



Digital Opacity Compliance System

Second Generation



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FNSB Overview
October 16, 2012
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How DOCS II Works

- **Contrasting background with foreground within user-selected regions of a JPG image of the visible emission evaluation, (VEE)**
 - **DOCS II Data Capture**, validates entire VEE record for integrity
 - Images taken in conformance with selected “Rule” e.g. Method 9 (15 second intervals)
 - Location Documented (sun angle, tilt, distance, weather, etc.)
 - **DOCS II Analysis**, user selects area of plume and background
 - DOCS II uses algorithms to determine opacity of image
 - DOCS II stores archive of validated analysis
- **Less variation than Method 9 against NIST traceable transmissometer**
- **Ideal conditions (high contrast) DOCS II $\pm 5\%$, Method 9 $\pm 10\%$**
- **Difficult conditions (low contrast) DOCS II $\pm 10\%$, Method 9 $\pm 15\%$**
- **Precision of DOCS II $\pm 5\%$ for 4 readers, Method 9 $\pm 15\%$ for 4 readers**
- **Flexible applicability**
 - **Clouds, Rain, Snow**
 - **Trees, Buildings**
 - **Day, Night**
 - **Close and Far**
- **Significant Data Collected and Analyzed by Industry SME’s for 7 + Years**
- **ASTM International and US EPA Domestic Standards Supported**

Simple, Fast, Reliable, Repeatable





ASTM D7520 vs Method 9

ASTM D7520-09 (10/09)

- Camera, computer, software
300 reading, certification
- Operator training
 - 8 hour course
 - 50 plume certification
 - $\pm 7.5\%$ overall and $\leq 15\%$
- Cert. duration 3 ½ years
- Digital Validated Record
- Operational conditions
 - Unlimited backgrounds
 - Unlimited weather conditions

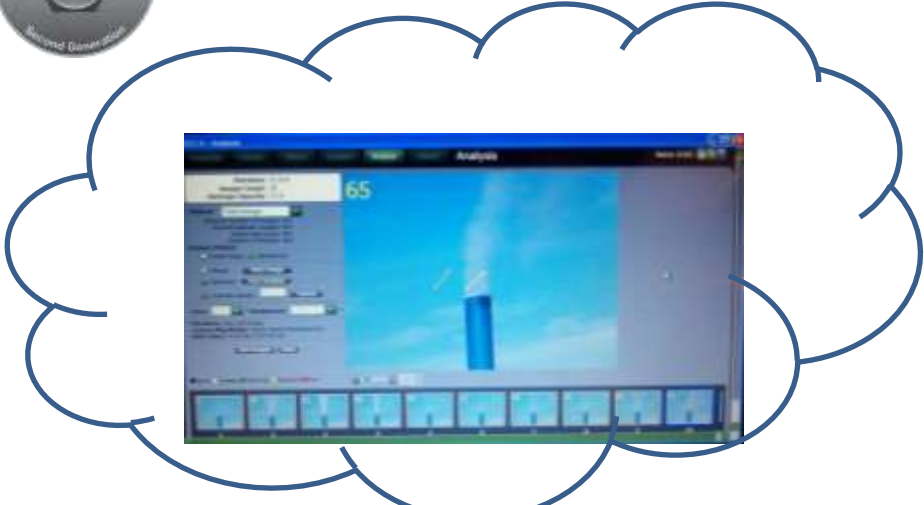
EPA Method 9

- Person With/Without Device
50 reading, certification
 - 8 hour course
 - 50 plume certification
 - $\pm 7.5\%$ overall and $\leq 15\%$
- Cert. duration 6 months
- Paper Non-Validated Record
- Operational conditions
 - Unlimited backgrounds
 - Unlimited weather conditions

***Electronic Method 9, allows separation of data
“Capture” from “Analysis”***



Opacity Lab Analysis, by Subject Matter Experts



DOCS II SaaS Simple, Fast, & Accurate

Field Data Collection



Height of Emission Point	200
Height of Emission Point relative to Observer	204
Distance to Emission Point	291
Direction to Emission Point	18
Vertical Angle to Observation Point	35
Direction to Observation Point	12
Distance to Observation Point from Emission Point	149
Direction to Observation Point from Emission Point	0
Distance to Boundary	500





EPA ALT 082

- Additional Certification Requirements
 - 6 certification runs must have various backgrounds
 - Include RGB, trees, clouds, sky, buildings.
 - Four different Analyzers of all 6 runs (300 images)
 - All must pass all 6 image sets
 - Power up self test
 - Analyzes all 300 certification images answers matched to certification no deviation allowed
- Applicability
 - 40 CFR All of Subparts 60, 61, 63 in lieu of EPA Method 9

***EPA ALT 082 exceeds ASTM certification requirements,
Defines applicability and acceptance***



EPA ALT 082 Update

Published as Broadly Applicable Standard

- Federal Register February 2012
 - Can be used in Lieu of Method 9
 - Federal Permit changes not required
 - Has limits of ASTM D7520-09
 - Case by case allowed for stacks >7' exit (May 2012)
- 301A Test being defined to eliminate 7' limit
 - EPA desires comparison to Human Method 9 observers
 - RMB Consulting wants comparison to in-stack transmissometers
 - In-stack opacity and exit opacity correlation not possible but RMB want to use DOCS II to determine how to do this.
 - Virtual Technology LLC is supporting EPA direction per 301a “comparison with current compliance method”



ASTM D7520 Update



- D7520-12 Updated Approved by D22-03 In April 2012
 - Allows use of any Digital Image Device
 - High Definition Digital Recorders
 - CDMA based Cameras
 - CCD based Cameras
 - Matches ASTM Certification requirements to EPA ALT 082
 - Allows certification of optical and digital zoom
 - Enforces Performance of any configuration within Method 9 tolerances and precision and bias of ASTM
- Fugitive Dust Applicability
 - Testing study completed January 2012
 - New standard submitted to ASTM April Ballot
 - New standard pulled from ballot, based on technical procedure complaint by RMB
 - ASTM Research Report submitted to committee July 2012
 - Updated standard resubmitted to ballot August 5, 2012



D7520 Update will allow Web Cams

FESTIVAL FAIRBANKS

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Festival Fairbanks - First Avenue cam - 2012-10-16 05:05:10 PM



ArcticCam Tue Oct 16 2012 04:29:19 PM



Mounted Web Cam View





Problems & Solutions

- The top three problems defending Human Method 9 readings.
 - I. VEE record not technically correct, missing data, sun angle, point of view.....
 - II. VEE not performed by Certified Observer
 - III. Smoke School Quality Assurance Protocol not meeting the requirements set forth by USEPA for VE certification programs.
- DOCS II SaaS Model separates data collection from Certified Analysis.
 - I. VEE record completely validated upon save.
 - II. Certified Analyst always available to perform analysis
 - III. Certified Analyst history of opacity determination across hundreds of readings eliminating personnel bias.

***DOCS II SaaS,
Complete & Validated, Certified, Reproducible
Most Samples are sent to Labs
Why not Opacity samples?***



Precedent

- **Lemaire v. Cooper/T. Smith**

23RD JUDICIAL DISTRICT COURT FOR THE PARISH OF
ASCENSION STATE OF LOUISIANA DOCKET NO. 99094
DIVISION "E" August 2011.

- 1) Pictures taken by an untrained operator with an uncertified camera can not be used for Opacity
- 2) Camera and operator certification is available "could have been used" .
- 3) Camera systems have to meet Operational requirements of LA DEQ

- **ASTM D7520 Validated**

- 1) Cameras and picture takers require Certification
- 2) Certification of cameras and operators is commercially available
- 3) Enforcement agencies set operational conditions

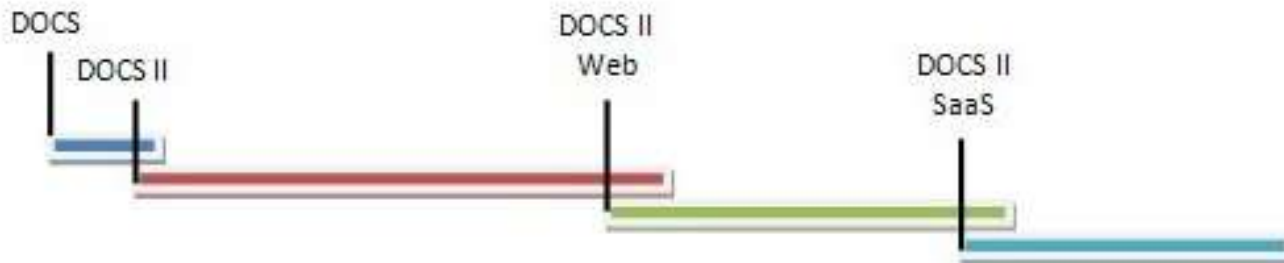
VT LLC/ETA on the defense team of this case





Evolution Of DOCS II (2006-2012)

Evolution of DOCSII...The Road to SaaS





Visual Emissions Evaluation

Samples in the Field, Data Analysis in the Lab

DOCS II Software as a Service (SaaS)

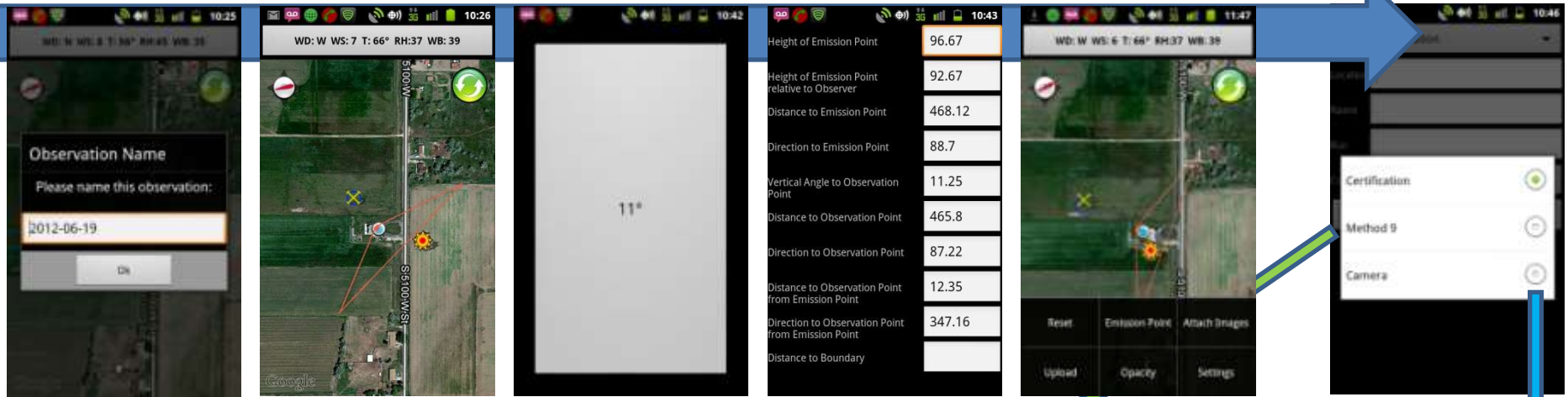
- Smart Phone/Camera Data Collection for DOCS II
 - Smart Phone Validated VEE Record
 - Camera Images of Observation
- Uses Smart Phone, to measure VEE data including:
 - Weather Conditions – From Web NOAA
 - GPS Position Location, Sun Position, & Time
 - Distance to Target Emission Source, enter angle
 - Transmit Images of Visual Emissions & Source, Date/Time





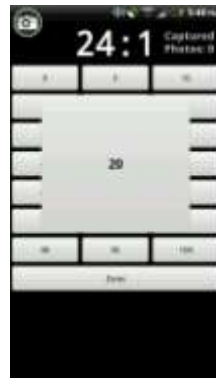
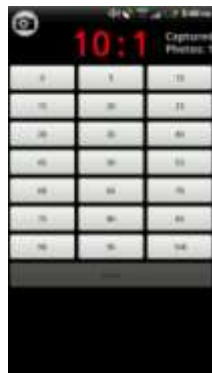
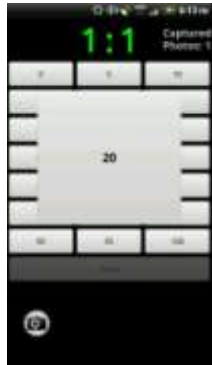
DOCS II SaaS Data Collection

“Method 9” in the Google Play Store



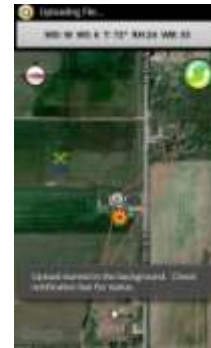
Method 9

Display Timer & Count



Alt. Method 082

Auto Timer & Count





Sun angle is Key to good pictures

View angle is Key to distance and height



Height of Emission Point	96.67
Height of Emission Point relative to Observer	92.67
Distance to Emission Point	468.12
Direction to Emission Point	88.7
Vertical Angle to Observation Point	11.25
Distance to Observation Point	465.8
Direction to Observation Point	87.22
Distance to Observation Point from Emission Point	12.35
Direction to Observation Point from Emission Point	347.16
Distance to Boundary	





