# 1. MEETING MINUTES

The minutes are organized by topic per the agenda.

## 1.1 INTRODUCTIONS & MEETING GOALS AND OBJECTIVES

Brad Schmidt (CoE) opened the meeting by thanking everyone for attending and participating. Brad then discussed the topics and objectives of the meeting which are captured in the agenda.

## 1.2 GENERAL UPDATES ON CO-FPS DEVELOPMENT (NCAR)

Bill Mahoney (NCAR) gave a high level overview of the CO-FPS development work that has been conducted since the April Stakeholder meeting. The focus areas included, but are not limited to:

- Staging of CO-FPS input datasets
- Development of the data ingest subsystem (HRRR, NAM, LANDFIRE, MMA, CO-WIMS)
- Implementing data security measures
- Testing of data flows
- Working with Intterra on the development of the Interface Control Document (ICD)
- Updating the Functional Requirements Specification (FRS) based on user feedback
- Testing a variety of CAWFE® model and computer configurations to optimize performance
- Configuring CAWFE® to run daily over the mountains and plains to evaluate run-time performance (MPI vs. OpenMP options, etc.) and robustness
- Created a test wildfire ignition capability to exercise CAWFE®
- Developed product viewing capability outside of CO-WIMS for testing and evaluation purposes
- Prepared a Draft Training Plan and coordinated plan with Intterra

Several documents are due by early- to mid-June including:
- Functional Requirements Specification (FRS)
- CO-FPS Design Specification
- Performance Verification Metrics and Methodology Report
- Stakeholder Meeting Minutes (from this meeting)
- Computer augmentation specification

Jim Cowie (NCAR) then provided a more detailed update on the software engineering aspects of the development work. The details are provided in the presentation slides.

## 1.3 CAWFE® Developments and Initial Review and Demonstration of CO-FPS Products (NCAR)

Bill Mahoney set the context (weather and location information) for a demonstration of a CAWFE® fire simulation and Bill Petzke (NCAR) triggered a fire simulation during the meeting at 2 PM LT at Hall Ranch Open Space west of Lyons, CO using a scrip (outside of CO-WIMS for now) that sent information (location, time/date, and fire boundary) to the CO-FPS. Because it was possible that the real-time weather would not be conducive for a wildland fire, the weather from 10 May 2016 was used to trigger the fire. The output from this simulation ran during the meeting and the results were viewed toward the end of the meeting.

Branko Kosović, Pedro Muñoz Jimenez, and Domingo Muñoz-Esparza (NCAR) provided a technical update on CAWFE® model configuration and development and discussed some of the case studies that have been performed to date. Some of the configuration and development information that was discussed is summarized below (see presentation slides for details).

- The surface fire spread model is being parameterized using Rothermel (1972) model
- LANDFIRE – Is the default fuel dataset being used at the current time (using the Anderson 1982 fuel model)
- The fuel burnout is calibrated based on Albini et al. (1995)
- The CAWFE® model performance is being tested and refined for the operational implementation
- NCAR will be implementing the crown fire model by Finney (1998, FARSITE)
- The fire and burn area perimeter is modeled using an improved higher order level-set method
- CAWFE® is configured to assimilate the MMA burn area perimeter and fire boundary data
- NCAR is exploring using the expanded Scott and Burgan fuel models, however, fuel burnout parameters for some fuel categories are not available. NCAR had contacted Joe Scott (Pyrologix) for information on this topic
- The current CAWFE® configuration and takes maximum advantage of parallel computing and removes unnecessary calculations
- The NCAR modeling team also discussed some of the case study work and evaluations from simulating, for example, the High Park and Last Chance fires to assess model skill and run-time performance

Discussion notes and stakeholder feedback are captured below.

- The stakeholders expressed an interest in having the CO-FPS use the expanded Scott and Burgan fuel models so NCAR will continue to explore how to obtain or estimate the missing burnout parameters.

