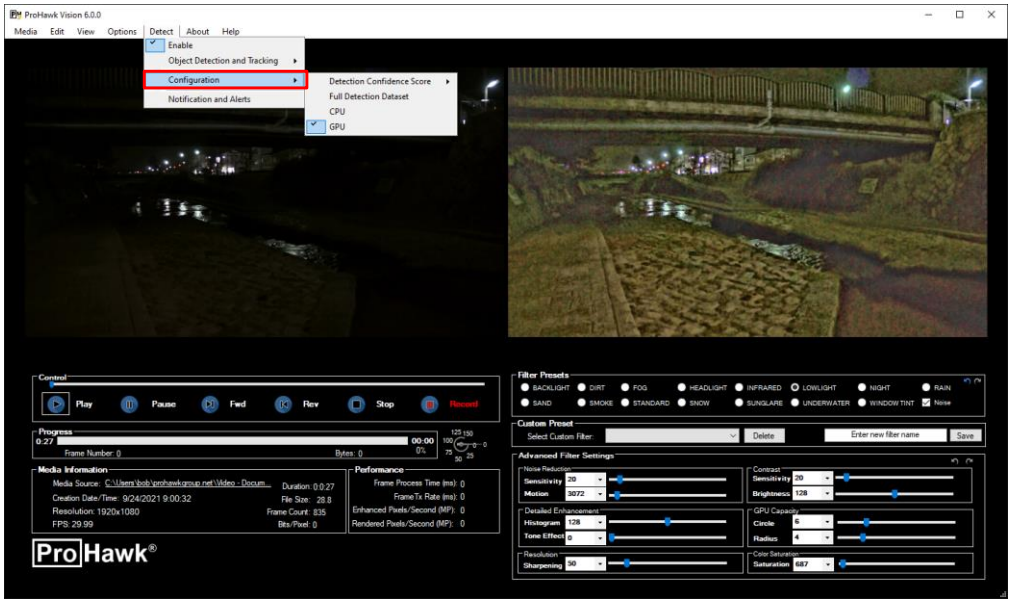


Figure 55

4.5.3.1 Detection Confidence Score

To set the **Detection Confidence Score** for object(s), *click* on the **Detect** menu, and *click* on the **Configuration** menu option. Next, *select* the **Detection Confidence Score** menu option. Finally, *select* the **Detection Confidence Score** you want for detection from the dropdown list, or enter the number you desire. (*Figure 56*)

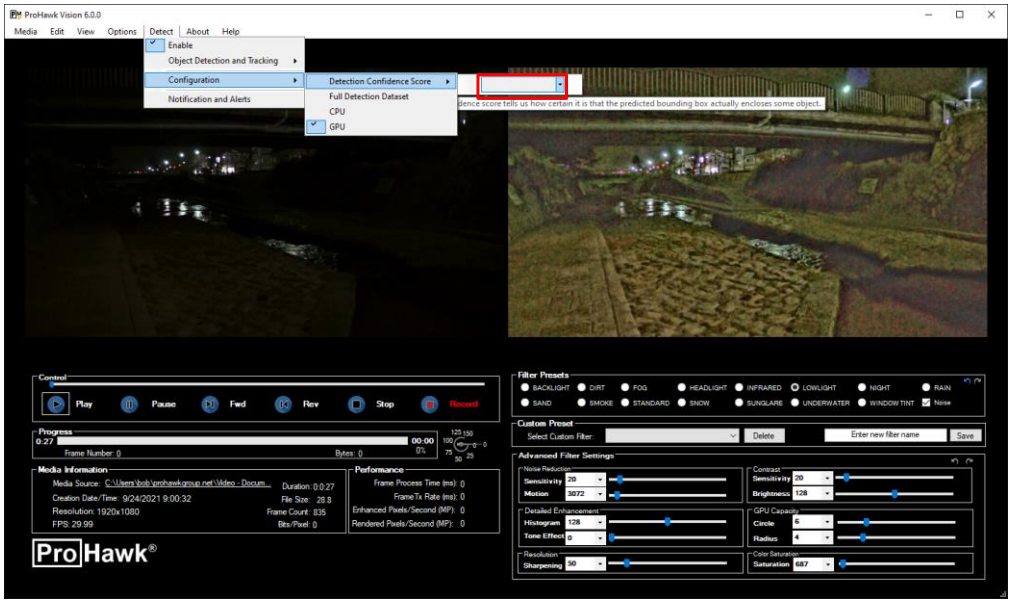


Figure 56

4.5.3.2 Full Detection Dataset

To **Enable** the **Full Detection Dataset** for Yolo/Coco deep neural network operation, *click* on the **Detect** menu, and *click* on the **Configuration** menu option. Next, *click* the **Full Detection Dataset** menu option. (*Figure 57*)

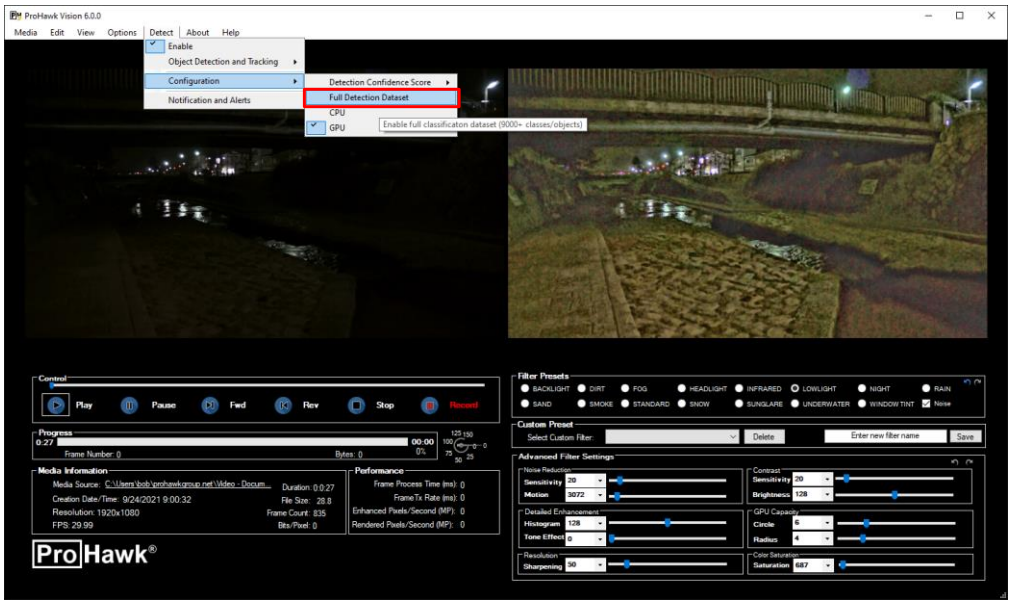


Figure 57

4.5.3.3 CPU

To use the systems **CPU** for Yolo/Coco deep neural network operation processing, *click* on the **Detect** menu, and *click* on the **Configuration** menu option. Next, *click* the **CPU** menu option. (*Figure 58*)

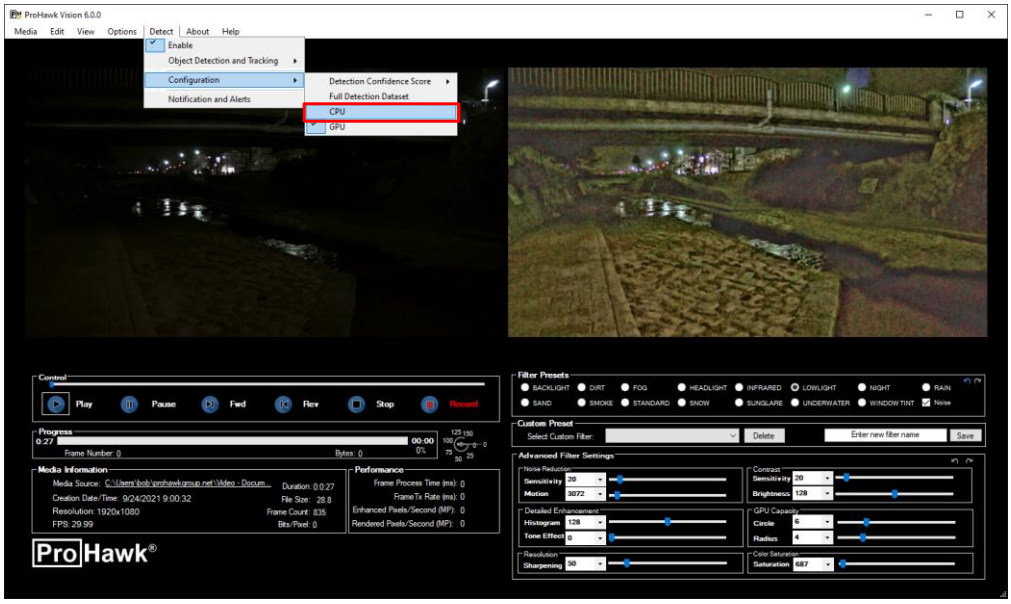


Figure 58

4.5.3.4 GPU

To use the systems **GPU** (recommend setting) for Yolo/Coco deep neural network operation processing, *click* on the **Detect** menu, and *click* on the **Configuration** menu option. Next, *click* the **GPU** menu option. (*Figure 59*)