Final Edit & Analysis Performed In Web Application



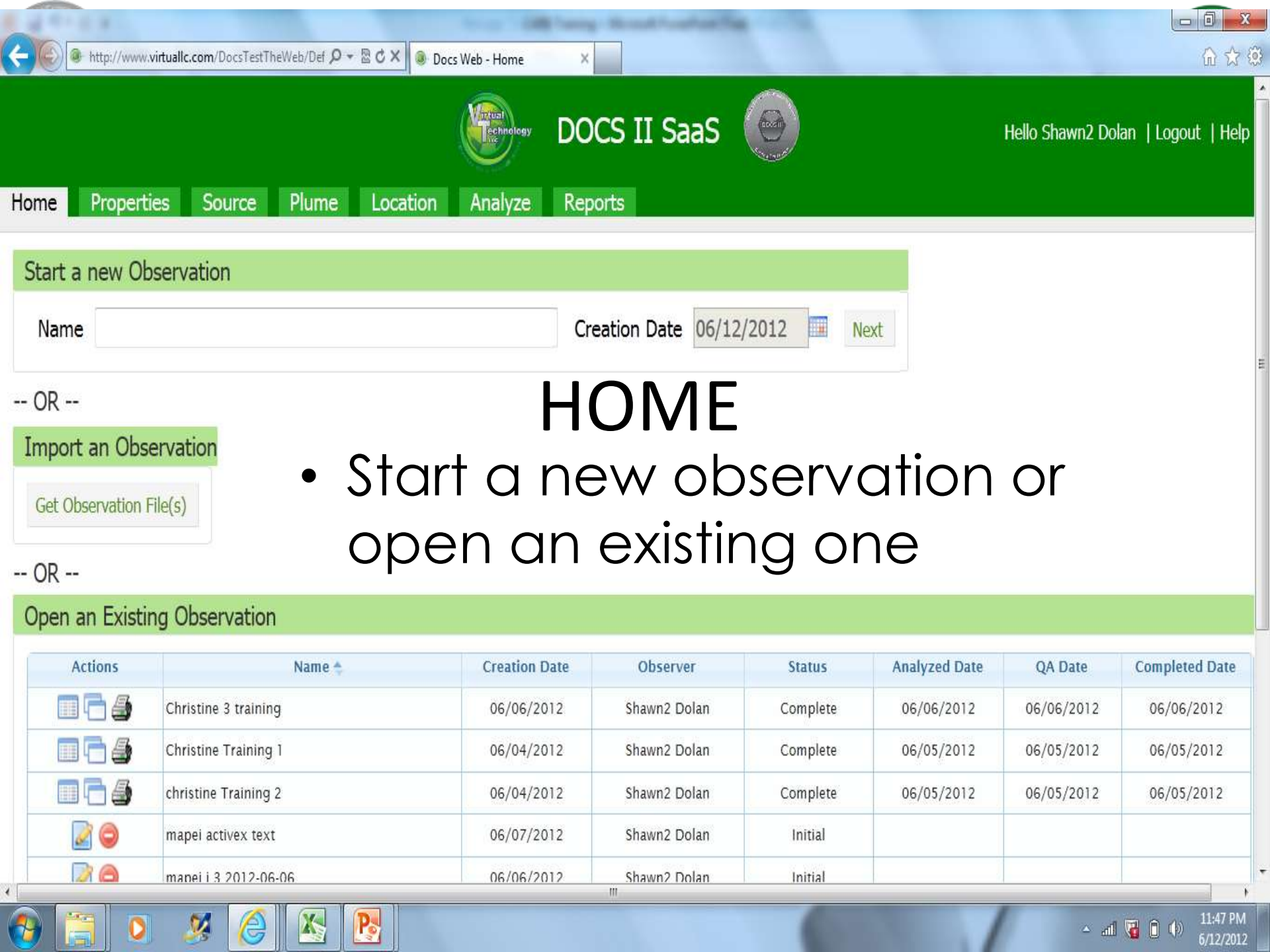
VISIBLE EMISSION OBSERVATION FORM

Obs No.	Obs Date	Obs Time	Obs Loc	Obs Desc	Obs Status	Obs Type	Obs Category	Obs Comment
1	6/20/12	11:29	1000	1000	1000	1000	1000	1000
2	6/20/12	11:29	1000	1000	1000	1000	1000	1000
3	6/20/12	11:29	1000	1000	1000	1000	1000	1000
4	6/20/12	11:29	1000	1000	1000	1000	1000	1000
5	6/20/12	11:29	1000	1000	1000	1000	1000	1000
6	6/20/12	11:29	1000	1000	1000	1000	1000	1000
7	6/20/12	11:29	1000	1000	1000	1000	1000	1000
8	6/20/12	11:29	1000	1000	1000	1000	1000	1000
9	6/20/12	11:29	1000	1000	1000	1000	1000	1000
10	6/20/12	11:29	1000	1000	1000	1000	1000	1000
11	6/20/12	11:29	1000	1000	1000	1000	1000	1000
12	6/20/12	11:29	1000	1000	1000	1000	1000	1000
13	6/20/12	11:29	1000	1000	1000	1000	1000	1000
14	6/20/12	11:29	1000	1000	1000	1000	1000	1000
15	6/20/12	11:29	1000	1000	1000	1000	1000	1000
16	6/20/12	11:29	1000	1000	1000	1000	1000	1000
17	6/20/12	11:29	1000	1000	1000	1000	1000	1000
18	6/20/12	11:29	1000	1000	1000	1000	1000	1000
19	6/20/12	11:29	1000	1000	1000	1000	1000	1000
20	6/20/12	11:29	1000	1000	1000	1000	1000	1000
21	6/20/12	11:29	1000	1000	1000	1000	1000	1000
22	6/20/12	11:29	1000	1000	1000	1000	1000	1000
23	6/20/12	11:29	1000	1000	1000	1000	1000	1000
24	6/20/12	11:29	1000	1000	1000	1000	1000	1000
25	6/20/12	11:29	1000	1000	1000	1000	1000	1000
26	6/20/12	11:29	1000	1000	1000	1000	1000	1000
27	6/20/12	11:29	1000	1000	1000	1000	1000	1000
28	6/20/12	11:29	1000	1000	1000	1000	1000	1000
29	6/20/12	11:29	1000	1000	1000	1000	1000	1000
30	6/20/12	11:29	1000	1000	1000	1000	1000	1000
31	6/20/12	11:29	1000	1000	1000	1000	1000	1000
32	6/20/12	11:29	1000	1000	1000	1000	1000	1000
33	6/20/12	11:29	1000	1000	1000	1000	1000	1000
34	6/20/12	11:29	1000	1000	1000	1000	1000	1000
35	6/20/12	11:29	1000	1000	1000	1000	1000	1000
36	6/20/12	11:29	1000	1000	1000	1000	1000	1000
37	6/20/12	11:29	1000	1000	1000	1000	1000	1000
38	6/20/12	11:29	1000	1000	1000	1000	1000	1000
39	6/20/12	11:29	1000	1000	1000	1000	1000	1000
40	6/20/12	11:29	1000	1000	1000	1000	1000	1000
41	6/20/12	11:29	1000	1000	1000	1000	1000	1000
42	6/20/12	11:29	1000	1000	1000	1000	1000	1000
43	6/20/12	11:29	1000	1000	1000	1000	1000	1000
44	6/20/12	11:29	1000	1000	1000	1000	1000	1000
45	6/20/12	11:29	1000	1000	1000	1000	1000	1000
46	6/20/12	11:29	1000	1000	1000	1000	1000	1000
47	6/20/12	11:29	1000	1000	1000	1000	1000	1000
48	6/20/12	11:29	1000	1000	1000	1000	1000	1000
49	6/20/12	11:29	1000	1000	1000	1000	1000	1000
50	6/20/12	11:29	1000	1000	1000	1000	1000	1000



DOCS II Web Version: 1.0 - 2012-06-20 - 6/20/2012 Page 1





Start a new Observation

Name

Creation Date

-- OR --

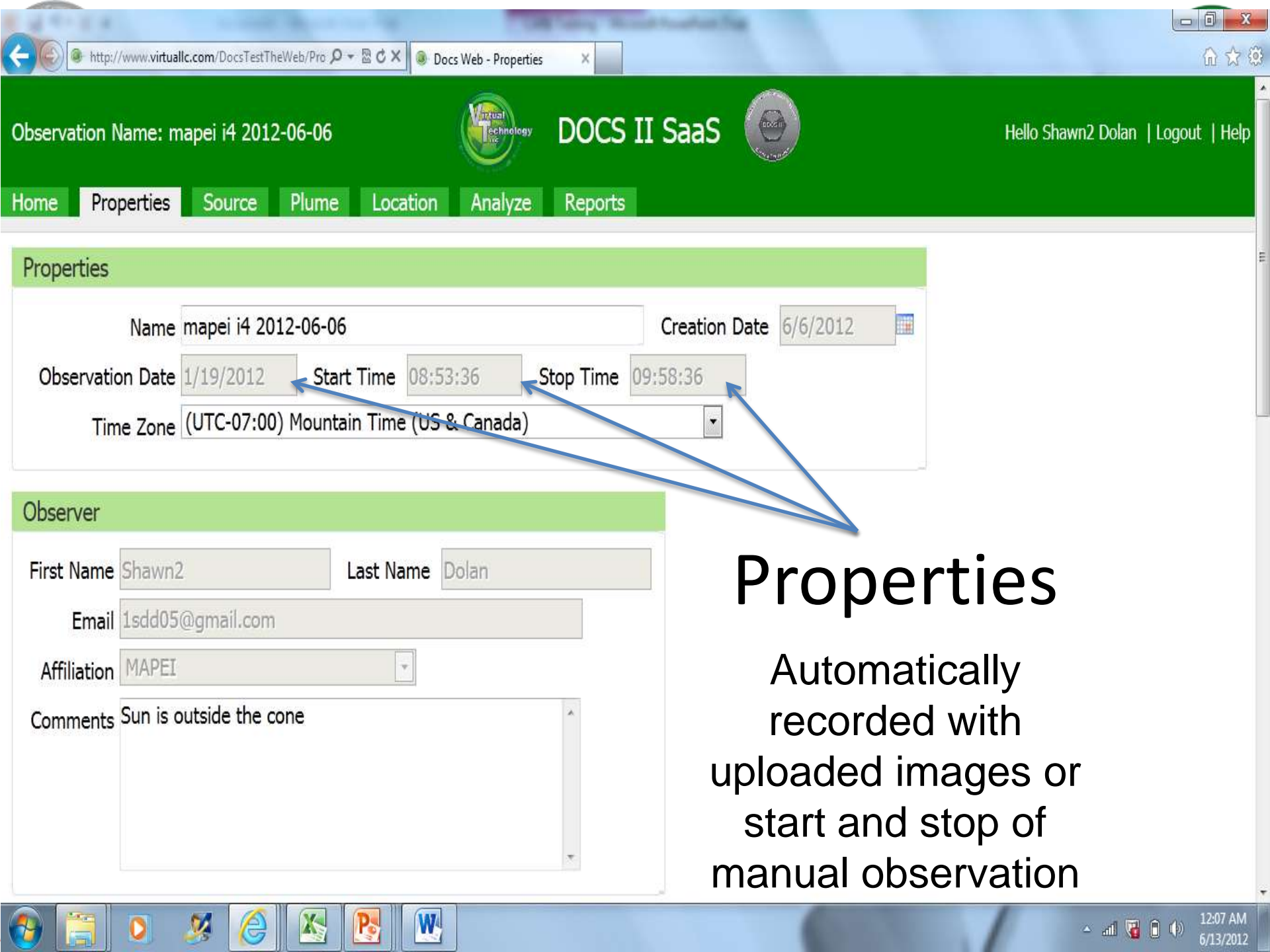
Import an Observation

- # HOME
- Start a new observation or open an existing one

-- OR --

Open an Existing Observation

Actions	Name	Creation Date	Observer	Status	Analyzed Date	QA Date	Completed Date
	Christine 3 training	06/06/2012	Shawn2 Dolan	Complete	06/06/2012	06/06/2012	06/06/2012
	Christine Training 1	06/04/2012	Shawn2 Dolan	Complete	06/05/2012	06/05/2012	06/05/2012
	christine Training 2	06/04/2012	Shawn2 Dolan	Complete	06/05/2012	06/05/2012	06/05/2012
	mapei activex text	06/07/2012	Shawn2 Dolan	Initial			
	mapei i 3 2012-06-06	06/06/2012	Shawn2 Dolan	Initial			



Observation Name: mapei i4 2012-06-06



DOCS II SaaS



Hello Shawn2 Dolan | Logout | Help

- Home
- Properties
- Source
- Plume
- Location
- Analyze
- Reports

Properties

Name Creation Date

Observation Date Start Time Stop Time

Time Zone

Observer

First Name Last Name

Email

Affiliation

Comments

Properties

Automatically recorded with uploaded images or start and stop of manual observation



Facility

Facility Name Ft Lauderdale MAPEI

POC Manny Cuba [Driving Directions](#)

Division MAPEI US

Address 1851 NW 22nd Street

City Ft. Lauderdale State FL Zip 33311

Phone 954 485 8637 Email 1sdd05@gmail.com

Manager Mike Zalusky [Driving Directions](#)

Company Name MAPEI US

Address 1144 East Newport Center Drive

City Deerfield Beach State FL Zip 33442

Phone 954 246 8683 Email cweber@mapei.com

Source

Docs Web - Source

Phone Email

Process Name Unit Ref Operating Mode

Equipment

Control Equipment Operating Mode

Source

Name

Address [Driving Directions](#)

City State Zip

Telephone Local Id Certification Date

Emission

Emission Point

Description

Emission Description

Emission Description End

Source (cont.)



Observer Entries

Type of Inspection

Initial Stack Test Annual Surveillance Partial Initial CEM Followup Complaint Certification NA

Plume Attached Detached NA

Condensed Water Yes No NA

Plume

Analyst Entries

Sky Condition

Start Clear Scattered Broken Overcast End Clear Scattered Broken Overcast

Background

Background Description
sky



Location

Location of camera

The current weather for lat/long coordinates is retrieved when pushing this button. Once the weather is entered the compass indicates wind direction.