- Related to the Hall Ranch fire simulation, the stakeholders also asked NCAR whether the fuels were "conditioned" with weather from previous days since snow had fallen during the 10 May period.
  - NCAR Response: The current configuration and fuel models used do not provide a mechanism to "condition" the fuels, but all the weather related ingredients to do so are available. NCAR plans to investigate this capability as it is also related to the use of the Scott and Burgan fuel models, which would make the conditioning process more feasible.

## 1.4 CONTINUATION OF THE CO-FPS INITIAL PRODUCT DEMONSTRATION

- Jennifer Boehnert and Kevin Sampson (NCAR) and Molly Hausmann (Intterra) demonstrated several CO-FPS products using a combination of NCAR's GIS display system and CO-WIMS.
- Jim Cowie and Bill Mahoney then went through several questions about what units (UTC, LT, mph, etc.) were desired for a variety of CO-FPS products. The responses were captured and included in the CO-FPS Functional Requirements Specification. Some of the feedback included:
  - Time: Show product times in both UTC and LT
  - Rate of Spread: Provide information in chains per minute (or feet per minute)
  - Heat Release: Watts/m$^2$ (may also be better to provide flame length)
  - Flame Length: Desire to estimate this parameter
  - Smoke Concentration: Represent the air quality for fine particles - PM2.5 using μg/m$^3$, and where appropriate, converted to the EPA Air Quality Index (1-hour breakpoints) for fine particle PM2.5.
  - Turbulence: Light, Moderate, Severe (per FAA standards)
  - Updrafts/Downdrafts: Thresholds TBD

- Toward the end of the product demonstration session, NCAR and Intterra demonstrated the output from the Hall Ranch wildland fire simulation that was initiated at the beginning of the meeting. The information was primarily shown using NCAR's web based GIS tool, but the fire spread and a 15-hour animation of predicted fire spread and heat release was shown on the CO-WIMS interface.
- Approximately 10 hours of the 15-hour Hall Ranch fire simulation had completed by about 1 hour and 30 minutes into the meeting. The first 3 hours of the fire behavior prediction completed within 30 minutes of the trigger time. An image from the simulation is shown below.
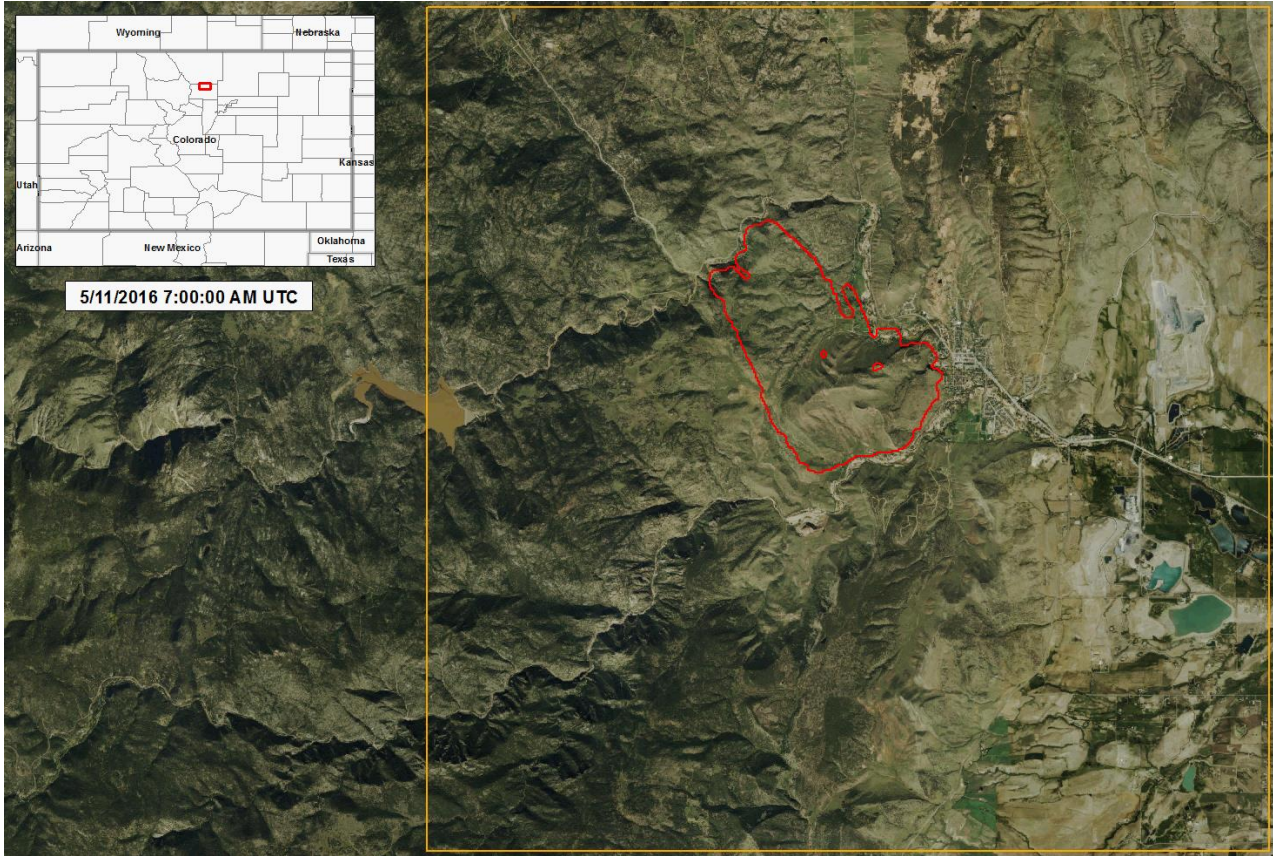
**Figure**. Image from the Hall Ranch CO-FPS displaced real-time 15-hour fire simulation using predicted weather information starting on 10 May 2016 at 20:00 UTC (2 PM LT). The predicted fire boundary (red polygon) on 11 May at 19:00 UTC (11 hour prediction) is shown. Note: Ignore the time shown in the image as it is labeled incorrectly.