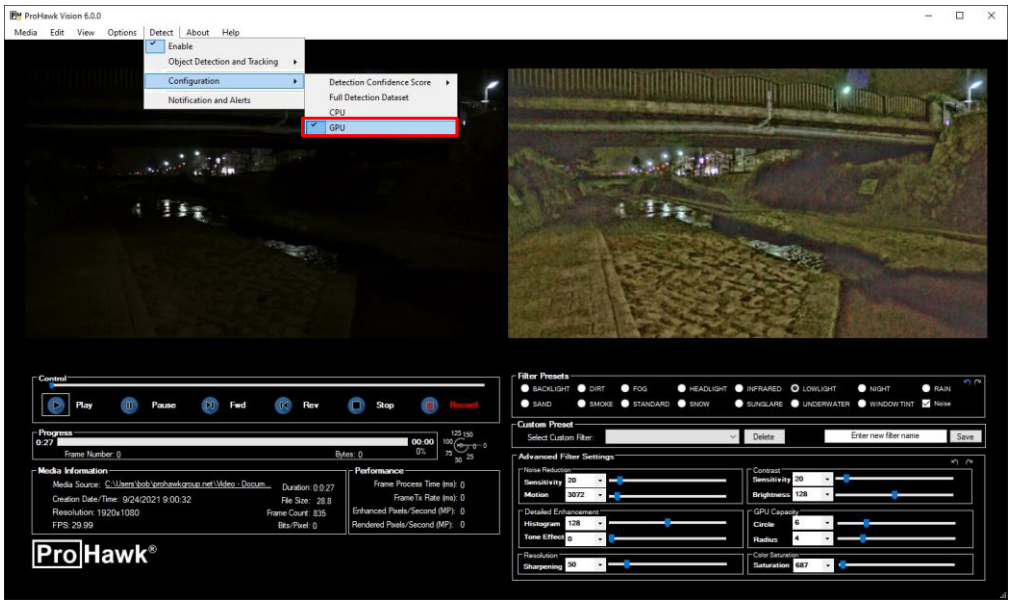


Figure 59

4.5.4 Notifications and Alerts

The **Configuration** menu has an option to setup **Notifications and Alerts** on **Object Detection and Tracking**. ProHawk Vision allows you to setup Email alerts based on **Object Detection and Tracking** and associated **Detection Confidence Score** to trigger the alert. *Click* on the **Configuration** menu, the *click* on the **Notifications and Alerts** menu option to open the **Alerts and Notifications** Settings dialog box. (*Figure 60*)

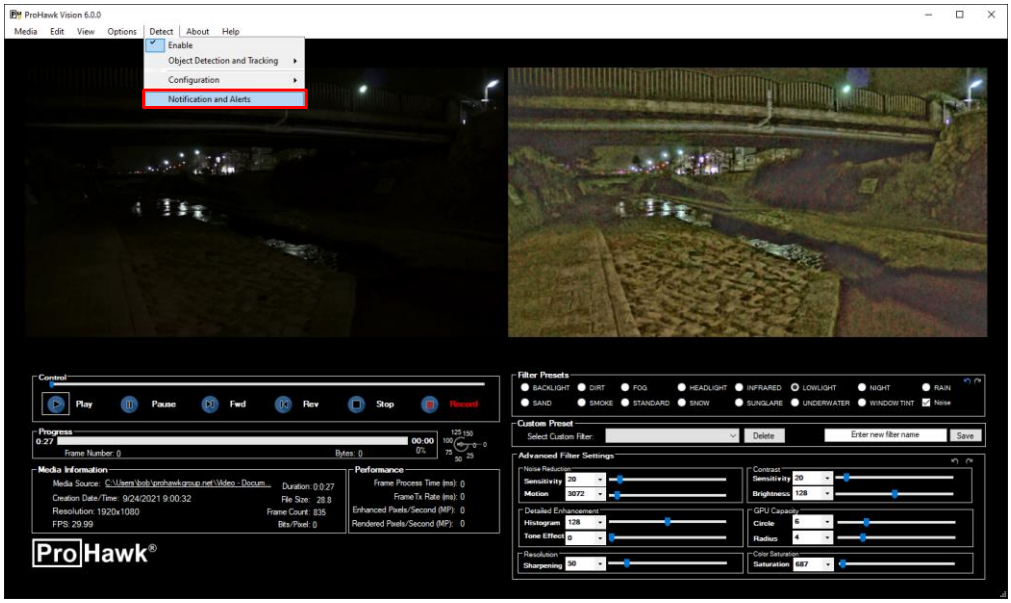


Figure 60

The **Alerts and Notifications Settings** dialog box allows you to setup **Email Notification Server** settings. To **Enable Email Notifications** *click* on the **Enable Email Notifications** checkbox after you have filled out all the information in the Alerts and Notifications Settings dialog box. (*Figure 61*)

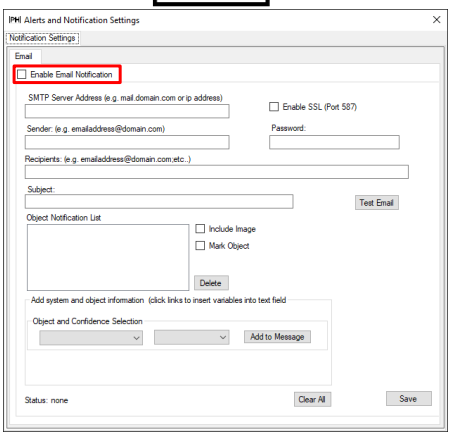


Figure 61

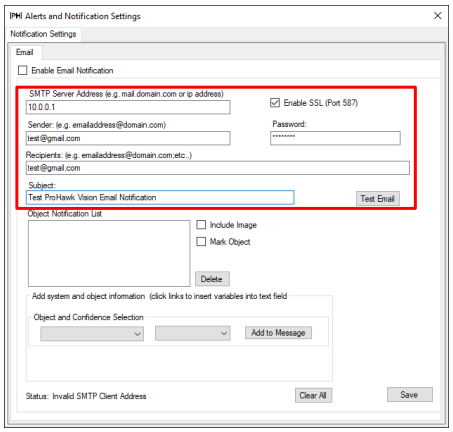


Figure 62

The first step is to setup the **Email Notification Server** settings information (*Figure 62*), that includes the information required to setup the **Email Notification Server**:

- **SMTP Server Address**
- **Enable SSL**
- **Sender**
- **Password**
- **Recipients**
- **Subject**

Once you have entered the configuration information for the **Email Notification Server**, you can test the setup using the **Test Email** button. To test the **Email Notification Server** settings, *click* on the **Test Email** button. (*Figure 63*)

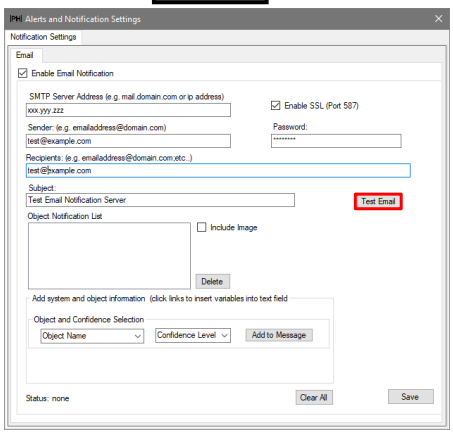


Figure 63

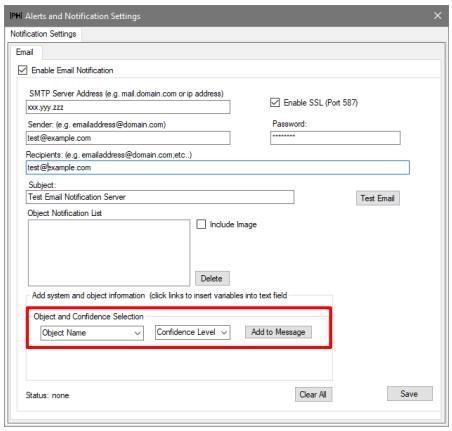


Figure 64

Once the **Email Notification Server** is configured and working, you will need to setup the **Object and Confidence Selection** including the **Object Name** to recognize and detect and the desired **Confidence Level**. (*Figure 64*)

To *select* an **Object Name**, *click* on the **Object Name** dropdown menu. (*Figure 65*)

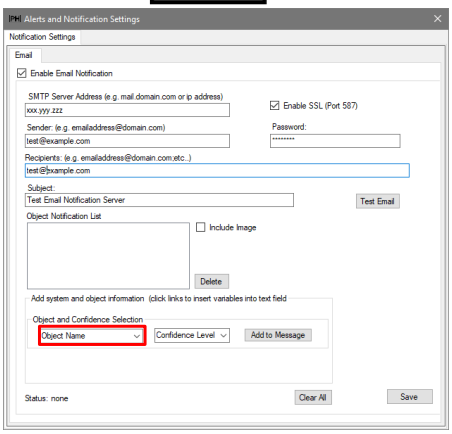


Figure 65

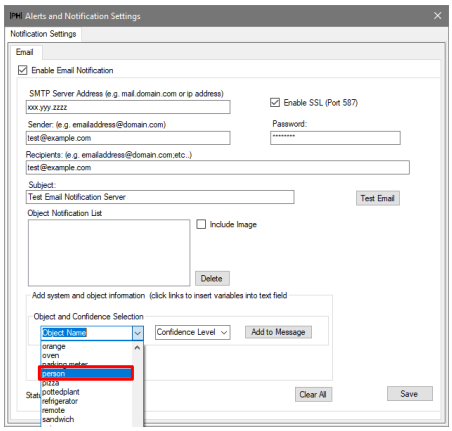


Figure 66

This will dropdown the list of **Object Names** that you can *select* to monitor with an **Email Notification**. Scroll through the list and *click* on the **Object Name** that you want ProHawk Vision to monitor. In the example to the right, the **Object Name Person** is *selected*. (*Figure 66*)

Once the **Object Name** has been *selected*, in this example **Person**, then the **Confidence Level** needs to be set. The **Confidence Level** is the percentage certainty ProHawk Vision has on **Object Detection and Tracking**. To set the **Confidence Level**, *click* on the **Confidence Level** dropdown menu. (*Figure 67*)