Digital layout "sketch"

The screenshot displays the following sections:

- Weather:** Wind Direction (S), Wind Speed (13 mph), Ambient Temperature (87 °F), Rel Humidity (72%), Wet Bulb (72 °F), Use NOAA? (Yes).
- NOAA (Read Only):** A duplicate of the weather data with a "Get Weather" button.
- Emission Point:**

Height of Emission Point	8.88	8.88	ft.
Height of Emission Point Relative to Observer	4.88	4.88	ft.
Distance to Emission Point	93.84	93.84	ft.
Direction to Emission Point	273.34	273.34	°
Vertical Angle to Observation Point	4.02	4.02	°
Distance to Observation Point	69.42	69.42	ft.
Direction to Observation Point	307.56	307.56	°
Distance to Observation Point from Emission Point	53.4	53.4	ft.
Direction to Observation Point from Emission Point	46.37	46.37	°
- Map Information:** Map Type (Google), Map Width in Feet (1000).
- Sun:** Altitude (37.6 °), Azimuth (150.7 °), Calculate button.
- Map:** Aerial view of a coastal area with a red "sketch" overlay and a compass.

The position of the sun is calculated in two modes.
1) Survey
2) Observation

Height of Emission Point = Physical Stack Height





Analysis



Browser address bar: <http://www.virtuallc.com/DocsTestTheWeb/Ani...> Docs Web - Analysis

Observation Name: mapei i4 2012-06-06

DOCS II SaaS

Hello Shawn2 Dolan | Logout | Help

Home Properties Source Plume Location Analyze Reports

Duration 1:5:0
 Image Count 24
 Average Opacity 47.71

Method **Total Average**

Minimum Number Of Images N/A Rolling High Count N/A
 Seconds Between Images N/A Duration in Minutes N/A

Single Image Background

Manual
 Automatic
 Override

Color **Black** Background **Blue**

Get Images Clear Images



File Name IMG_0628.jpg Camera Mfg/Model Canon Canon PowerShot G11 Date Taken 1/19/2012 9:58:36 AM

Normal Processed Rolling High Background Error



Skip to Content | Legal | Privacy | Security | Terms of Service

Windows taskbar with icons for Start, Internet Explorer, Word, PowerPoint, and other applications. System tray shows time 12:31 AM and date 6/13/2012.





Analysis (Complex Background)



Duration 0:18:54
 Image Count 25
 Average Opacity 5

Method Total Average

Minimum Number Of Images N/A Rolling High Count N/A
 Seconds Between Images N/A Duration in Minutes N/A

Single Image Background

Manual Next Image

Automatic Start Analysis

Override 10 Submit

White? Yes No

Color White Background Green

Get Images Clear Images

Normal
 Processed
 Rolling High
 Background
 Error
 Scale



File Name IMG_2030.JPG Camera Mfg/Model Canon Canon PowerShot G11 Date Taken 4/5/2012 8:27:31 AM

Img Bck Accept Boxes

Background

Report

VISIBLE EMISSION OBSERVATION FORM




General
 Method 9
 Consolidated Cabinetry
 126 Main Street
 Falls Church, VA 22040
 Emission Equipment: Specialized Catalytic Converter
 100%
 Height of Stack: 100 ft
 Diameter of Stack: 48 in
 Distance to Receiver: 100 ft
 Wind Direction: 100°
 Temperature: 57°F
 Relative Humidity: 72%
 Wet Bulb Temp: 46°F
 Date Taken: 3/24/2010 10:02 AM
 Camera Model: Canon/Canon PowerShot G11
 Wind Direction: 5
 Wind Speed: 9
 Temperature: 57
 Rel Humidity: 72
 Wet Bulb Temp: 46

Opacity	15	30	45	60
1	10	5	0	10
2	10	5	10	5
3	10	5	10	10
4	0	5	10	5
5	5	10	5	5
6	5	0	5	10
7	0	10	10	0
8				
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32				

Avg Opacity = 6.667

Image	Opacity	Coordinates	Camera and Weather Information
	10	Foreground Coordinates: T: 1680, L: 1900, S: 2122, R: 1938 Background Coordinates: T: 1940, L: 1373, S: 2110, R: 1266	Date Taken: 3/24/2010 10:03:45 AM Camera Mfg/Model: Canon/Canon PowerShot G11 Wind Direction: 5, Wind Speed: 9 Temperature: 57, Rel Humidity: 72 Wet Bulb Temp: 46
	10	Foreground Coordinates: T: 1680, L: 1900, S: 2122, R: 1938 Background Coordinates: T: 1940, L: 1373, S: 2110, R: 1266	Date Taken: 3/24/2010 10:04:02 AM Camera Mfg/Model: Canon/Canon PowerShot G11 Wind Direction: 5, Wind Speed: 9 Temperature: 57, Rel Humidity: 72 Wet Bulb Temp: 46
	5	Foreground Coordinates: T: 1680, L: 1900, S: 2122, R: 1938 Background Coordinates: T: 1940, L: 1373, S: 2110, R: 1266	Date Taken: 3/24/2010 10:04:15 AM Camera Mfg/Model: Canon/Canon PowerShot G11 Wind Direction: 5, Wind Speed: 9 Temperature: 57, Rel Humidity: 72 Wet Bulb Temp: 46
	10	Foreground Coordinates: T: 1680, L: 1900, S: 2122, R: 1938 Background Coordinates: T: 1940, L: 1373, S: 2110, R: 1266	Date Taken: 3/24/2010 10:04:32 AM Camera Mfg/Model: Canon/Canon PowerShot G11 Wind Direction: 5, Wind Speed: 9 Temperature: 57, Rel Humidity: 72 Wet Bulb Temp: 46
	5	Foreground Coordinates: T: 1680, L: 1900, S: 2122, R: 1938 Background Coordinates: T: 1940, L: 1373, S: 2110, R: 1266	Date Taken: 3/24/2010 10:04:49 AM Camera Mfg/Model: Canon/Canon PowerShot G11 Wind Direction: 5, Wind Speed: 9 Temperature: 57, Rel Humidity: 72 Wet Bulb Temp: 46
	10	Foreground Coordinates: T: 1680, L: 1900, S: 2122, R: 1938 Background Coordinates: T: 1940, L: 1373, S: 2110, R: 1266	Date Taken: 3/24/2010 10:05:00 AM Camera Mfg/Model: Canon/Canon PowerShot G11 Wind Direction: 5, Wind Speed: 9 Temperature: 57, Rel Humidity: 72 Wet Bulb Temp: 46
	5	Foreground Coordinates: T: 1680, L: 1900, S: 2122, R: 1938 Background Coordinates: T: 1940, L: 1373, S: 2110, R: 1266	Date Taken: 3/24/2010 10:05:15 AM Camera Mfg/Model: Canon/Canon PowerShot G11 Wind Direction: 5, Wind Speed: 9 Temperature: 57, Rel Humidity: 72 Wet Bulb Temp: 46
	10	Foreground Coordinates: T: 1680, L: 1900, S: 2122, R: 1938 Background Coordinates: T: 1940, L: 1373, S: 2110, R: 1266	Date Taken: 3/24/2010 10:05:30 AM Camera Mfg/Model: Canon/Canon PowerShot G11 Wind Direction: 5, Wind Speed: 9 Temperature: 57, Rel Humidity: 72 Wet Bulb Temp: 46

Forensic Data

Image	Opacity	Coordinates	Camera and Weather Information																
 <p>IMG_0222.JPG</p>	55	<p>Foreground Coordinates</p> <table border="1"> <tr> <td>T</td> <td>L</td> <td>B</td> <td>R</td> </tr> <tr> <td>1781</td> <td>1882</td> <td>2128</td> <td>1808</td> </tr> </table> <p>Background Coordinates</p> <table border="1"> <tr> <td>T</td> <td>L</td> <td>B</td> <td>R</td> </tr> <tr> <td>1788</td> <td>1280</td> <td>2183</td> <td>998</td> </tr> </table>	T	L	B	R	1781	1882	2128	1808	T	L	B	R	1788	1280	2183	998	<p>Date Taken 3/24/2010 10:00:40 AM</p> <p>Camera Mfg/Model Canon/Canon PowerShot G11</p> <p>Wind Direction SW Wind Speed 10</p> <p>Temperature 60 Rel Humidity 38</p> <p>Wet Bulb Temp 34</p>
T	L	B	R																
1781	1882	2128	1808																
T	L	B	R																
1788	1280	2183	998																
 <p>IMG_0223.JPG</p>	75	<p>Foreground Coordinates</p> <table border="1"> <tr> <td>T</td> <td>L</td> <td>B</td> <td>R</td> </tr> <tr> <td>1783</td> <td>1911</td> <td>2139</td> <td>1595</td> </tr> </table> <p>Background Coordinates</p> <table border="1"> <tr> <td>T</td> <td>L</td> <td>B</td> <td>R</td> </tr> <tr> <td>1714</td> <td>1181</td> <td>2018</td> <td>994</td> </tr> </table>	T	L	B	R	1783	1911	2139	1595	T	L	B	R	1714	1181	2018	994	<p>Date Taken 3/24/2010 10:00:57 AM</p> <p>Camera Mfg/Model Canon/Canon PowerShot G11</p> <p>Wind Direction SW Wind Speed 10</p> <p>Temperature 60 Rel Humidity 38</p> <p>Wet Bulb Temp 34</p>
T	L	B	R																
1783	1911	2139	1595																
T	L	B	R																
1714	1181	2018	994																
 <p>IMG_0224.JPG</p>	85	<p>Foreground Coordinates</p> <table border="1"> <tr> <td>T</td> <td>L</td> <td>B</td> <td>R</td> </tr> <tr> <td>1732</td> <td>1917</td> <td>2124</td> <td>1583</td> </tr> </table> <p>Background Coordinates</p> <table border="1"> <tr> <td>T</td> <td>L</td> <td>B</td> <td>R</td> </tr> <tr> <td>1703</td> <td>1291</td> <td>2093</td> <td>1033</td> </tr> </table>	T	L	B	R	1732	1917	2124	1583	T	L	B	R	1703	1291	2093	1033	<p>Date Taken 3/24/2010 10:01:20 AM</p> <p>Camera Mfg/Model Canon/Canon PowerShot G11</p> <p>Wind Direction SW Wind Speed 10</p> <p>Temperature 60 Rel Humidity 38</p> <p>Wet Bulb Temp 34</p>
T	L	B	R																
1732	1917	2124	1583																
T	L	B	R																
1703	1291	2093	1033																



CA Campaign Summer 2012

- Environmental Studies Students
- Never heard of Opacity before May 2012



Michelle, 2 yrs. @ U of A



Allison, 2 yrs. @ NAU

- Now Both CA Certified Visual Observers
- Now Both DOCS II Certified Operators





El Cajon, CA Campaign 2012

DOCS II GUI Screenshot

Address: 13302 E. Street

Map View

Height of Emission Point: 34.00 ft

Height of Observer Point: 30.00 ft

Distance to Observation Point: 50.00 ft

Direction to Observation Point: 90.00 deg

Distance to Observation Point: 46.67 ft

Direction to Observation Point: 13.33 deg

Distance to Observation Point: 46.67 ft

Direction to Observation Point: 90.00 deg

Distance to Observation Point: 46.67 ft

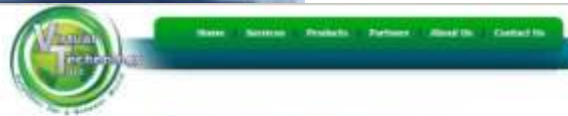
Direction to Observation Point: 46.67 deg

Distance to Observation Point: 3.33 ft

Direction to Observation Point: 90.00 deg

Distance to Observation Point: 30.00 ft

Direction to Observation Point: 30.00 deg



El Cajon Smoke School Results

Smoke Pipe: 1/12/2012

PASS

	Spots Exhaust	Correct Spots	Pass
Reading #1 (Black - Run 3)	20	20	0
Reading #2 (Black - Run 3)	40	40	0
Reading #3 (Black - Run 3)	60	60	0
Reading #4 (Black - Run 3)	80	80	0
Reading #5 (Black - Run 3)	100	100	0
Reading #6 (Black - Run 3)	40	40	0
Reading #7 (Black - Run 3)	60	75	0
Reading #8 (Black - Run 3)	0	0	0
Reading #9 (Black - Run 3)	20	20	0
Reading #10 (Black - Run 3)	30	30	0
Reading #11 (Black - Run 3)	40	40	0
Reading #12 (Black - Run 3)	10	20	0
Reading #13 (Black - Run 3)	0	0	0
Reading #14 (Black - Run 3)	20	20	0
Reading #15 (Black - Run 3)	40	40	0
Reading #16 (Black - Run 3)	40	40	0
Reading #17 (Black - Run 3)	20	20	0
Reading #18 (Black - Run 3)	40	40	0
Reading #19 (Black - Run 3)	60	60	0
Reading #20 (Black - Run 3)	40	40	0
Reading #21 (Black - Run 3)	0	0	0
Reading #22 (Black - Run 3)	20	20	0
Reading #23 (Black - Run 3)	40	40	0
Reading #24 (Black - Run 3)	40	40	0
Reading #25 (Black - Run 3)	60	60	0
Reading #26 (Black - Run 3)	80	80	0