## 1.5 DISCUSSION ON THE INTEGRATION BETWEEN CO-FPS AND CO-WIMS

Most of the discussion occurred during the demonstration presentations.

- The stakeholders reiterated that a faster turn-around time is highly desired. NCAR is working with the CoE to augment (more than double) the current CO-FPS computing platform.

# Appendix A – Meeting Agenda

**COLORADO**
Division of Fire
Prevention & Control
Department of Public Safety

Center of Excellence for Advanced
Technology Aerial Firefighting

Colorado Fire Prediction System May Meeting Agenda
May 23, 2016: 1 p.m. - 4 p.m.

NCAR Mesa Laboratory
1850 Table Mesa Drive Boulder, Colorado 80305
Damon Room

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| 12:00 p.m. - 1:00 p.m. | Lunch in NCAR's cafeteria (cash accepted only, open to the public) |
| 1:00 p.m. - 1:15 p.m. | Introductions & meeting goals and objectives (CoE) |
| 1:15 p.m. - 1:45 p.m. | General updates on CO-FPS development (NCAR)<br>• Overview of development since April meeting<br>• System development highlights |
| 1:45 p.m. - 2:15 p.m. | CAWFE® developments and initial limited demonstration of CO-FPS products (NCAR)<br>• Triggering a fire simulation demo<br>• Discuss CAWFE® system configuration and tuning process for Colorado<br>• Review case study testing to date |
| 2:15 p.m. - 2:30 p.m. | Break |
| 2:30 p.m. - 3:00 p.m. | Continue CO-FPS product demonstration (NCAR + Intterra)<br>• Demonstrate fire behavior and fire weather products<br>• Seek user feedback on product presentation and units<br>• Demonstrate output from fire simulation triggered earlier in the meeting |
| 3:00 p.m. - 3:45 p.m. | Discussion on CO-FPS product content and next steps |
| 3:45 p.m. - 4:00 p.m. | Closing remarks |