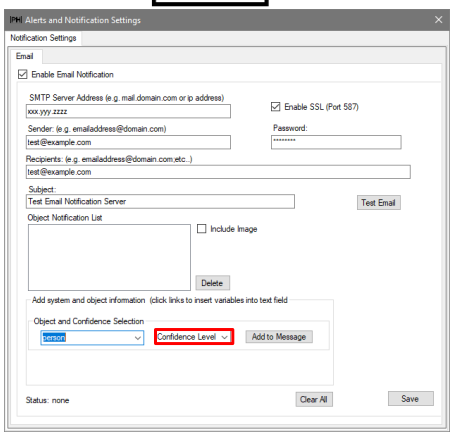


Figure 67

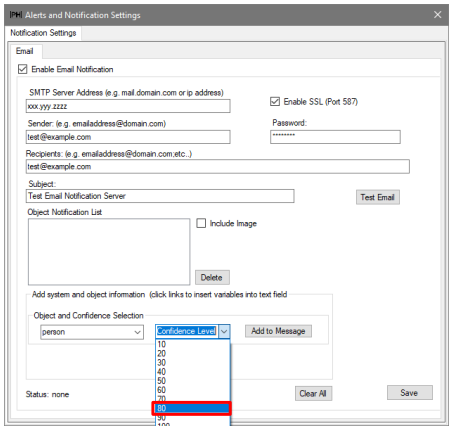


Figure 68

This will dropdown the list of **Confidence Levels** that you can *select* to monitor the **Object Name** that was selected. Scroll through the list and *click* on the **Confidence Level** that you want ProHawk Vision to use as the threshold to monitor for **Email Notifications**. In the example to the right, **80** is *selected* as the percentage threshold to trigger an **Email Notification**. (*Figure 68*)

Once the **Confidence Level** has been set for the **Object Name** to monitor, **80** in the example, for **Email Notification**, to finalize the monitoring, *click* on the **Add to Message** button. (*Figure 69*)

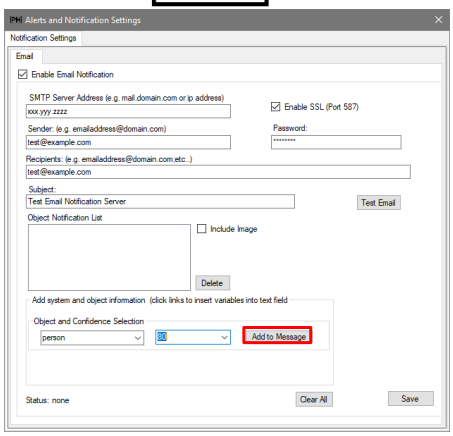


Figure 69

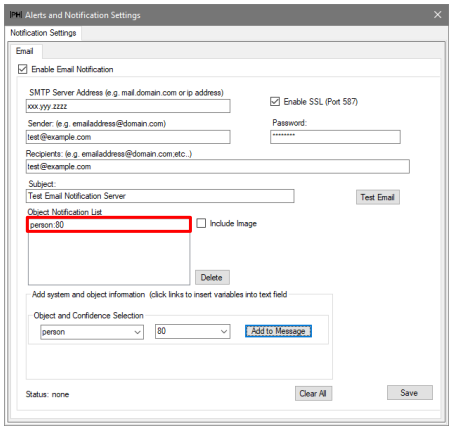


Figure 70

This will add the **Object and Confidence Selection** to the **Object Notification List**. The **Object Notification List** contains the individual **Object and Confidence** selections that were added to the **Object Notification List**. Both the **Object Name:Confidence Level** are displayed in the **Object Notification List** to uniquely identify the **Email Notification** settings for ProHawk Vision to monitor. (*Figure 70*)

To add the image that triggers an **Email Notification**, *click* on the **Include Image** checkbox to the right of the **Object Notification List**. This will add the image that triggered the **Email Notification** into the body of the email message. (*Figure 71*)

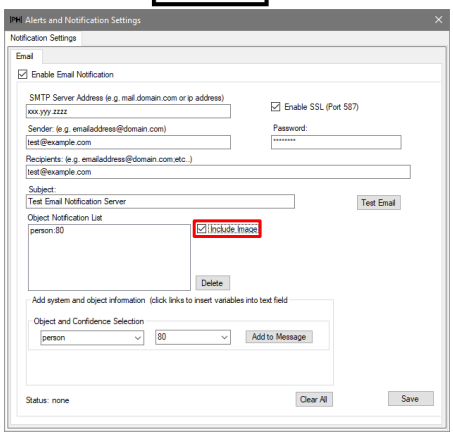


Figure 71

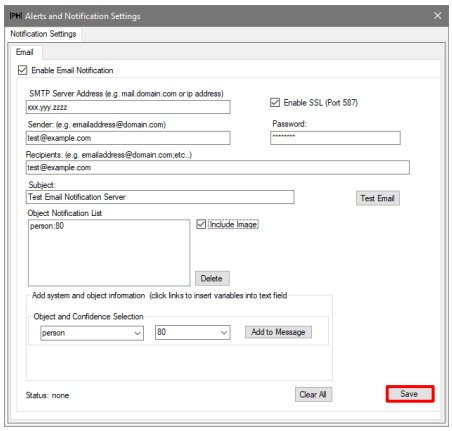


Figure 72

To **Save** the **Alerts and Notification Settings**, *click* on the **Save** button in the lower right hand corner of the **Alerts and Notifications Settings** dialog box. This will **Save** the **Alerts and Notifications Settings** in ProHawk Vision. (*Figure 72*)

To **Delete** item(s) on the **Object Notification List**, first *click* on the **Object(s)** that you want to **Delete** in the **Object Notification List**. (*Figure 73*)

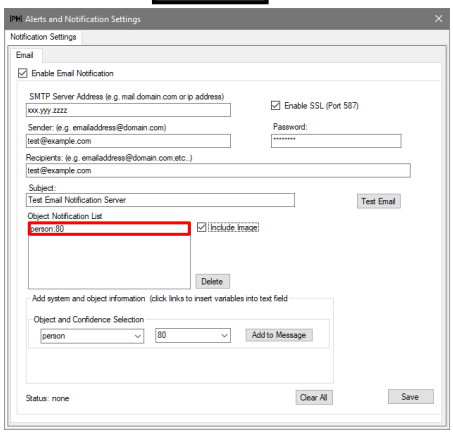


Figure 73

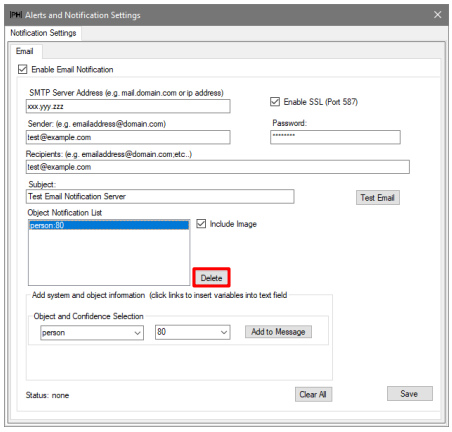


Figure 74

This will select the **Object(s)** indicated by a blue highlight bar. To remove the **Object(s)** from the **Object Notification List**, *click* on the **Delete** button. (*Figure 74*)

To **Clear All** the information that is filled in the **Alerts and Notifications Settings** dialog box, *click* on the **Clear All** button. (*Figure 75*)

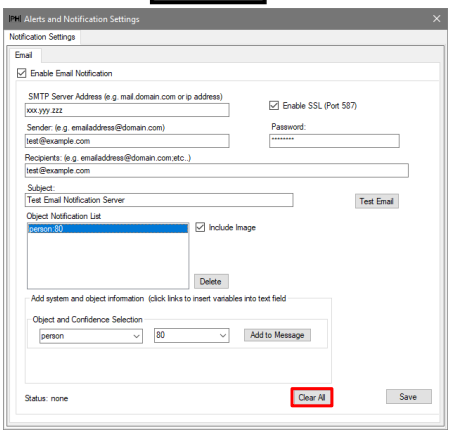


Figure 75

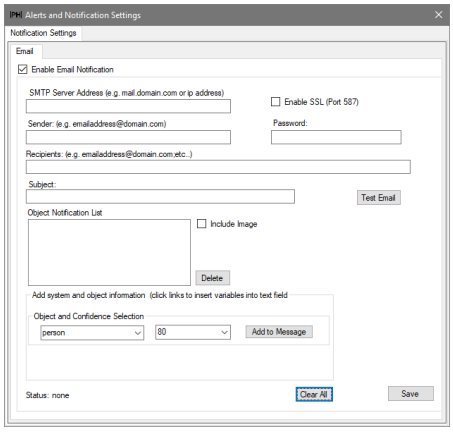


Figure 76

This will remove all the information that has been filled out in the **Alerts and Notification Settings** dialog box fields. (*Figure 76*)

4.6 About Menu

The ProHawk Vision application provides an **About** menu that provides access to license key information. (*Figure 77*)

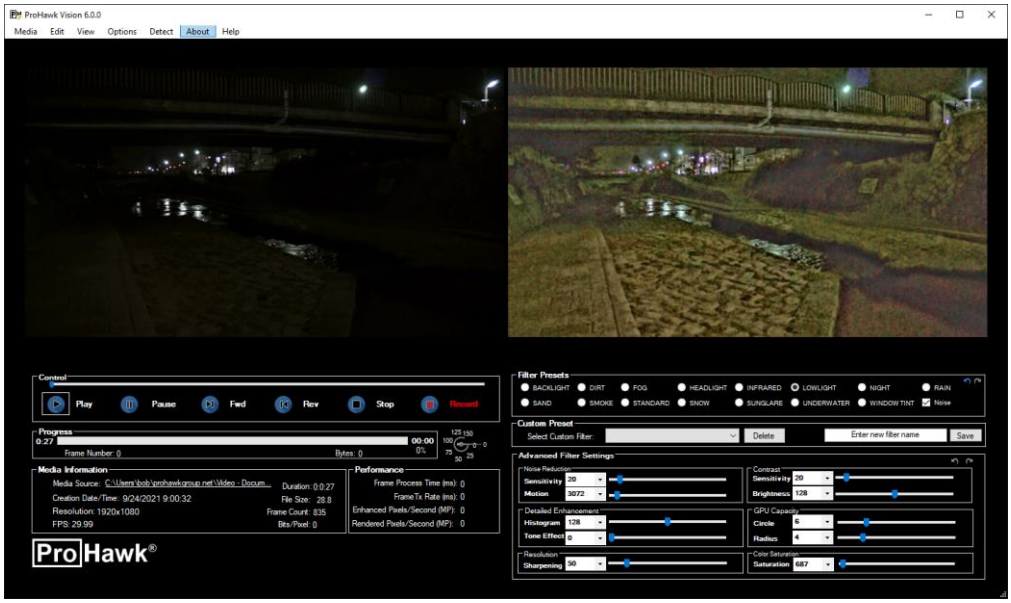


Figure 77

The **license key information** that is display in the dialog box is the expiration date of the license. (*Figure 78*)