13



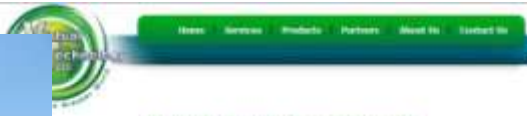
El Cajon Smoke School Results

Smoke Pipe: 1/12/2012

PASS

	Spots Exhaust	Correct Spots	Pass
Reading #1 (White - Run 2)	20	20	1
Reading #2 (White - Run 2)	30	40	1
Reading #3 (White - Run 2)	70	60	1
Reading #4 (White - Run 2)	10	20	0
Reading #5 (White - Run 2)	10	10	0
Reading #6 (White - Run 2)	5	5	0
Reading #7 (White - Run 2)	30	20	1
Reading #8 (White - Run 2)	50	40	1
Reading #9 (White - Run 2)	60	70	0
Reading #10 (White - Run 2)	70	60	0
Reading #11 (White - Run 2)	2	2	0
Reading #12 (White - Run 2)	30	20	0
Reading #13 (White - Run 2)	20	40	0
Reading #14 (White - Run 2)	10	10	0
Reading #15 (White - Run 2)	70	70	0
Reading #16 (White - Run 2)	40	40	0
Reading #17 (White - Run 2)	60	60	0
Reading #18 (White - Run 2)	30	30	0
Reading #19 (White - Run 2)	10	10	0
Reading #20 (White - Run 2)	40	40	0
Reading #21 (White - Run 2)	70	70	0
Reading #22 (White - Run 2)	40	40	1
Reading #23 (White - Run 2)	60	70	1
Reading #24 (White - Run 2)	40	40	1
Reading #25 (White - Run 2)	20	20	1

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El Cajon Smoke School Results

Smoke Pipe: 1/12/2012

PASS

	Spots Exhaust	Correct Spots	Pass
Reading #1 (White - Run 1)	20	20	0
Reading #2 (White - Run 1)	40	40	0
Reading #3 (White - Run 1)	60	60	0
Reading #4 (White - Run 1)	80	80	0
Reading #5 (White - Run 1)	20	20	0
Reading #6 (White - Run 1)	20	10	0
Reading #7 (White - Run 1)	20	20	0
Reading #8 (White - Run 1)	40	30	0
Reading #9 (White - Run 1)	60	30	0
Reading #10 (White - Run 1)	5	5	0
Reading #11 (White - Run 1)	30	20	0
Reading #12 (White - Run 1)	40	30	0
Reading #13 (White - Run 1)	20	20	0
Reading #14 (White - Run 1)	5	0	0
Reading #15 (White - Run 1)	20	30	0
Reading #16 (White - Run 1)	20	10	0
Reading #17 (White - Run 1)	40	40	0
Reading #18 (White - Run 1)	60	60	0
Reading #19 (White - Run 1)	30	30	0
Reading #20 (White - Run 1)	40	40	1
Reading #21 (White - Run 1)	40	20	0
Reading #22 (White - Run 1)	20	20	0
Reading #23 (White - Run 1)	20	20	0
Reading #24 (White - Run 1)	2	2	0
Reading #25 (White - Run 1)	20	20	0

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El Cajon Smoke School Results

Smoke Pipe: 1/12/2012

PASS

	Spots Exhaust	Correct Spots	Pass
Reading #1 (Black - Run 2)	20	20	1
Reading #2 (Black - Run 2)	60	40	0
Reading #3 (Black - Run 2)	70	70	1
Reading #4 (Black - Run 2)	0	0	0
Reading #5 (Black - Run 2)	20	10	1
Reading #6 (Black - Run 2)	40	30	1
Reading #7 (Black - Run 2)	50	40	1
Reading #8 (Black - Run 2)	40	40	1
Reading #9 (Black - Run 2)	60	60	1
Reading #10 (Black - Run 2)	60	60	1
Reading #11 (Black - Run 2)	70	70	1
Reading #12 (Black - Run 2)	0	0	1
Reading #13 (Black - Run 2)	20	20	1
Reading #14 (Black - Run 2)	40	40	1
Reading #15 (Black - Run 2)	70	60	1
Reading #16 (Black - Run 2)	40	40	0
Reading #17 (Black - Run 2)	50	50	0
Reading #18 (Black - Run 2)	0	0	1
Reading #19 (Black - Run 2)	20	20	1
Reading #20 (Black - Run 2)	30	40	2
Reading #21 (Black - Run 2)	70	60	2
Reading #22 (Black - Run 2)	60	60	2
Reading #23 (Black - Run 2)	80	60	2
Reading #24 (Black - Run 2)	10	10	0
Reading #25 (Black - Run 2)	0	0	1

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El Dorado Park, CA Campaign 2012



Visual Technology logo in the top left corner of the browser window.



El Dorado Smoke School Results

Week: 7/2/2012

PASS

Reading #1 (White - Run 1)	Counts Observed	Correct Counts	Score
Reading #1 (White - Run 1)	20	20	1
Reading #2 (White - Run 2)	40	40	1
Reading #3 (White - Run 3)	15	15	1
Reading #4 (White - Run 4)	2	2	0
Reading #5 (White - Run 5)	20	20	1
Reading #6 (White - Run 6)	5	5	1
Reading #7 (White - Run 7)	1	1	0
Reading #8 (White - Run 8)	40	40	1
Reading #9 (White - Run 9)	20	20	1
Reading #10 (White - Run 10)	40	40	1
Reading #11 (White - Run 11)	20	20	1
Reading #12 (White - Run 12)	1	1	0
Reading #13 (White - Run 13)	10	10	1
Reading #14 (White - Run 14)	10	10	1
Reading #15 (White - Run 15)	20	20	1
Reading #16 (White - Run 16)	40	40	1
Reading #17 (White - Run 17)	40	40	1
Reading #18 (White - Run 18)	1	1	0
Reading #19 (White - Run 19)	20	20	1
Reading #20 (White - Run 20)	40	40	1
Reading #21 (White - Run 21)	40	40	1
Reading #22 (White - Run 22)	10	10	1
Reading #23 (White - Run 23)	10	10	1
Reading #24 (White - Run 24)	40	40	1
Reading #25 (White - Run 25)	10	10	1
Reading #26 (White - Run 26)	40	40	1
Reading #27 (White - Run 27)	20	20	1
Reading #28 (White - Run 28)	20	20	1
Reading #29 (White - Run 29)	20	20	1
Reading #30 (White - Run 30)	20	20	1

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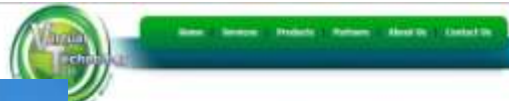
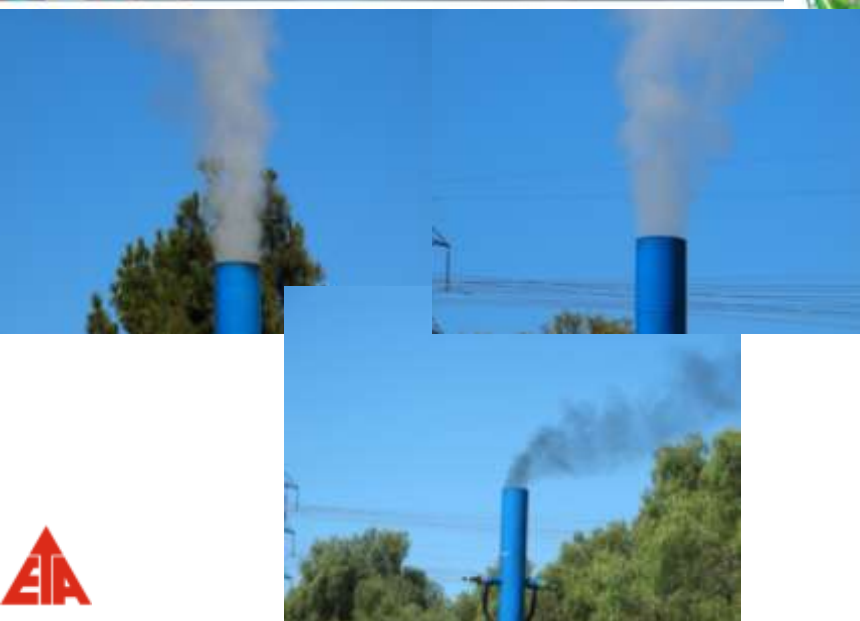
El Dorado Smoke School Results

Week: 7/2/2012

PASS

Reading #1 (Black - Run 1)	Counts Observed	Correct Counts	Score
Reading #1 (Black - Run 1)	10	10	0
Reading #2 (Black - Run 2)	40	40	0
Reading #3 (Black - Run 3)	40	40	0
Reading #4 (Black - Run 4)	40	40	0
Reading #5 (Black - Run 5)	40	40	0
Reading #6 (Black - Run 6)	40	40	0
Reading #7 (Black - Run 7)	2	2	0
Reading #8 (Black - Run 8)	20	20	1
Reading #9 (Black - Run 9)	40	40	2
Reading #10 (Black - Run 10)	40	40	1
Reading #11 (Black - Run 11)	40	40	1
Reading #12 (Black - Run 12)	10	10	0
Reading #13 (Black - Run 13)	10	10	0
Reading #14 (Black - Run 14)	10	10	0
Reading #15 (Black - Run 15)	1	1	0
Reading #16 (Black - Run 16)	40	40	0
Reading #17 (Black - Run 17)	20	20	1
Reading #18 (Black - Run 18)	40	40	0
Reading #19 (Black - Run 19)	40	40	0
Reading #20 (Black - Run 20)	10	10	0
Reading #21 (Black - Run 21)	10	10	0
Reading #22 (Black - Run 22)	40	40	1
Reading #23 (Black - Run 23)	40	40	1
Reading #24 (Black - Run 24)	40	40	2
Reading #25 (Black - Run 25)	1	1	0
Reading #26 (Black - Run 26)	2	2	0
Reading #27 (Black - Run 27)	1	1	0

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el dorado Smoke School Results

Week: 7/2/2012

PASS

Reading #1 (White - Run 1)	Counts Observed	Correct Counts	Score
Reading #1 (White - Run 1)	20	20	0
Reading #2 (White - Run 2)	40	40	1
Reading #3 (White - Run 3)	40	40	0
Reading #4 (White - Run 4)	20	20	0
Reading #5 (White - Run 5)	1	1	0
Reading #6 (White - Run 6)	20	20	0
Reading #7 (White - Run 7)	40	40	1
Reading #8 (White - Run 8)	20	20	0
Reading #9 (White - Run 9)	40	40	0
Reading #10 (White - Run 10)	20	20	0
Reading #11 (White - Run 11)	20	20	0
Reading #12 (White - Run 12)	40	40	2
Reading #13 (White - Run 13)	40	40	0
Reading #14 (White - Run 14)	40	40	1
Reading #15 (White - Run 15)	10	10	1
Reading #16 (White - Run 16)	40	40	0
Reading #17 (White - Run 17)	20	20	0
Reading #18 (White - Run 18)	40	40	1
Reading #19 (White - Run 19)	40	40	0
Reading #20 (White - Run 20)	10	10	1
Reading #21 (White - Run 21)	40	40	1
Reading #22 (White - Run 22)	10	10	0
Reading #23 (White - Run 23)	20	20	0
Reading #24 (White - Run 24)	40	40	1
Reading #25 (White - Run 25)	10	10	0

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el dorado Smoke School Results

Week: 7/2/2012

PASS

Reading #1 (White - Run 1)	Counts Observed	Correct Counts	Score
Reading #1 (White - Run 1)	20	20	0
Reading #2 (White - Run 2)	40	40	0
Reading #3 (White - Run 3)	40	40	0
Reading #4 (White - Run 4)	40	40	0
Reading #5 (White - Run 5)	1	1	0
Reading #6 (White - Run 6)	20	20	0
Reading #7 (White - Run 7)	40	40	0
Reading #8 (White - Run 8)	10	10	0
Reading #9 (White - Run 9)	20	20	0
Reading #10 (White - Run 10)	40	40	0
Reading #11 (White - Run 11)	40	40	0
Reading #12 (White - Run 12)	40	40	0
Reading #13 (White - Run 13)	1	1	0
Reading #14 (White - Run 14)	20	20	0
Reading #15 (White - Run 15)	40	40	0
Reading #16 (White - Run 16)	40	40	0
Reading #17 (White - Run 17)	40	40	0
Reading #18 (White - Run 18)	40	40	0
Reading #19 (White - Run 19)	40	40	0
Reading #20 (White - Run 20)	10	10	1
Reading #21 (White - Run 21)	40	40	0
Reading #22 (White - Run 22)	1	1	0
Reading #23 (White - Run 23)	20	20	0
Reading #24 (White - Run 24)	40	40	1
Reading #25 (White - Run 25)	40	40	0

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Long Beach, CA (Night) Campaign 2012



Reading #	Capacity Entered	Corrected Capacity	Dir
Reading #1 (Black - Run 1)	5	10	0
Reading #2 (Black - Run 1)	25	75	0
Reading #3 (Black - Run 1)	50	45	0
Reading #4 (Black - Run 1)	75	60	0
Reading #5 (Black - Run 1)	20	25	0
Reading #6 (Black - Run 1)	50	50	0
Reading #7 (Black - Run 1)	75	75	0
Reading #8 (Black - Run 1)	75	80	0
Reading #9 (Black - Run 1)	60	60	0
Reading #10 (Black - Run 1)	5	5	0
Reading #11 (Black - Run 1)	15	20	0
Reading #12 (Black - Run 1)	55	40	0
Reading #13 (Black - Run 1)	15	15	0
Reading #14 (Black - Run 1)	40	30	0
Reading #15 (Black - Run 1)	60	60	0
Reading #16 (Black - Run 1)	60	75	0
Reading #17 (Black - Run 1)	20	20	0
Reading #18 (Black - Run 1)	10	10	0
Reading #19 (Black - Run 1)	25	30	0
Reading #20 (Black - Run 1)	50	50	0
Reading #21 (Black - Run 1)	75	75	0
Reading #22 (Black - Run 1)	55	70	0
Reading #23 (Black - Run 1)	15	15	0
Reading #24 (Black - Run 1)	5	5	0
Reading #25 (Black - Run 1)	20	20	0