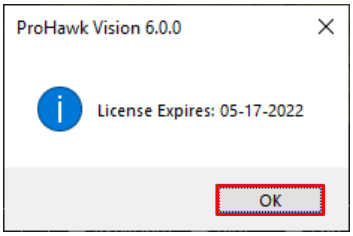


Figure 78

4.7 Control Section

The ProHawk Vision Application provides a **Control Section** with media player controls for video control and record capabilities. This allows users to Play, Pause, Forward, Rewind, Stop, or Record video streams. *Click* on the **Control** buttons to manipulate the video. (*Figure 79*)

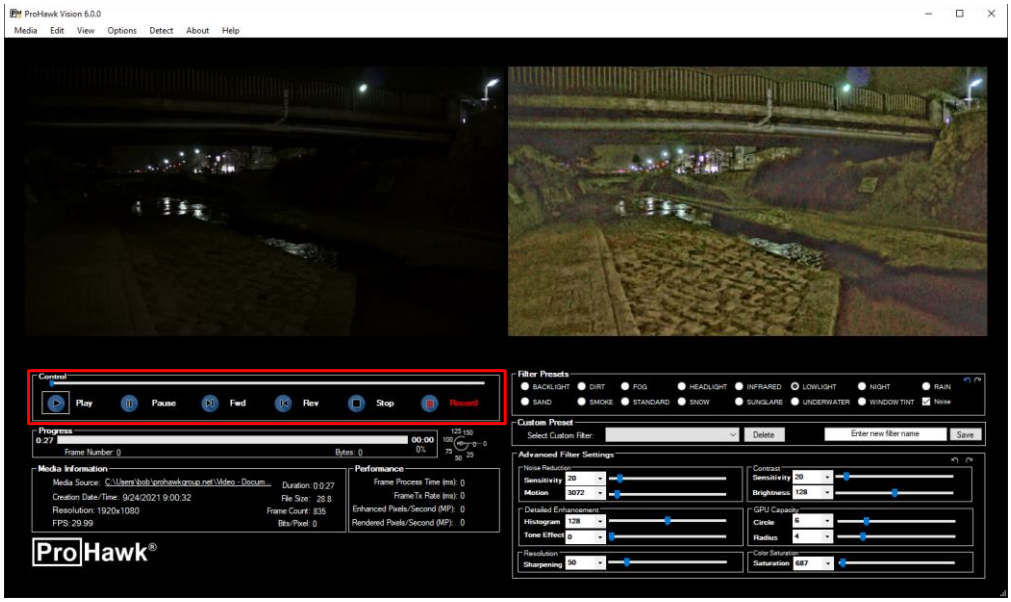


Figure 79

- Forward/Rewind slider – Forwards or Rewinds the current video by time.
- **Play** – Plays the currently loaded video
- **Pause** – Pauses the video being played
- **>>** – Forwards the current video by frames
- **<<** – Rewinds the current video by frames
- **Stop** – Stops and terminates the video enhancement
- **Record** – Record control for the video

Commented [BB1]:

4.7.1 Record Clarified Video

The current video stream can be recorded and stored. *Click* the **Record** button to start and stop recording. (*Figure 80*)

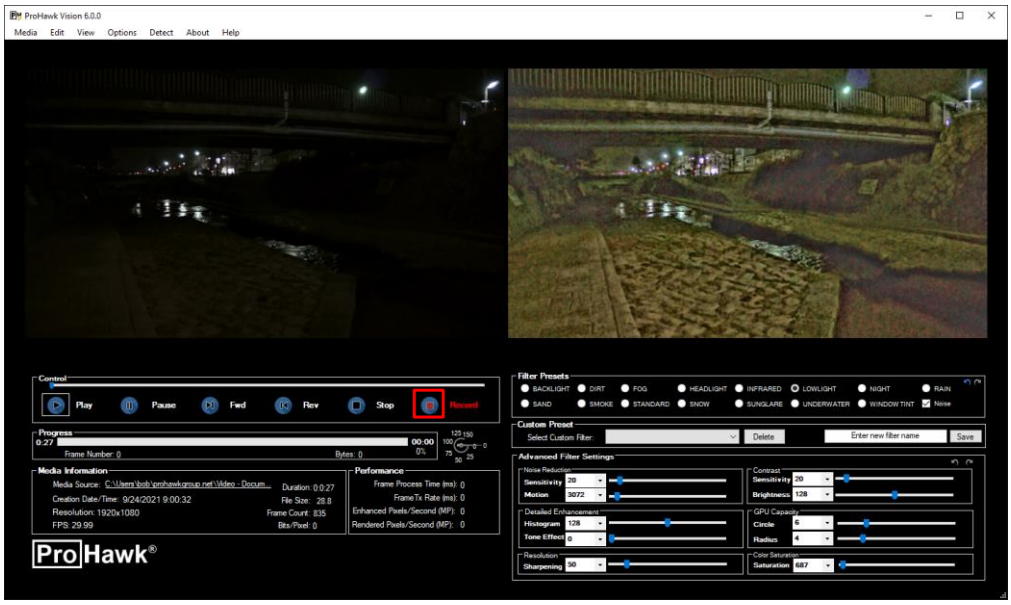


Figure 80

When the enhancement process is completed, the following dialog will prompt if you want to open the location of the file. If you wish to view the folder that contains the recorded video, *click* on the **Yes** button. (*Figure 81*)

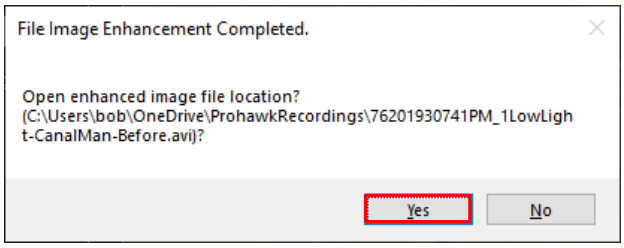


Figure 81

Below shows the location of the recorded enhanced video that the system produced. The default storage location is the installed users Videos folder. (*Figure 82*)

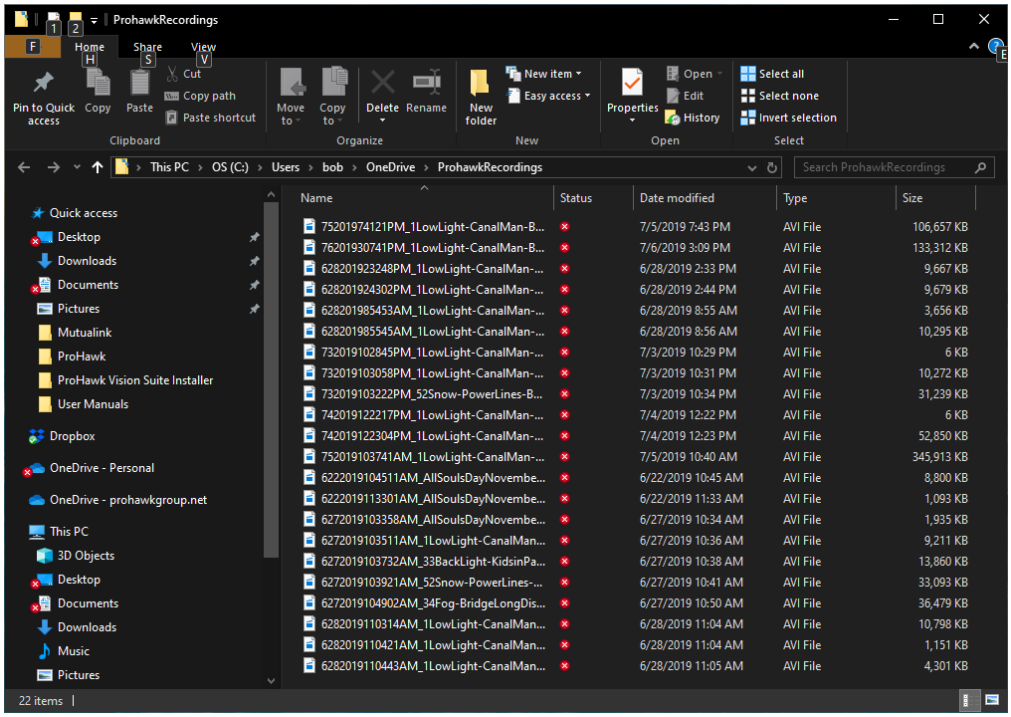


Figure 82

4.8 Progress Section

The ProHawk Vision Application provides a **Progress Section** with several progress status indicator metrics. (*Figure 83*) The progress status metrics include:

- **Progress Bar**
  - **% progress**
  - **Begin timestamp**
  - **End timestamp**
- **Frame #** - Current frame count number of the video
- **Bytes** – Total bytes process of the video

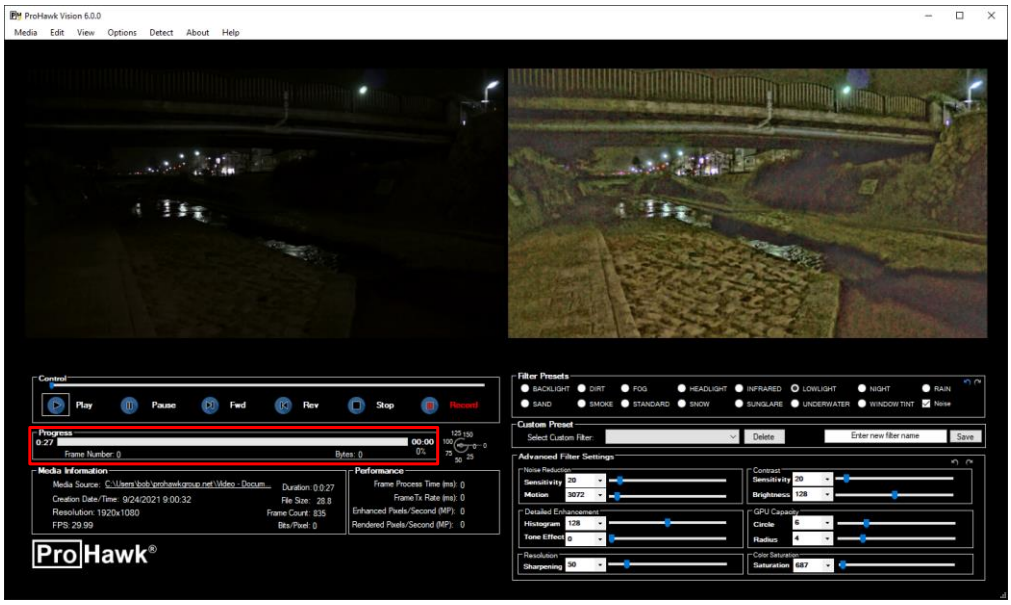


Figure 83

4.9 Media Information Section

The ProHawk Vision Application provides a **Media Information Section** containing metadata information about the video. (*Figure 84*) The metadata information about a video stream or file includes:

- **Media Source** – Name of the source of the video
- **Creation Date/Time** – The date and time the video was created
- **Resolution** – The video number of distinct pixels in each dimension, typically width x height
- **FPS** – Frames per second of the video
- **Duration** – Length of time of the video
- **File Size** – Storage size of the video
- **Frame Count** – Number of frames in the video
- **Bits/Pixel** – Number of bits of information to represent the color channels of each pixel

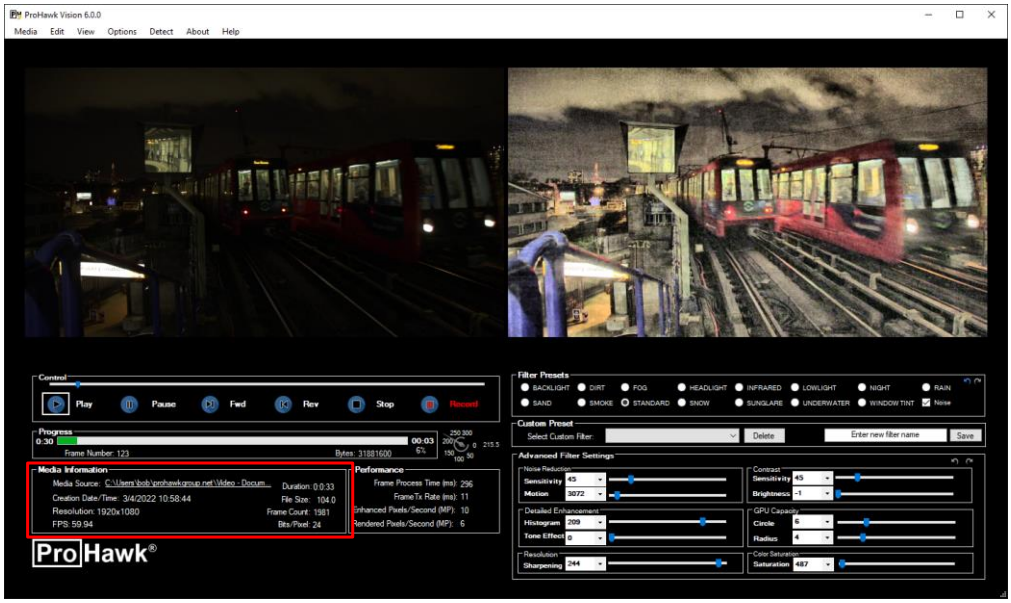


Figure 84

4.10 Performance Section

The ProHawk Vision Application provides a **Performance Section** containing metadata information about the video. (*Figure 85*) The performance information about a video stream includes:

- **Frame Process Time (ms)** – The time, in milliseconds, for the application to process and render video in the GUI
- **Frame Tx Rate (ms)** – The time, in milliseconds, for the application to transfer a frame of video
- **Enhanced Pixels/Second (MP)** – The number of Megapixels process in 1 second
- **Rendered Pixels/Second (MP)** – The number of Megapixels rendered in the GUI in 1 second

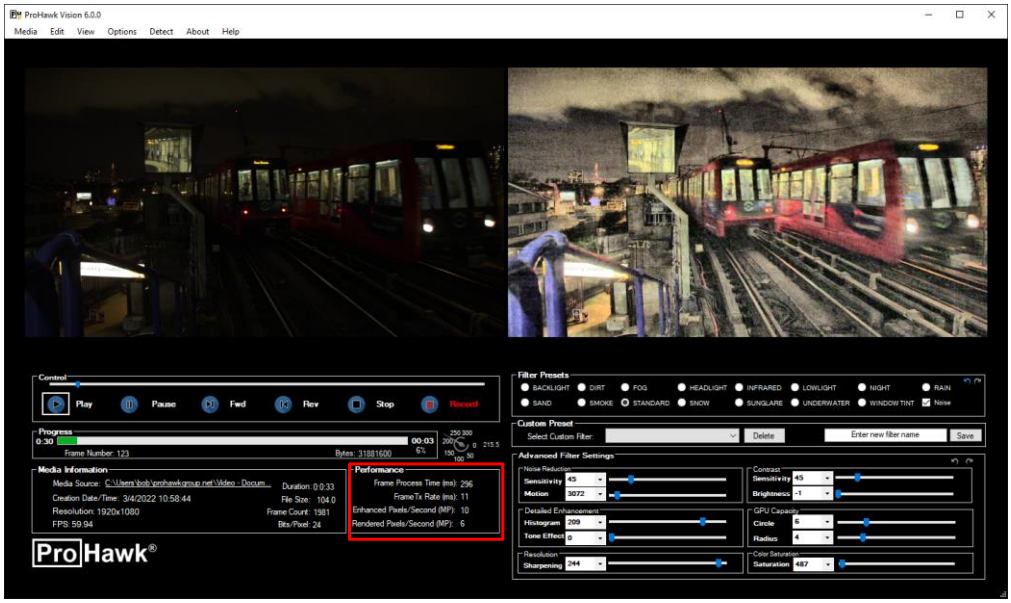


Figure 85

Located above the **Performance Section** is a **performance gauge** for the underlying ProHawk Vision engine. The **performance gauge** displays the throughput of the ProHawk Vision engine in milliseconds (ms).

4.11 Filter Presets Section

The ProHawk Vision Application provides a **Filter Presets Section** containing one click preset adjustments for problematic video. **Filter Presets radio buttons** assist users in clarifying challenging visual conditions. (*Figure 86*)

The problem conditions include:

- BACKLIGHT
- DIRT
- FOG
- HEADLIGHT
- INFRARED
- LOWLIGHT
- NIGHT
- RAIN
- SAND
- SNOW
- SMOKE
- STANDARD
- SUNGLARE
- UNDERWATER
- WINDOW TINT

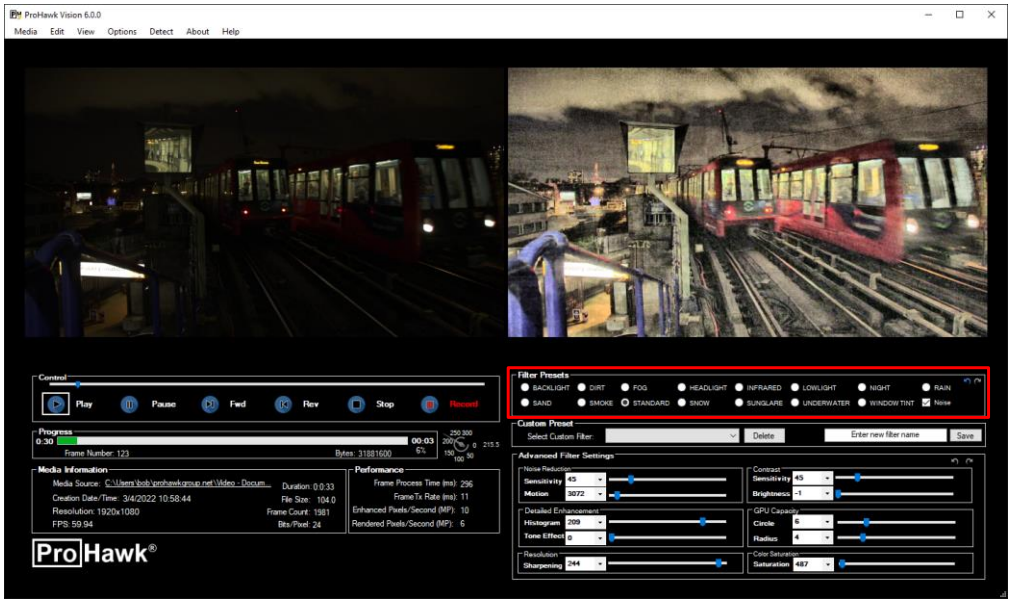


Figure 86

4.12 Custom Presets Section

The ProHawk Vision Application provides a **Custom Presets Section** containing controls to save, select, and delete your own **Custom Preset** filters. (*Figure 87*) **Custom Presets** controls include:

- **Select Custom Filter** – Choosing the custom filter saved to use
- **Delete** – Remove a custom filter created
- **Save** – Enter a new customer filter name and save it with the current advanced filter settings