Long Beach Smoke School Results

Reading #	Capacity Entered	Corrected Capacity	Dir
Reading #1 (White - Run 2)	10	10	0
Reading #2 (White - Run 2)	45	40	0
Reading #3 (White - Run 2)	55	60	0
Reading #4 (White - Run 2)	50	60	0
Reading #5 (White - Run 2)	5	5	0
Reading #6 (White - Run 2)	15	20	0
Reading #7 (White - Run 2)	45	40	0
Reading #8 (White - Run 2)	25	20	0
Reading #9 (White - Run 2)	10	10	0
Reading #10 (White - Run 2)	5	5	0
Reading #11 (White - Run 2)	20	25	0
Reading #12 (White - Run 2)	50	45	0
Reading #13 (White - Run 2)	5	10	0
Reading #14 (White - Run 2)	15	20	0
Reading #15 (White - Run 2)	60	60	0
Reading #16 (White - Run 2)	0	5	0
Reading #17 (White - Run 2)	10	10	0
Reading #18 (White - Run 2)	60	60	0
Reading #19 (White - Run 2)	15	20	0
Reading #20 (White - Run 2)	5	10	0
Reading #21 (White - Run 2)	60	60	0
Reading #22 (White - Run 2)	40	40	0
Reading #23 (White - Run 2)	20	20	0
Reading #24 (White - Run 2)	45	70	0
Reading #25 (White - Run 2)	45	70	0
Reading #26 (White - Run 2)	0	5	0





San Dimas, CA Campaign 2012



Weather

Wind Direction: 100
Wind Speed: 10 mph
Ambient Temperature: 100
Rel Humidity: 20%
Sea Level Pressure: 30.1

Emission Point

Height of Emission Point: 15.57 ft
Height of Observation Point: 42.57 ft
Distance to Emission Point: 42.57 ft
Detection to Emission Point: 247.03 ft
Vertical Angle to Observation Point: 0.88
Distance to Observation Point: 47.44 ft
Detection to Observation Point: 246.94 ft
Distance to Observation Point from Emission Point: 4.23 ft

San Dimas CARB Smoke School Results

Month: May - 20120002

PASS

Reading #	Quartz Detected	Correct Quartz	Error
Reading #1 (Black - Run 2)	20	20	0
Reading #2 (Black - Run 2)	40	40	0
Reading #3 (Black - Run 2)	60	60	0
Reading #4 (Black - Run 2)	80	80	0
Reading #5 (Black - Run 2)	100	100	0
Reading #6 (Black - Run 2)	40	40	0
Reading #7 (Black - Run 2)	20	20	0
Reading #8 (Black - Run 2)	30	30	0
Reading #9 (Black - Run 2)	50	50	0
Reading #10 (Black - Run 2)	70	70	0
Reading #11 (Black - Run 2)	90	90	0
Reading #12 (Black - Run 2)	10	10	0
Reading #13 (Black - Run 2)	30	30	0
Reading #14 (Black - Run 2)	50	50	0
Reading #15 (Black - Run 2)	70	70	0
Reading #16 (Black - Run 2)	90	90	0
Reading #17 (Black - Run 2)	10	10	0
Reading #18 (Black - Run 2)	30	30	0
Reading #19 (Black - Run 2)	50	50	0
Reading #20 (Black - Run 2)	70	70	0
Reading #21 (Black - Run 2)	90	90	0
Reading #22 (Black - Run 2)	10	10	0
Reading #23 (Black - Run 2)	30	30	0
Reading #24 (Black - Run 2)	50	50	0
Reading #25 (Black - Run 2)	70	70	0

San Dimas CARB Smoke School Results

Month: May - 011001

PASS

Reading #	Quartz Detected	Correct Quartz	Error
Reading #1 (White - Run 2)	20	20	0
Reading #2 (White - Run 2)	40	40	0
Reading #3 (White - Run 2)	60	60	0
Reading #4 (White - Run 2)	80	80	0
Reading #5 (White - Run 2)	100	100	0
Reading #6 (White - Run 2)	20	20	0
Reading #7 (White - Run 2)	40	40	0
Reading #8 (White - Run 2)	60	60	0
Reading #9 (White - Run 2)	80	80	0
Reading #10 (White - Run 2)	100	100	0
Reading #11 (White - Run 2)	20	20	0
Reading #12 (White - Run 2)	40	40	0
Reading #13 (White - Run 2)	60	60	0
Reading #14 (White - Run 2)	80	80	0
Reading #15 (White - Run 2)	100	100	0
Reading #16 (White - Run 2)	20	20	0
Reading #17 (White - Run 2)	40	40	0
Reading #18 (White - Run 2)	60	60	0
Reading #19 (White - Run 2)	80	80	0
Reading #20 (White - Run 2)	100	100	0
Reading #21 (White - Run 2)	20	20	0
Reading #22 (White - Run 2)	40	40	0
Reading #23 (White - Run 2)	60	60	0
Reading #24 (White - Run 2)	80	80	0
Reading #25 (White - Run 2)	100	100	0



San Dimas CARB Smoke School Results

Month: May - 011002

PASS

Reading #	Quartz Detected	Correct Quartz	Error
Reading #1 (White - Run 2)	20	20	0
Reading #2 (White - Run 2)	40	40	0
Reading #3 (White - Run 2)	60	60	0
Reading #4 (White - Run 2)	80	80	0
Reading #5 (White - Run 2)	100	100	0
Reading #6 (White - Run 2)	20	20	0
Reading #7 (White - Run 2)	40	40	0
Reading #8 (White - Run 2)	60	60	0
Reading #9 (White - Run 2)	80	80	0
Reading #10 (White - Run 2)	100	100	0
Reading #11 (White - Run 2)	20	20	0
Reading #12 (White - Run 2)	40	40	0
Reading #13 (White - Run 2)	60	60	0
Reading #14 (White - Run 2)	80	80	0
Reading #15 (White - Run 2)	100	100	0
Reading #16 (White - Run 2)	20	20	0
Reading #17 (White - Run 2)	40	40	0
Reading #18 (White - Run 2)	60	60	0
Reading #19 (White - Run 2)	80	80	0
Reading #20 (White - Run 2)	100	100	0
Reading #21 (White - Run 2)	20	20	0
Reading #22 (White - Run 2)	40	40	0
Reading #23 (White - Run 2)	60	60	0
Reading #24 (White - Run 2)	80	80	0
Reading #25 (White - Run 2)	100	100	0

San Dimas CARB Smoke School Results

Month: May - 011003

PASS

Reading #	Quartz Detected	Correct Quartz	Error
Reading #1 (Black - Run 2)	20	20	0
Reading #2 (Black - Run 2)	40	40	0
Reading #3 (Black - Run 2)	60	60	0
Reading #4 (Black - Run 2)	80	80	0
Reading #5 (Black - Run 2)	100	100	0
Reading #6 (Black - Run 2)	20	20	0
Reading #7 (Black - Run 2)	40	40	0
Reading #8 (Black - Run 2)	60	60	0
Reading #9 (Black - Run 2)	80	80	0
Reading #10 (Black - Run 2)	100	100	0
Reading #11 (Black - Run 2)	20	20	0
Reading #12 (Black - Run 2)	40	40	0
Reading #13 (Black - Run 2)	60	60	0
Reading #14 (Black - Run 2)	80	80	0
Reading #15 (Black - Run 2)	100	100	0
Reading #16 (Black - Run 2)	20	20	0
Reading #17 (Black - Run 2)	40	40	0
Reading #18 (Black - Run 2)	60	60	0
Reading #19 (Black - Run 2)	80	80	0
Reading #20 (Black - Run 2)	100	100	0
Reading #21 (Black - Run 2)	20	20	0
Reading #22 (Black - Run 2)	40	40	0
Reading #23 (Black - Run 2)	60	60	0
Reading #24 (Black - Run 2)	80	80	0
Reading #25 (Black - Run 2)	100	100	0



Venture, CA Campaign 2012



DOCS II Data

Map

Height of Emission Point: 25.00

Direction to Observation Point: 75.87

Wind Speed: 1.00

Wind Direction: 270

Temperature: 62

Humidity: 65

Pressure: 30.00

Altitude: 224



Ventura Smoke School Results

Week Type: 1220302

PASS

Reading #1 (Black) - Run 12	Spots Observed	Correct Spots	Pass
Reading #1 (Black) - Run 12	20	20	100
Reading #2 (Black) - Run 12	40	40	100
Reading #3 (Black) - Run 12	10	7	70
Reading #4 (Black) - Run 12	20	20	100
Reading #5 (Black) - Run 12	50	50	100
Reading #6 (Black) - Run 12	40	40	100
Reading #7 (Black) - Run 12	40	40	100
Reading #8 (Black) - Run 12	40	40	100
Reading #9 (Black) - Run 12	40	40	100
Reading #10 (Black) - Run 12	20	20	100
Reading #11 (Black) - Run 12	10	10	100
Reading #12 (Black) - Run 12	30	29	97
Reading #13 (Black) - Run 12	30	30	100
Reading #14 (Black) - Run 12	30	30	100
Reading #15 (Black) - Run 12	30	30	100
Reading #16 (Black) - Run 12	70	70	100
Reading #17 (Black) - Run 12	10	10	100
Reading #18 (Black) - Run 12	20	20	100
Reading #19 (Black) - Run 12	40	40	100
Reading #20 (Black) - Run 12	20	19	95
Reading #21 (Black) - Run 12	30	30	100
Reading #22 (Black) - Run 12	20	19	95
Reading #23 (Black) - Run 12	40	39	98
Reading #24 (Black) - Run 12	2	2	100
Reading #25 (Black) - Run 12	20	20	100

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Ventura Smoke School Results

Week Type: 1220301

PASS

Reading #1 (White) - Run 12	Spots Observed	Correct Spots	Pass
Reading #1 (White) - Run 12	20	20	100
Reading #2 (White) - Run 12	40	40	100
Reading #3 (White) - Run 12	10	10	100
Reading #4 (White) - Run 12	20	20	100
Reading #5 (White) - Run 12	50	50	100
Reading #6 (White) - Run 12	20	19	95
Reading #7 (White) - Run 12	5	5	100
Reading #8 (White) - Run 12	20	20	100
Reading #9 (White) - Run 12	40	40	100
Reading #10 (White) - Run 12	40	40	100
Reading #11 (White) - Run 12	10	10	100
Reading #12 (White) - Run 12	30	29	97
Reading #13 (White) - Run 12	20	20	100
Reading #14 (White) - Run 12	20	19	95
Reading #15 (White) - Run 12	40	40	100
Reading #16 (White) - Run 12	40	40	100
Reading #17 (White) - Run 12	40	40	100
Reading #18 (White) - Run 12	40	40	100
Reading #19 (White) - Run 12	5	5	100
Reading #20 (White) - Run 12	20	19	95
Reading #21 (White) - Run 12	40	40	100
Reading #22 (White) - Run 12	40	40	100
Reading #23 (White) - Run 12	70	70	100
Reading #24 (White) - Run 12	40	40	100
Reading #25 (White) - Run 12	5	5	100

14



Ventura Smoke School Results

Week Type: 1220302

PASS

Reading #1 (Black) - Run 21	Spots Observed	Correct Spots	Pass
Reading #1 (Black) - Run 21	20	20	100
Reading #2 (Black) - Run 21	40	40	100
Reading #3 (Black) - Run 21	40	40	100
Reading #4 (Black) - Run 21	20	19	95
Reading #5 (Black) - Run 21	20	20	100
Reading #6 (Black) - Run 21	40	40	100
Reading #7 (Black) - Run 21	40	39	98
Reading #8 (Black) - Run 21	40	40	100
Reading #9 (Black) - Run 21	40	40	100
Reading #10 (Black) - Run 21	20	20	100
Reading #11 (Black) - Run 21	40	40	100
Reading #12 (Black) - Run 21	20	19	95
Reading #13 (Black) - Run 21	5	5	100
Reading #14 (Black) - Run 21	20	20	100
Reading #15 (Black) - Run 21	20	20	100
Reading #16 (Black) - Run 21	40	40	100
Reading #17 (Black) - Run 21	40	40	100
Reading #18 (Black) - Run 21	5	5	100
Reading #19 (Black) - Run 21	20	20	100
Reading #20 (Black) - Run 21	40	39	98
Reading #21 (Black) - Run 21	40	40	100
Reading #22 (Black) - Run 21	40	40	100
Reading #23 (Black) - Run 21	40	40	100
Reading #24 (Black) - Run 21	5	5	100
Reading #25 (Black) - Run 21	20	20	100

11

Ventura Smoke School Results

Week Type: 1220302

PASS

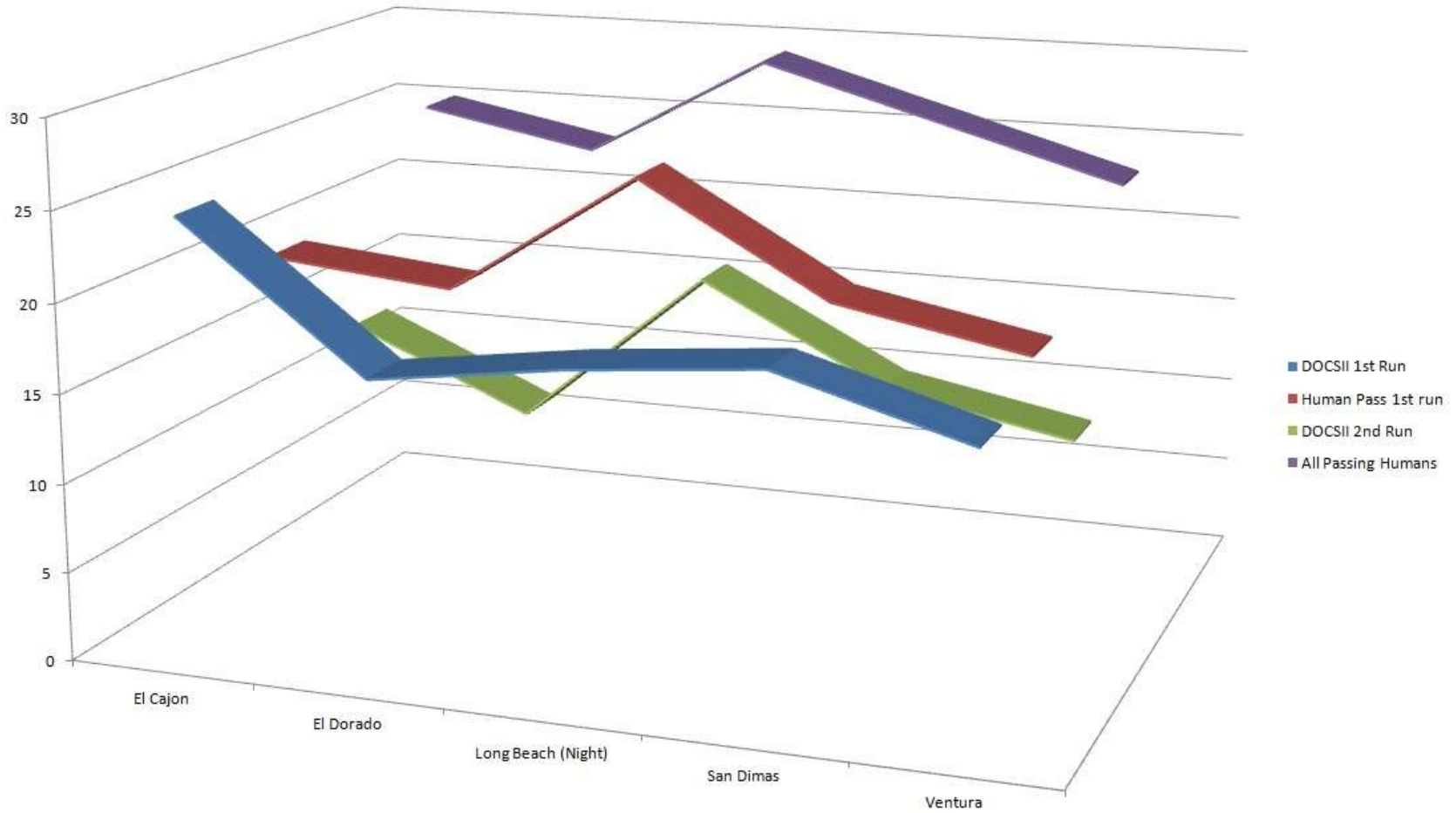
Reading #1 (White) - Run 21	Spots Observed	Correct Spots	Pass
Reading #1 (White) - Run 21	20	20	100
Reading #2 (White) - Run 21	40	40	100
Reading #3 (White) - Run 21	20	20	100
Reading #4 (White) - Run 21	20	20	100
Reading #5 (White) - Run 21	20	20	100
Reading #6 (White) - Run 21	5	5	100
Reading #7 (White) - Run 21	20	20	100
Reading #8 (White) - Run 21	20	20	100
Reading #9 (White) - Run 21	20	20	100
Reading #10 (White) - Run 21	5	5	100
Reading #11 (White) - Run 21	20	20	100
Reading #12 (White) - Run 21	20	19	95
Reading #13 (White) - Run 21	20	20	100
Reading #14 (White) - Run 21	20	20	100
Reading #15 (White) - Run 21	40	40	100
Reading #16 (White) - Run 21	40	40	100
Reading #17 (White) - Run 21	20	20	100
Reading #18 (White) - Run 21	20	20	100
Reading #19 (White) - Run 21	20	20	100
Reading #20 (White) - Run 21	20	20	100
Reading #21 (White) - Run 21	20	20	100
Reading #22 (White) - Run 21	20	20	100
Reading #23 (White) - Run 21	20	20	100
Reading #24 (White) - Run 21	5	5	100
Reading #25 (White) - Run 21	20	20	100

10





Matched up to humans





Reaching Out in the Distance

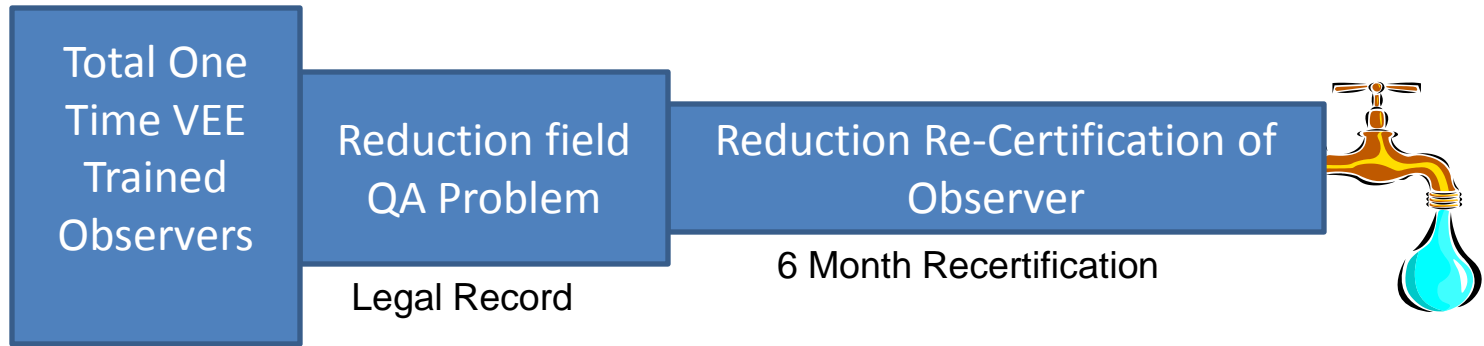


***EPA ALT 082, Distance only limited by
Optical Zoom Capability***

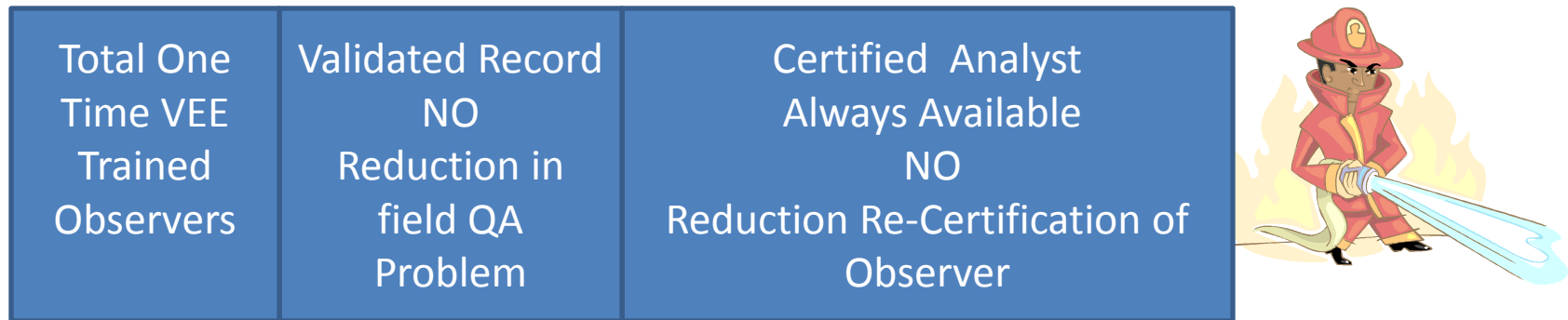


Visible Emissions Throughput

Human Certified Method 9 Yield



DOCS II SaaS Yield



Automated Records
Validation and QA
Defendable Legal Record

3.5 Year Recertification, 300 images each
SME's, highly qualified Analysts
increased consistency and data quality





VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image



Lesson Learned
Use low resolution camera settings





VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image



Lesson Learned
Stay out of Shadows



VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image



Lesson Learned
Use the optical zoom





VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image



Lesson Learned

If you have to shoot pics in shadows
make sure the lighting is even





VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image



Lesson Learned
Don't move the camera



VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image



Lesson Learned
Contrast the background



VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image



Lesson Learned
Use the optical zoom



VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image

Lesson Learned
Even color backgrounds





VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image

Lesson Learned

Use auto angle correction, but get an even colored background





VA DEQ Standalone Trials



VA DEQ Testing Images



Certification Image

Lesson Learned
Don't move the camera



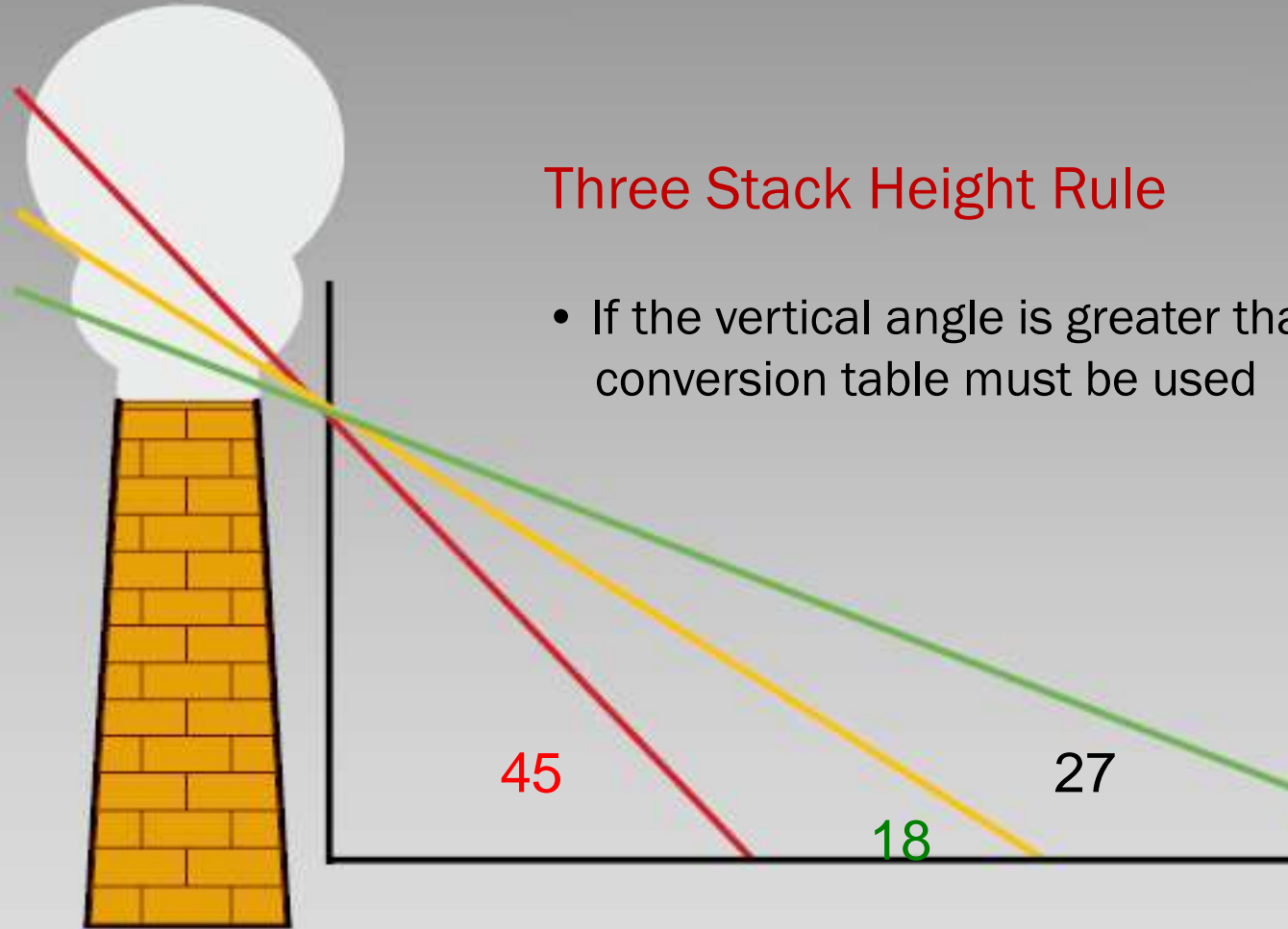


Qualifications

- 3 Stack Height Rule, Distance from “evaluation point”
- Sun is behind camera within the 140 degree cone
- Identify the “Plume” and “Background” of Picture
 - Contrasting background
 - Even “Like” Colors
 - Even Light Intensity
 - No shadows
 - All shadows
- Stabilize Camera and Frame
 - Shadows all Out (preferred) or all In
 - Opacity fills 2/3rds of photo (Zoom)