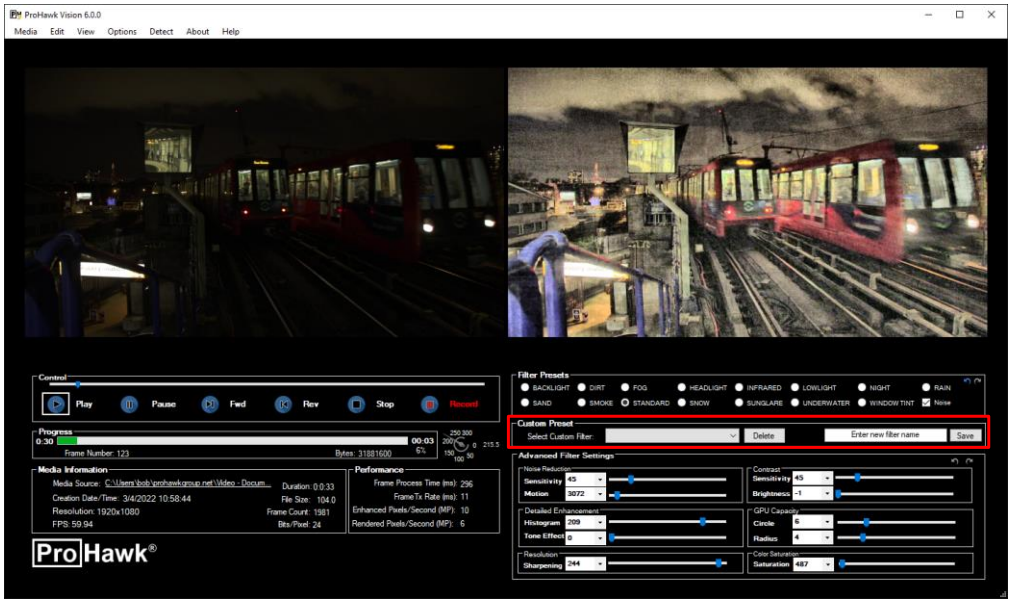


Figure 87

4.13 Advanced Filter Setting Section

The **Advanced Filter Settings** section will be displayed that contains specific adjustments that may have an impact on details to be revealed. (*Figure 88*) Many times, when looking for specific details in compromised imagery or video, these parameters can be individually adjusted to achieve hidden details. The Advanced Filter Settings section contains these grouping and parameter adjustments:

- **Noise Reduction**
  - **Sensitivity**
  - **Motion**
- **Detailed Enhancement**
  - **Histogram**
  - **Tone Effect**
- **Resolution**
  - **Sharpening**
- **Contrast**
  - **Sensitivity**
  - **Brightness**
- **GPU Capacity**
  - **Circle**
  - **Radius**
- **Color Saturation**
  - **Saturation**

4.13.1 **Noise Reduction**

The **Noise Reduction** parameters reduce or remove noise from compromised video. Examples of problem environment conditions that require extensive **Noise Reduction** include: Rain, Smoke, Snow, Dirt, Sand, and Underwater. (*Figure 88*)

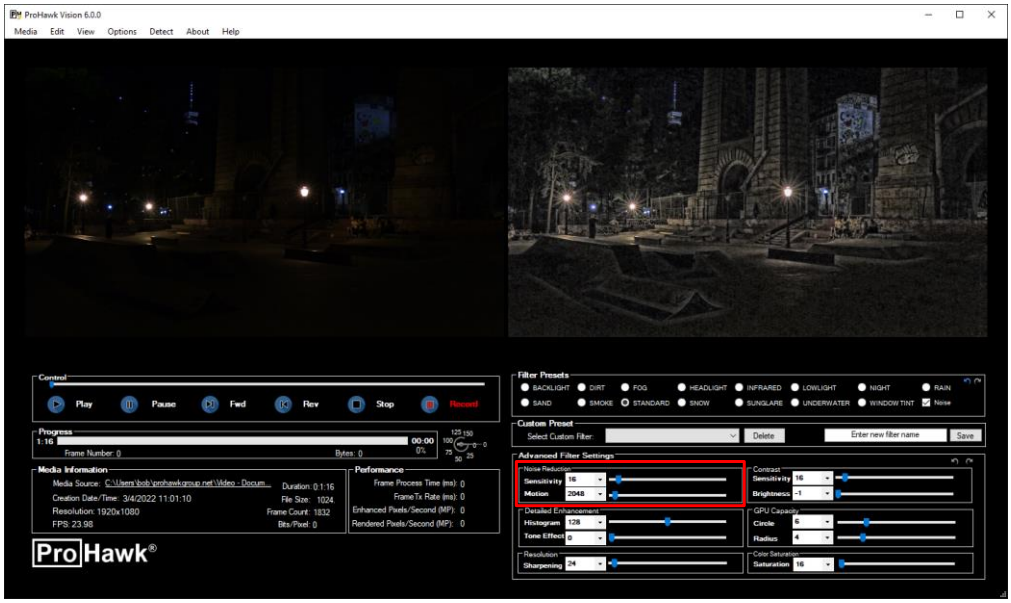


Figure 88

4.13.1.1 Sensitivity

Noise Reduction Sensitivity adjusts the ratio/percentage brightness information for combining the ProHawk Vision processed image and histogram image. The parameter adjusts/sets the ratio versus the histogram, the larger the number, the more impact the histogram produces on the result. Specifies parameters for accumulating processed images and reducing noise. When set to 0, it will adjust the ProHawk Vision processed image 100%. The **Noise Reduction Sensitivity** parameter defaults to 0. Range: 0-256

4.13.1.2 Motion

The **Noise Reduction Motion** parameter adjusts the level of residual image reduction effect due to movement compensation. This is a threshold to recognize an object as a moving pixel(s). When the setting is lower, ProHawk Vision becomes more sensitive to changes and residual image is reduced, but with less noise elimination effect. When the setting is higher, it would become less sensitive, and with more noise elimination effect, yet residual image would become more noticeable. Specify parameters for reducing noise by adapting to the motion of the image.

In most conditions, setting ProHawk Vision between 1024-3072 works well. On a fixed camera/sensor, decrease ProHawk Vision to detect moving objects, and increase **Noise Reduction Sensitivity**. The **Noise**

Reduction Motion should always be **ON** if **Noise Reduction Sensitivity** is **ON** under normal circumstances. The setting of **Noise Reduction Sensitivity ON** and **Motion** is **OFF** should be used only when it is desired to remove the movements of snow or rain, etc. using a fixed camera. Range: 0-256.

4.13.2 Detailed Enhancement

The **Detailed Enhancement** parameters for ProHawk Vision enable fine tuning and revealing details in hidden areas of video. Examples of problem environment conditions that require **Detailed Enhancement** include almost every situation. (*Figure 89*)

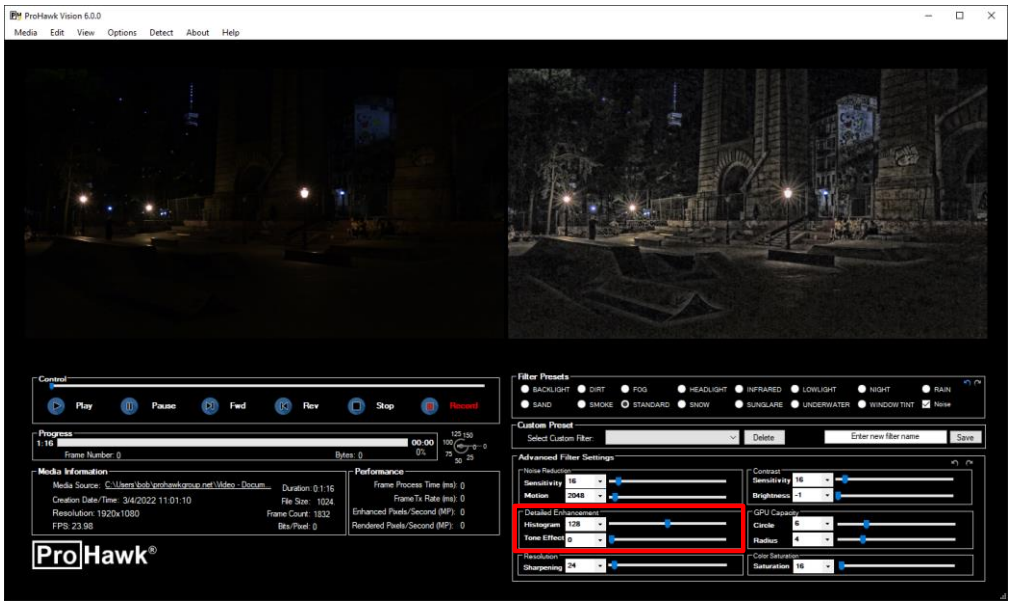


Figure 89

4.13.2.1 Histogram

Detailed Enhancement Histogram adjusts the ratio/percentage for combining the input image and histogram image. The **Detailed Enhancement Histogram** parameter adjusts the level of ProHawk Vision enhancement effect. Images and video are improved in low contrast situations such as fog, rain, or snow, and in situations of too much contrast such as backlight or direct sunlight, or in darkness at night. The higher the setting is, the clearer the contrast will become, but the noise may also increase. This parameter specifies the Detailed Enhancement Histogram between the original image and the processed image. Set it at 128 (50%) under normal circumstances. When set to 256, the image is processed by the ProHawk Vision 100%. The **Detailed Enhancement Histogram** defaults to 0. Range: 0-256.

4.13.2.2 Tone Effect

The **Detailed Enhancement Tone Effect** parameter expands the luminance range of ProHawk Vision. The **Detailed Enhancement Tone Effect** is for adjusting the contrast of the **Tone Effect**. It is available if the **Contrast Brightness** parameter is turned **OFF**.

Set the **Detailed Enhancement Tone Effect** to 0 under normal conditions, gradually increase it until optimal results achieved. When the setting is high, it may cause fuzzy outlines to appear more noticeable on top of buildings into the sky. When it is set low to 0, it does not expand the luminance range. When it is set high to 256, it will expand the luminance range to the maximum capacity of ProHawk Vision. Range: 0-256.