Vertical Angle to Emission Point



Three Stack Height Rule

- If the vertical angle is greater than 18° , then conversion table must be used





All 50%



Sun Angle, Background, Weather All Make a Difference



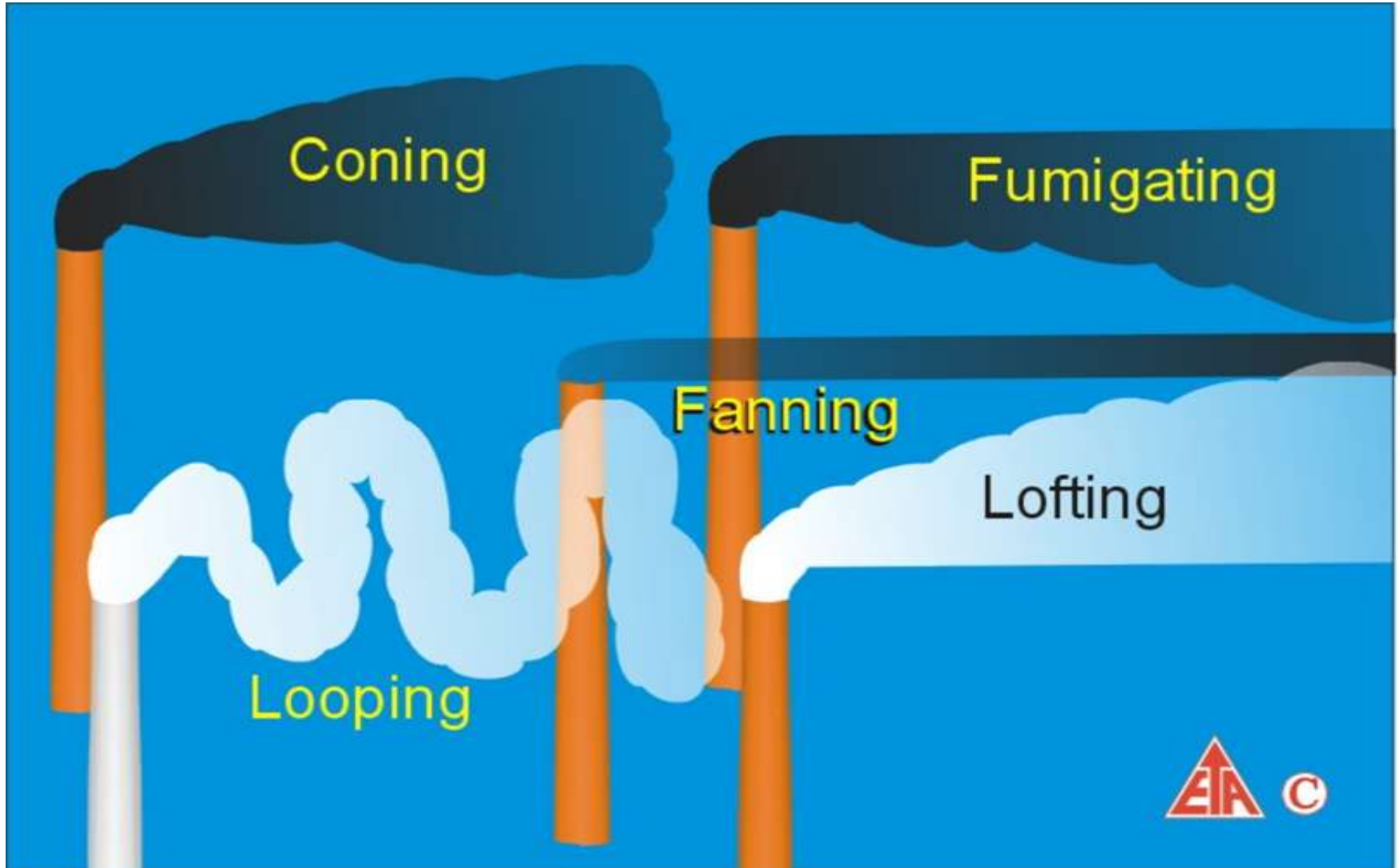


Emission

- Emission Point:
 - Specific vent, stack, etc.
 - Ex) Main Vent 1
- Description:
 - Where is it?
 - What does it look like?
 - Ex) Southernmost Rectangular Vent
- Emission Description/Emission Description End:
 - Ex) Coning, Fanning, Fumigating, Looping, Lofting
 - Auto-fill can be modified

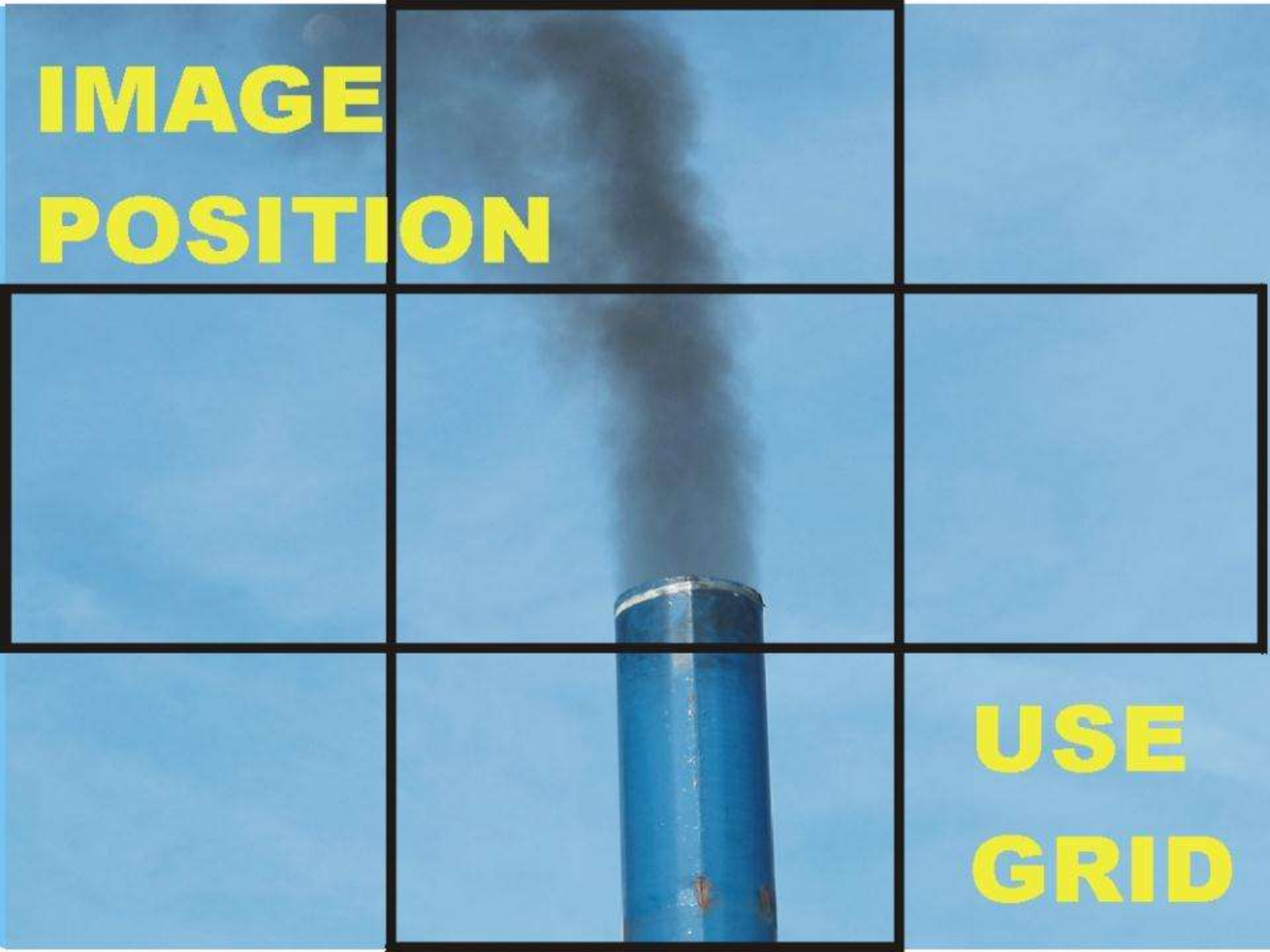


Emission Description



**IMAGE
POSITION**

**USE
GRID**





Tripods and Framing CRITICAL

- Allows you to capture excellent quality images without the need for image stabilization.
 - **Necessary piece of equipment**
- Auto Focus and Zoom Camera On:
 - Point of highest apparent opacity AND clear background WITHOUT shadow &/or condensed water vapor
 - Zoom as required to fill 2/3 of frame with plume area



Stabilization

Consistency: Must
Sun compliance: Must

Framing/zoom: Must



Brown Background

Zero image: ok



Image stabilization: ok





Brown Background

Zoomed in: ok

Zoomed out: bad





Keeping out of Caves

Shadow Cave: bad

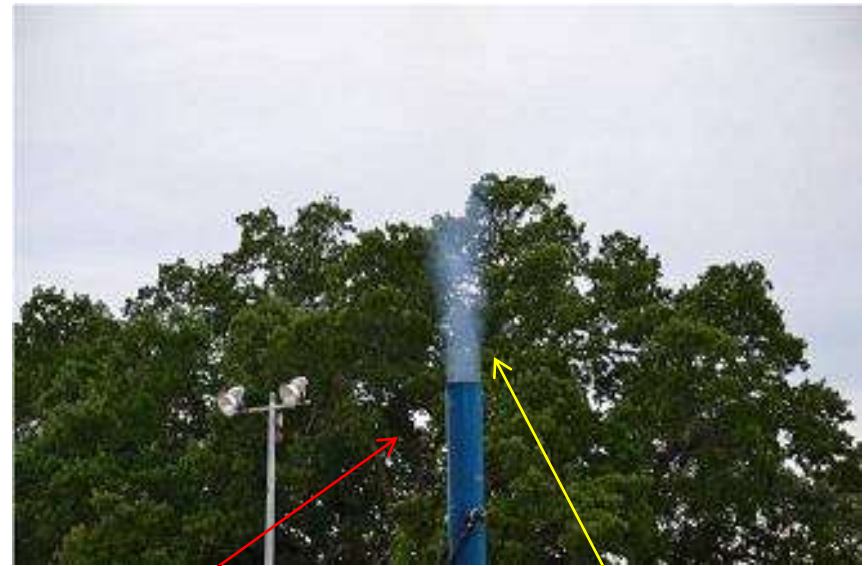
Zoom: ok



Tree Gaps

**Consistence Contrast:
Preferred Zero Image**

Find Dense leaves



Density of leaves:
Bad

Density of leaves: ok



Water Vapor

Background: ok

Zoom: a little too far back



Background: bad

Zoom: bad





Vents

Sun Compliance: Bad

Combining Plumes: Bad

Zoom: ok





Shoot for the Sky

Zero Image: ok



Broken Clouds: ok





Shoot for the Sky

Zero Image: ok



Clear Sky: ok





Blue Sky

White Smoke: ok

Zoom: ok

Black Smoke: ok

Zoom: ok





Lining up Cloud Coverage

Background: ok



Broken Clouds: ok



Poor Pictures

Background: bad

Framing: bad



Zoom: bad





Fumigating

Careful to NOT Capture Plume Multipliers

Folding Over



Mushrooming





Image Quality

Horizontal Lines of Light

Folding with Scattered Backgrounds



Mushrooming Plume with Scattered Cloud Coverage





Image Quality Checklist

Avoid

- Shadow Caves
- Complicated Backgrounds
- Long Distance Pictures
- Bad Framing
- Combining Plumes
- Folding/Mushrooming Plumes

Ideal

- Sun Compliance
- Clear Backgrounds
- Correct Framing
- Zoom Satisfaction
- Consistency
- Stabilization
 - Tripod
 - Intervalometer



How Does Color Contrast Affect Evaluation?





Poor Color Contrast Yields a Negative Bias!





Negative Bias!