4.13.3 Resolution

The **Resolution** parameter setting controls how the ProHawk Vision will process video according to the resolution of the source device or desired sharpening enhancement results for object detection and tracking. (*Figure 90*)

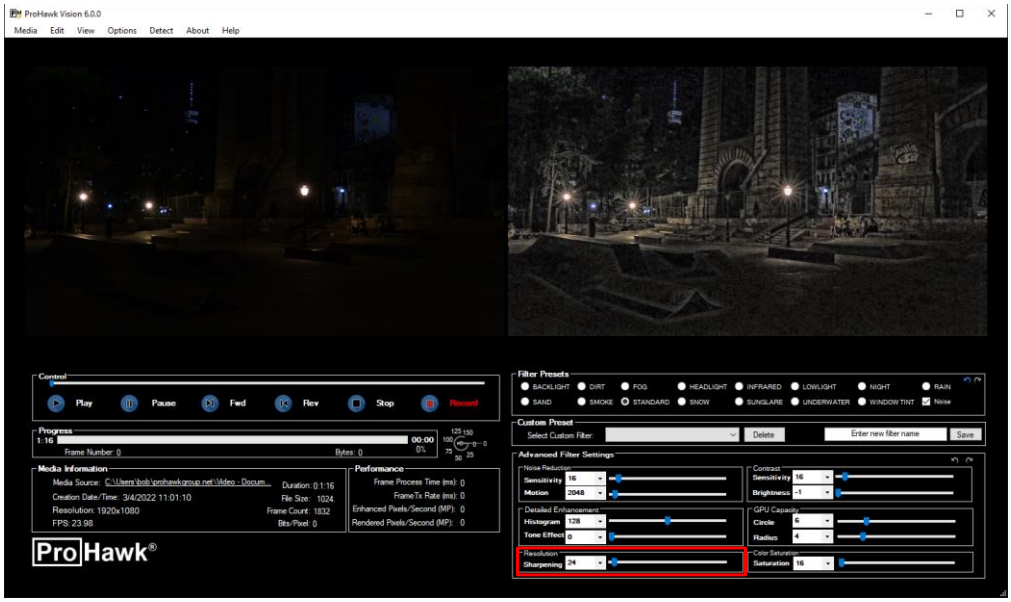


Figure 90

4.13.3.1 Sharpening

Sharpening specifies the range to be referred to from the pixel to be processed in radius (pixel). **Sharpening** considers the width and height of the radius of processing range of the ProHawk Vision. The smaller the setting is, the clearer the contrast for details will become, but it will result in a painting-like image as the contrast for the entire screen is averaged. Generally, set it low to emphasize small parts and fine details, or high if natural image quality is desired, or when there is

too much noise. Set it in the middle under normal circumstances for a 1080p video. Set it lower between 20-30 for SD 480p-720p video. Set it higher between 128-256 for UHD 4K-8K video. Set higher to increase edge sharpening for computer vision and analytics applications.
Range: 1-256

4.13.4 Contrast

The **Contrast** parameters provide for adjustment to the contrast of the ProHawk Vision. Examples of problem environment conditions that require extensive **Noise Reduction** include: Rain, Smoke, Snow, Dirt, Sand, and Underwater. (*Figure 91*)

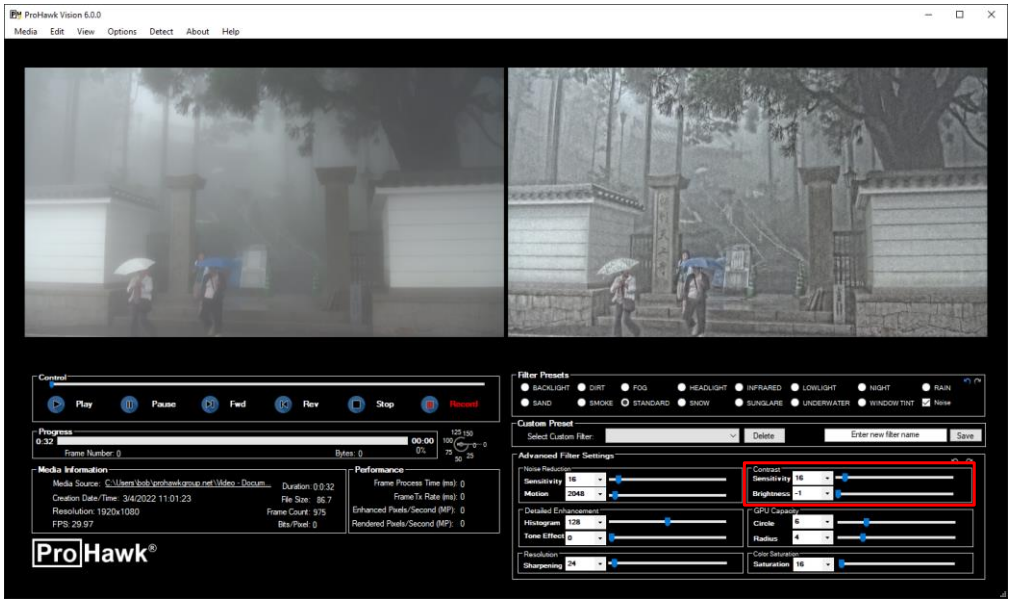


Figure 91

4.13.4.1 Sensitivity

Contrast Sensitivity limits the luminance range of the ProHawk Vision. Set to a lower number reduces the level of residual image effect due to movement compensation. This is a threshold to recognize an object as a moving pixel(s). The **Contrast Sensitivity** parameter defines the distance allowance between the adjacent pixels (for example, luminance 10 and luminance 11 becomes luminance 15 by ProHawk Vision…the distance 5 is calculated from the luminance 10) limiting the slope of the brightness fluctuation amount. This parameter allows for local contrast adjustments to the imagery enabling higher contrast viewing. Set it at 16 under normal circumstances.

Decrease the **Contrast Sensitivity** value if random noise is noticeable in the video. When the **Contrast Sensitivity** setting is lower, ProHawk Vision becomes more sensitive to changes and residual image

is reduced, but with less noise elimination effect. Raise the **Contrast Sensitivity** setting higher to obtain better contrast or if contrast is insufficient. If the video is dark, the setting should be turned higher. When the setting is higher, ProHawk Vision becomes less sensitive, and with more noise elimination effect, yet residual image would become more noticeable. If it is dark and noise is conspicuous, reduce the **Contrast Sensitivity** to between 8 to 12, while also increasing the Contrast Brightness. When the **Contrast Sensitivity** is set to 256, the **Histogram Tone Effect** enhancement is turned **OFF**, **Contrast Brightness** and **Detailed Enhancement Tone Effect** are disabled. Range: 1-256

4.13.4.2 Brightness

Contrast Brightness changes the luminance range of ProHawk Vision. **Contrast Brightness** is for automatically adjusting the brightness of the tone effect according to the screen area. In typical use cases unless there is conspicuous noise, set the Contrast Brightness to automatic by selecting the Auto checkbox that overrides the **Contrast Brightness** slider bar. Specify parameters for brightness adjustment. When Auto is checked, brightness adjustment is done automatically.

When **Contrast Brightness** is **ON** and **Contrast Sensitivity** is set low for dark video that is noisy, the entire screen is adjusted by a fixed brightness. When **Contrast Brightness** is set in the middle to 128, ProHawk Vision will adjust brightness by 50%. Range: 0-256

4.13.5 GPU Capacity

The **GPU Capacity** parameters provide adjustment for optimal operation tuned to the capacity, throughout, and performance of the NVIDIA GPU being used. (*Figure 92*)

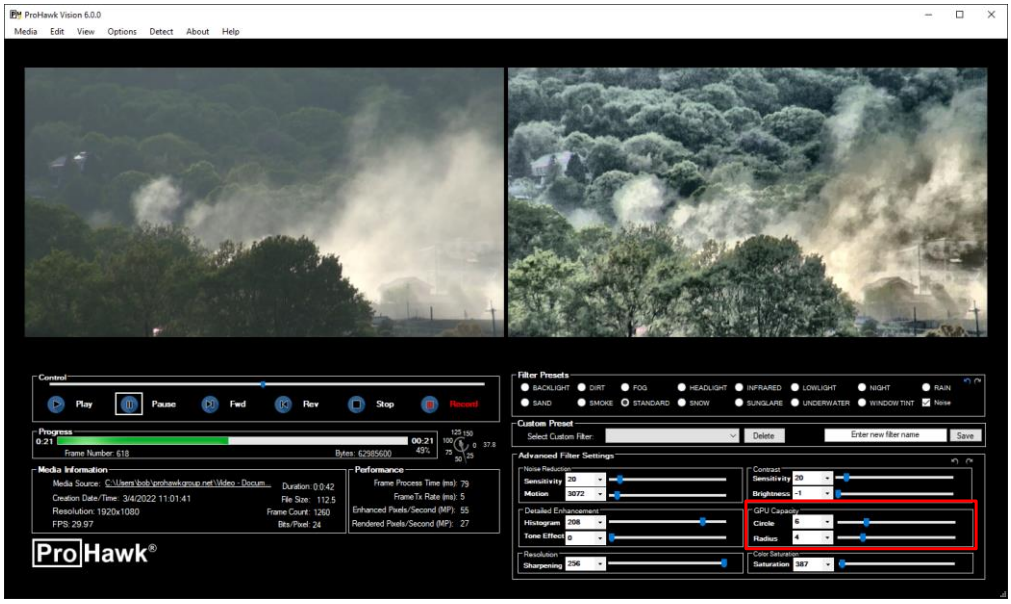


Figure 92

4.13.5.1 Circle

GPU Capacity Circle is the number of divisions of circles in the processing range. Specify how many divisions are to be referenced from the processing target pixel to the radius specified by Radius. The number of divisions and processing time are proportional. Typically, 8 is the optimal setting, but in some cases where the video has many 45-degree lines, the image quality can be improved by setting to an odd number. Range: 3-16

4.13.5.2 Radius

Radius is the number of divisions of radius of processing range of ProHawk Vision. When referring to the pixel to be processed, it specifies how many surroundings to divide. The number of divisions and processing time are proportional. Range: 1-16

4.13.6 Color Saturation

The Color Saturation parameter reveals vivid color in dark video scenes. (*Figure 93*)

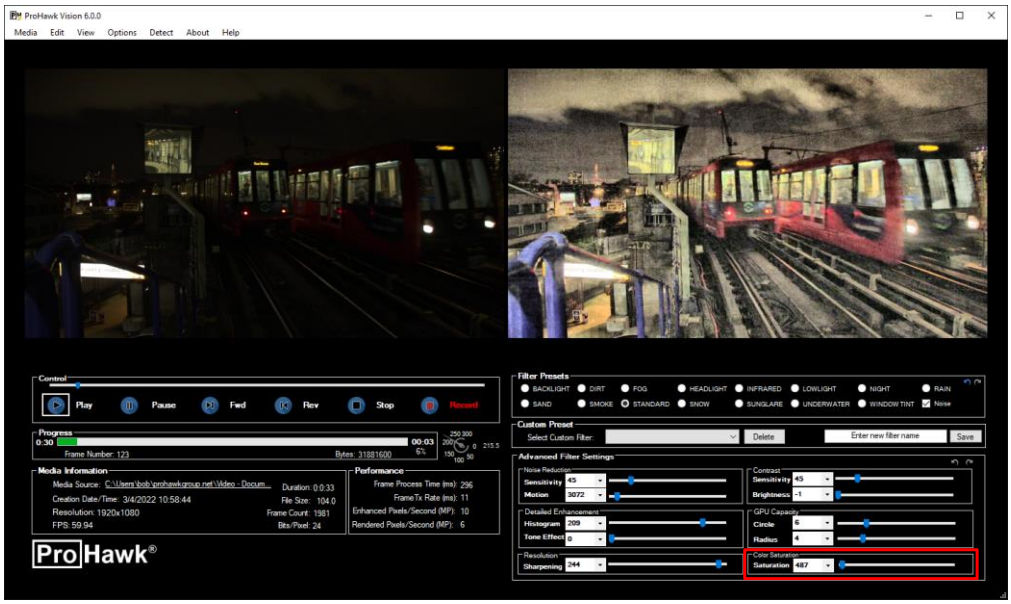


Figure 93

4.13.6.1 Saturation

Saturation changes the magnification of color adjustment in ProHawk Vision. The **Color Saturation** parameter adjusts the level of ProHawk Vision color correction effect. Turn the **Color Adjustment Saturation ON** under normal circumstances with slight color correction.

It may be turned **OFF** if it becomes difficult to see the image with color enhancement when the entire screen has color such as being in the ocean, etc. Set it higher temporarily to check color only when it is difficult to recognize color in video due to a dark video or a foggy video. Specify parameters for emphasizing color information that tends to be lost due to sharpening. The Color Saturation parameter defaults to 0. Range: 0-512

5 License Key Update

Figure 94

The ProHawk Vision License Key Update program allows you to upgrade and update your license key. To access the ProHawk Vision License Key Update program, *click* on the **ProHawk Vision License Key Update**, **Start Menu** option. This will run the ProHawk Vision License Key Update application. (*Figure 94*)

5.1 License Key

Enter the 25-character license key, then *click* the **Next >** button. (*Figure 95*)

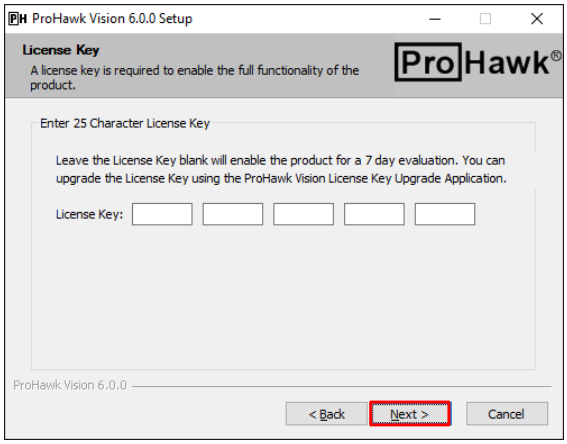


Figure 95

5.2 Product Registration

Fill in the registration information form, then *click* the **Next >** button to complete. (*Figure 96*)

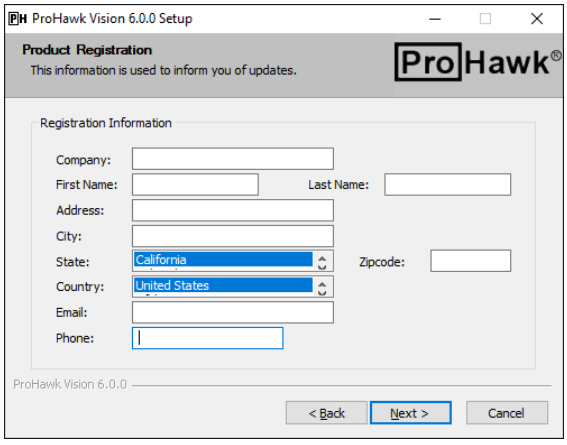


Figure 96

6 Uninstaller

This section covers the removal of ProHawk Vision from your computer.

7.1 Initiate Uninstaller

To begin the uninstaller, go to your Windows Settings/Apps & features. *Select* the **ProHawk Vision v5.0.0**. Then *click* on the **Uninstall** button. (*Figure 97*)

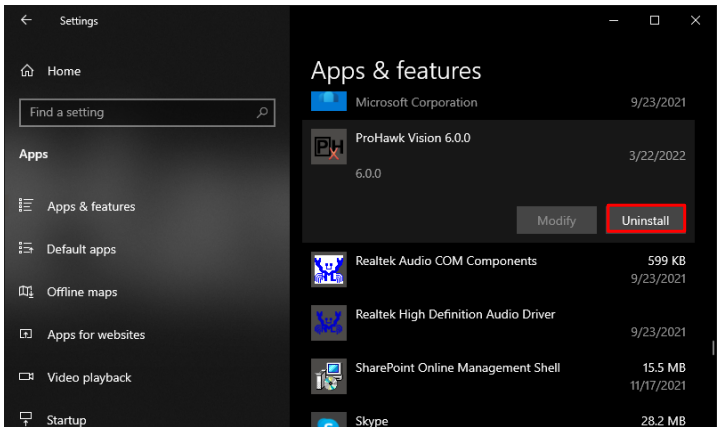


Figure 97

You will be prompted by Windows "This app and its related info will be uninstalled." *Click* on the **Uninstall** button. (*Figure 98*)

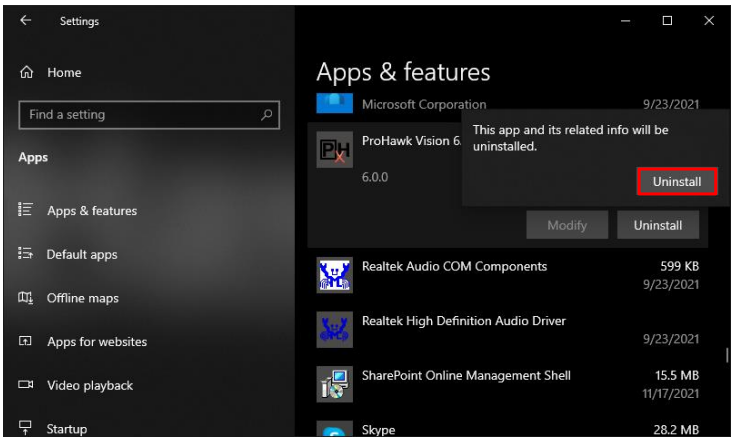


Figure 98

7.2 Confirm Uninstall

To confirm uninstall, *click* the **Yes** button when prompted. *Click* the **No** button to cancel. (*Figure 98*)

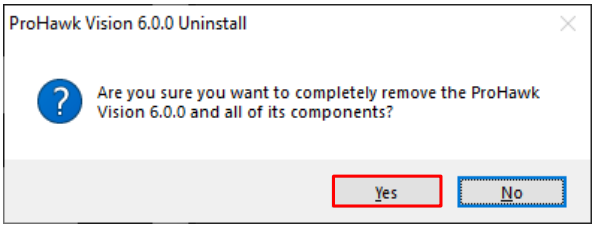


Figure 98

7.3 Uninstalling

A progress dialog will appear after confirming to uninstall, wait for it to finish running. If you wish to end the uninstallation at any time you may *click* the **Close** or **Cancel** button. (*Figure 100*)

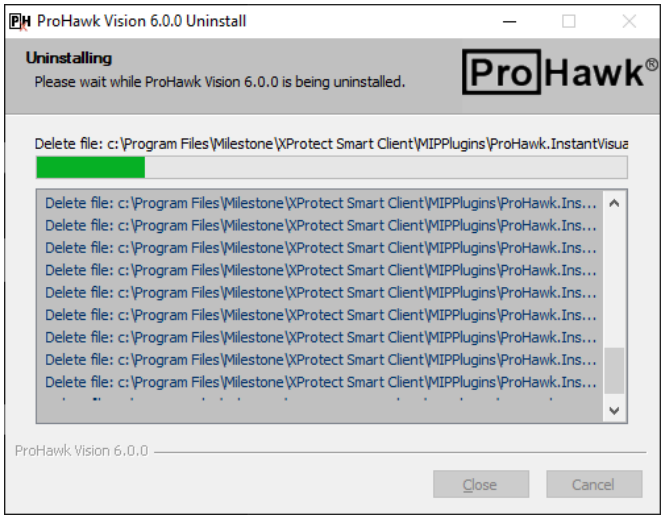


Figure 100

7.4 Configuration Information Removal

The uninstaller prompt with a dialog to ask you if you want to completely remove the ProHawk Vision Server configuration information. *Click* **Yes** to remove the configuration information or *Click* **No** to preserve the configuration information. (*Figure 101*)

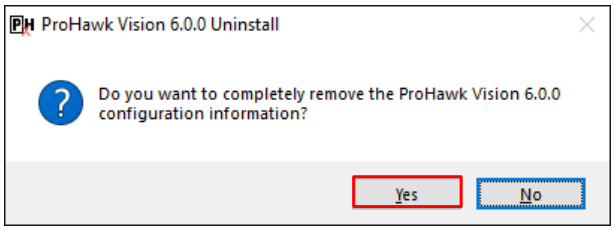


Figure 101

7.5 Finished Uninstalling

When the uninstaller is finished a dialog will tell you that ProHawk Vision Application has been successfully removed from your system. *Click* **OK** to finish the uninstallation. (*Figure 102*)

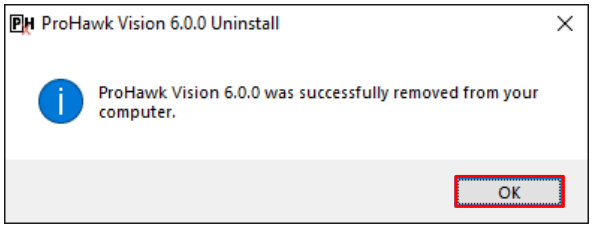


Figure 102