50% = Ringelmann 2 1/2





Light Interactions

- **Luminous conditions**
 - Refers to the ambient lighting conditions
- **Color contrast**
 - Refers to the emission color in relation to the background
- **Attenuation**
 - Is the gradual loss in intensity of any kind of light through a medium



Avoid:

- ✓ No Color Contrast &
- ✓ High Luminous Conditions





Avoid: Sunsets/Sunrises



Multiple Source Issues Avoid:

- Combining Plumes
- Interfering Plumes





Bad Framing



Good Framing





Good: Satisfactory Framing & Zoom





Bad: No Optical Zoom & Too Far Away





- Combing/Interfering Plumes
- Shadows
- Framing
- No Tripod
- Inconsistency





☐ Good

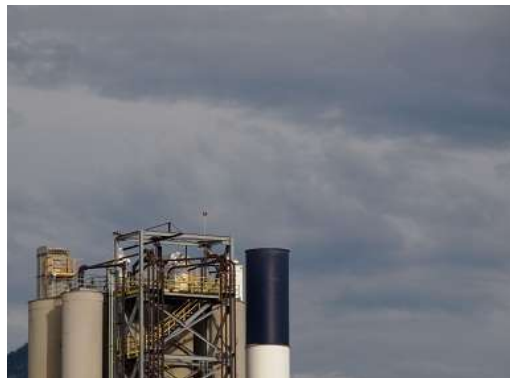




Framing Checklist

- **Sun behind camera in 140 degree sector?**
- **Observation Point “Plume” within center frame taking up ~2/3 of that frame, And 2/3 of total frame?**
- **Where will the analyst draw Plume and Background sticks? Is the background clear of residual plume, wind shear?**
- **Does the Background evenly contrast with Plume**
- **Is there going to be any interference?**
- **Do I need a zero image?**
- **If plume moves will it be framed correctly?**









DOCS II SUMMARY

- **DOCS II “Method 9” app available in Google Play Store**
- **DOCS II SaaS submitted for GSA Schedule 70 at 5K/yr, + \$100/VEE with, 1 time Image and Data Collection Course at \$2500,**
- **Pricing Tailored by:**
 - Number of sources and VE’s required
 - Current costs of achieving VE objectives
 - Requirements for defend ability of opacity readings
 - Archive storage and security requirements
- **Objective is standardize on DOCS II through out the AF and DOD community based on permit requirements and current expenditures**
- **DOCS II offers a more consistent, complete and verifiable VEE record than Method 9 records**
- **DOCS II meets all requirements for “Most Credible Evidence”**
- **DOCS II is certified to EPA ALT 082 and ASTM D7520**
- **ALT 082 is an EPA Approved Alternate to Method 9 for 40 CFR 60, 61, 63**

Digital Opacity Compliance System, Second Generation

Virtual Technology LLC

Shawn Dolan

888-872-3836

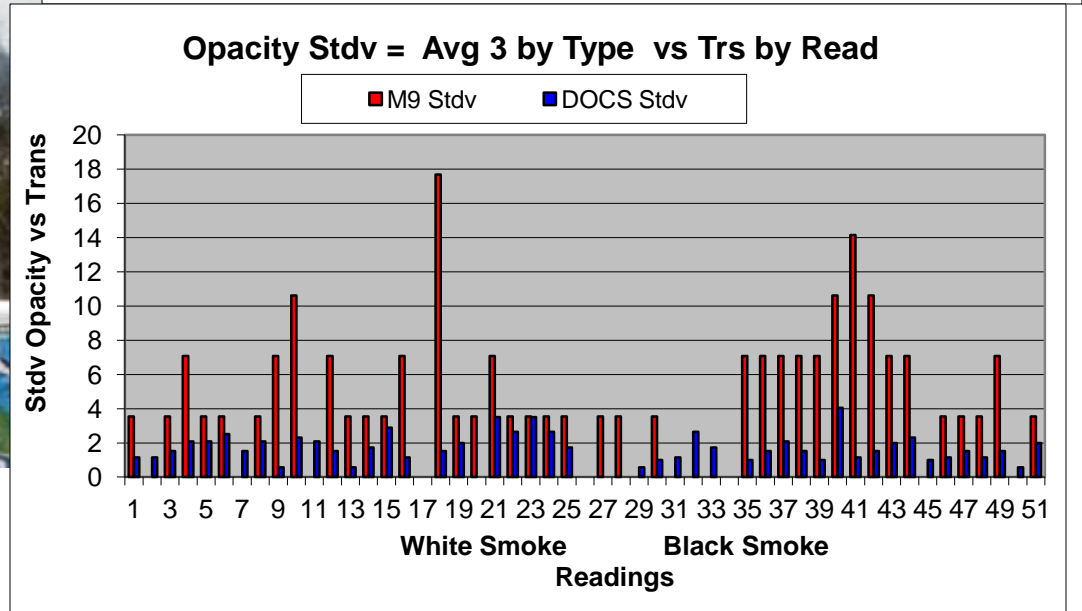
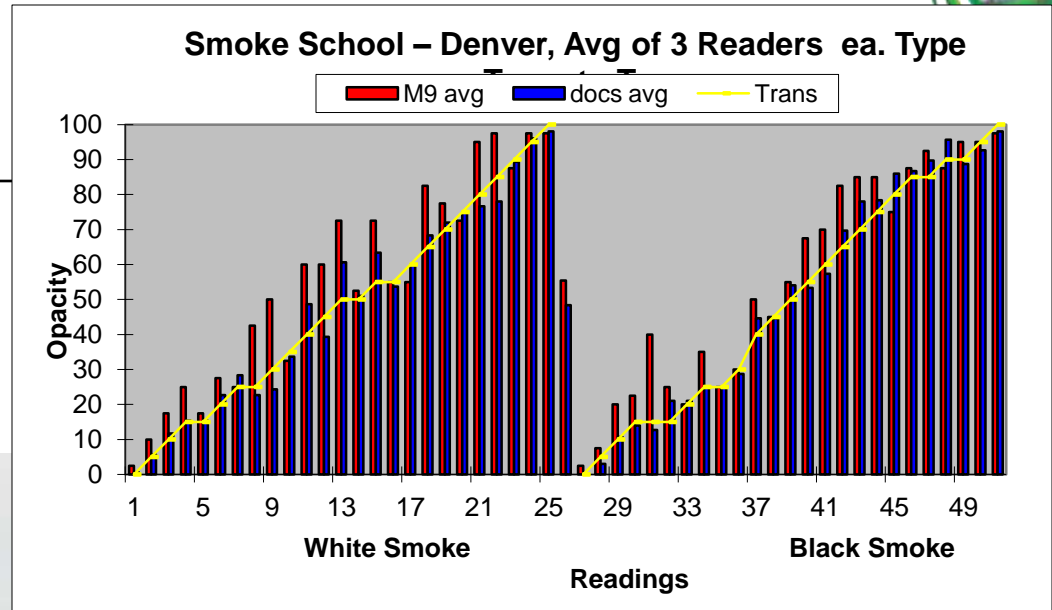
shawn.dolan@virtuallc.com



Back up data DOCS II Smoke School Region 6 Test 02 20

07

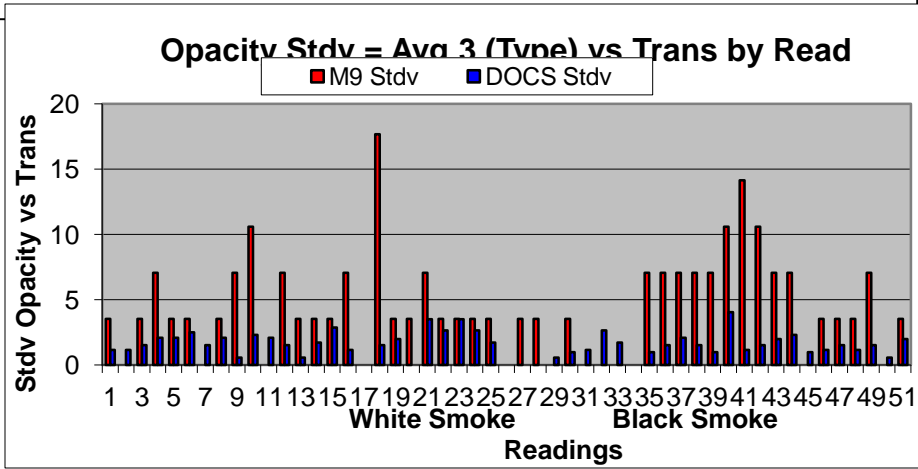
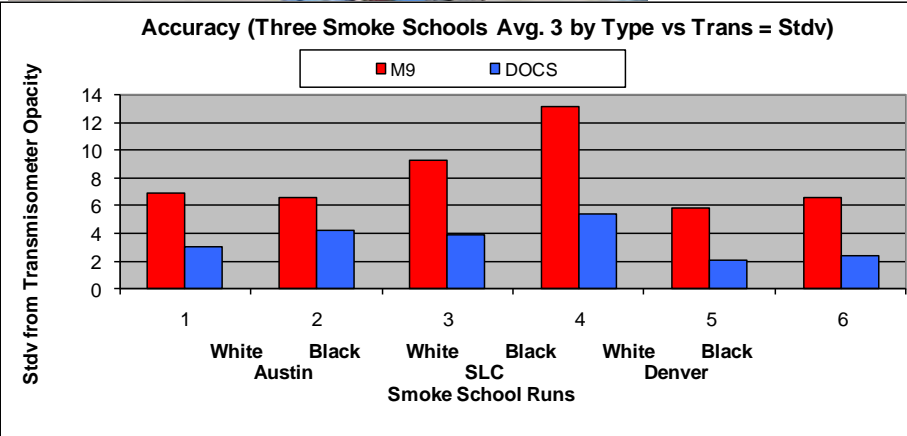
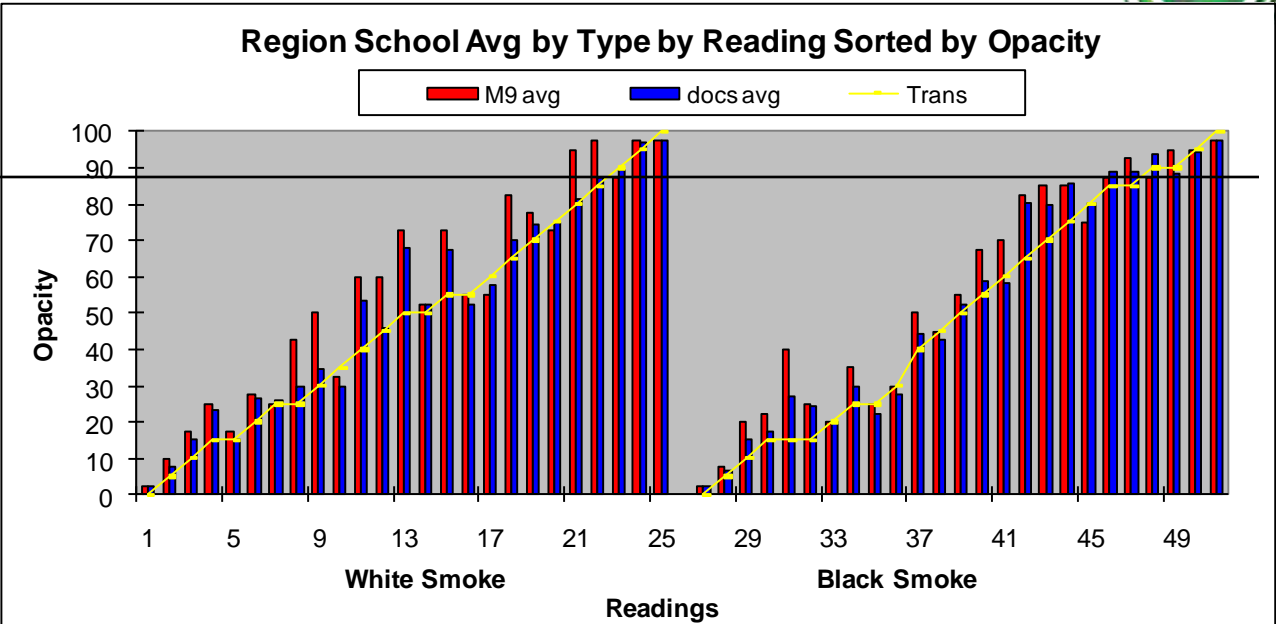
- 3) DOCS II Operators, and 3) Certified Method 9 Observers Compared to NIST COM





Backup data DOCS II Smoke School
Region 8 Test 04 17 07

3) DOCS II & 3) Method 9 vs NIST COM



Validation of DOCS II Capability
Average Accuracy Validated, Instantaneous Capability Established
DOCS II Passed Smoke School Just Like Method 9 Readers





Software as a Service: Cloud Computing Category:

BA02 Asset management, BA15 Engineering, BA29 Tracking and monitoring tools

Price: \$4995/yr (1 Required, Per 10 Trained VEE Users)

Product Name:

DOCS II Digital Opacity Compliance System Setup

Description:

Price is for 1 Certified Account per year, allowing 10 Trained VEE Users. Provides set up of organization specific Air emission sources, permits, limits, frequencies, processes and alerts reference set of VEE requirements for the organization .

Product URL:

<http://www.virtuallc.com/apps/DOCSIIAC/index.html>

Price: \$99/ea (Opacity Analysis of User VEE data)

Product Name:

DOCS II Digital Opacity Compliance System VEE

Description:

Price is for 1 Visible Emission Evaluation Record Set. Web based Opacity determinations from Certified Account, Trained VEE User, input of required VE dataset: acquisition location, source images.

Product URL:

<http://www.virtuallc.com/apps/DOCSIIOA/index.html>

Price: \$2499/ea (1 Required for each Trained VEE User)

Product Name:

DOCS II Digital Opacity Compliance System Train

Description:

Price is for 1 Visible Emission Evaluation Data Collection Certification required once for all DOCS II Trained VEE User Accounts with in a Certified Account

Product URL:

<http://www.virtuallc.com/apps/DOCSIIIR/index.html>

Price: \$49/yr (Storage for ~100 VEE records)

Product Name:

DOCS II Digital Opacity Compliance System Storage

Description:

Price is per GB of Visible Emission Evaluation Record Set Storage per year. Secure virtual storage and easy retrieval of VEE records, VEE record ~ 7MB

Product URL:

<http://www.virtuallc.com/apps/DOCSIIIST/index.html>

Price: \$499/ea (Litigation Detail Report/VEE)

Product Name:

DOCS II Digital Opacity Compliance System LDR

Description:

Price is for 1 Visible Emission Evaluation Certification Detail report, includes: DOCS II certification package, NIST trace to smoke generator certification, Analyst certification history, Source comparative analysis within Certified Account

Product URL: <http://www.virtuallc.com/apps/DOCSIIID/index.html>





The Future of Visual Emissions Evaluation Data Collection

Handheld Real Time Climatic Sensor

- Handheld Data Collection Device for DOCS II Application
 - One Device Collects all Required Data
 - Error-Free Automated Data Collection
- Integrated Weather Meter, GPS, Rangefinder, & Camera
- Measures all Required Report Data including:
 - Weather Conditions - Wind Speed, Wind Direction, Temperature, & Humidity
 - GPS Position Location, Sun Position, & Time
 - Distance to Target Emission Source, Angle of View
 - Digital Images of Visual Emissions & Source, Date/Time
- Automated Data Collection for DOCS II SaaS



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**Detached:
Condensed
Water**



**Attached:
Condensed
Water**

