Categorization of Map Symbol Standardization

Justine Blanford

Anthony C. Robinson

Robert E. Roth

Scott Pezanowski

Benjamin Finch

Alan M. MacEachren

GeoVISTA Center

PENN STATE 1855

DEPARTMENT OF
GEOGRAPHY
COLLEGE OF EARTH AND
MINERAL SCIENCES

Standardization Process

- **Phase 1: Needs Assessment**
  - Review current symbology, identify new symbol needs, problems with current symbols

- **Phase 2: Initial Standard Development**
  - Develop symbol categories, vote on changes to current symbology

- **Phase 3: Standard Refinement**
  - Discuss, refine & vote on final categories

- **Phase 4: Implementation & Quality Control**
  - Test new symbology in exercise, submit standard for graphical refinement by cartographers

Process Testing

- 7 participants from Customs & Border Protection

- All are part of GIS/Mapping unit

- Testing from mid-February to early March

- 3 rounds with each round designed to last approximately 1 week in duration

- Three types of moderated activities: group discussion, voting/polling, card sorting

Methodology

– Distributed, web-based activities through a customized Drupal site

– Anonymized participation

– Round-based discussion & voting (modified Delphi)

– Card-sorting activities (using websort.com)

Web-based activities through Drupal site

Round-based discussion & voting

Round 1 Discussion Topics

Forum	Topics	Posts	Last post
▤ Activity #2: Problems With Existing Symbols - **reroth**, Fri, 02/05/2010 - 12:48			

↳ **Symbols that are never used** - **jblanford**, Thu, 02/18/2010 - 12:11
  ↳ **After reviewing the symbol** - **Bravo**, Fri, 02/19/2010 - 15:50
  ↳ symbol usage - **Juliet**, Thu, 02/18/2010 - 12:35
↳ **Problems with existing symbols** - **jblanford**, Wed, 02/17/2010 - 15:30
  ↳ **Aircraft crash** - **Foxtrot**, Thu, 02/18/2010 - 09:01
    ↳ **Aircraft crash** - **Bravo**, Fri, 02/19/2010 - 16:04
  ↳ **Similar symbols** - **Foxtrot**, Thu, 02/18/2010 - 08:43
    ↳ Similar symbols - **Bravo**, Fri, 02/19/2010 - 16:22
↳ Necessary Symbol ? - **Juliet**, Tue, 02/16/2010 - 10:19
  ↳ **Necessary Symbol Part II** - **India**, Wed, 02/17/2010 - 15:46
    ↳ **Infrequently-used (but still recurrent) symbols** - **Foxtrot**, Thu, 02/18/2010 - 08:35
      ↳ **I agree with this statement.** - **Hotel**, Thu, 02/25/2010 - 10:29
  ↳ Other symbol is usless - **Charlie**, Tue, 02/16/2010 - 14:47
  ↳ "Other" symbol - **Foxtrot**, Tue, 02/16/2010 - 13:29
    ↳ other symbol - **Echo**, Tue, 02/16/2010 - 16:44
      ↳ **Need better description** - **Charlie**, Wed, 02/17/2010 - 10:31
↳ Same Symbology - **Juliet**, Tue, 02/16/2010 - 10:16
  ↳ **Checkpoint Symbology** - **Foxtrot**, Tue, 02/16/2010 - 13:24
    ↳ checkpoint symbology - **Echo**, Tue, 02/16/2010 - 16:39
      ↳ checkpoint symbology - **Juliet**, Wed, 02/17/2010 - 08:40
        ↳ **I agree, we should have only** - **Hotel**, Thu, 02/18/2010 - 09:43
      ↳ checkpoint symbology - **Echo**, Wed, 02/17/2010 - 12:14
        ↳ I believe that its Tuscan - **India**, Wed, 02/17/2010 - 15:43
↳ **Symbols that are too complex** - **Foxtrot**, Tue, 02/16/2010 - 10:11
  ↳ **Too Complex** - **Bravo**, Fri, 02/19/2010 - 16:01
  ↳ **Also** - **Charlie**, Wed, 02/17/2010 - 10:34
    ↳ **Agreed - the actual symbol** - **Hotel**, Thu, 02/18/2010 - 09:46
    ↳ **Could you provide a** - **Echo**, Wed, 02/17/2010 - 12:08
↳ **Symbols that are difficult to interpret** - **Foxtrot**, Tue, 02/16/2010 - 09:59

Round-based discussion & voting

Which of the following categories should be included in the new standard?

view edit outline track

Submitted by **reroth** on Mon, 03/01/2010 - 00:24

CBP
88% (7 votes)

Events
88% (7 votes)

Assets
88% (7 votes)

Picture Symbols
75% (6 votes)

DHS
63% (5 votes)

Miscellaneous
50% (4 votes)

General not OBP specific
50% (4 votes)

Intelligence
50% (4 votes)

Landmark not OBP specific
0% (0 votes)

Exploratory card sorting

- ## Card sorting

    - a method "used to discover users' mental models of an information space" (Nielsen and Sano 1995: 180)
    - a technique for understanding how users classify a set of topics into a larger conceptual taxonomy

- ## Symbol Standardization Process

    - applied to identify ambiguity and possible confusion in both feature categories and symbols/definitions

Exploratory card sorting

- **Two exploratory card sorting studies were completed**

  1. Open sort of symbols (n= 168) and no categories

  2. Closed sort of symbols (n= 170) into 5 pre-defined categories

Symbols to be categorized

5-Day Forecast Storm Track Point	Bridge	Entry	IBET RCMP
Activity	BSI Death	Export	ICE
Agent Vehicle	BSI egis	FBI	ICE Office
Air National Guard	BSI Rescue	FBI	Illegal Alien
Aircraft	BST	Federal Law Enforcement Agency	Import
Aircraft Crash	Bus	FEMA Mobilization Staging Area	Incursion
Airport	Camera	FEMA Recovery Office	Intel
American Red Cross	Capital	FEMA Regional HQ	Intel Alert
AMOC Point Illegal	CBP	FEMA USAR	Intel Summary
AMOC Point Legal	City	Fire Station	Joint Forces Headquarters
AMOC Point Other	Correctional Facility	Foot Sign	Landmark
AMOC Point Suspect	Crossing	Fusion Center	Landmark Cattle Guard (egis)
Apprehension	DEA	G166	Landmark Mile Marker (egis)
Army National Guard	DEA	Gate	Landmark Other (egis)
ASIC	DHS	Heliport	Landmark Windmill (egis)
Assault	DHS	Historical Storm Track Point	Layup
ATF	Documents	Hospital	LEA County
Border Monument	Electric Power Plant	House	LEA Local
Border Monument (egis)	EMS Operations	Hurricane	LEA Other
BORSTAR	Encounters	IBET	LEA State

LETC	OBP Checkpoint Permanent	Oil Platform	Sensor Other
Light	OBP Checkpoint Permanent (egis)	OIOC Facility	Sensor Repeater
Light TI	OBP Checkpoint Tactical	OIT	Sensor Seismic
Linewatch	OBP K-9 Unit	Olympic Rings	Sensors All
Low Water Crossing	OBP National HQ	Other	Significant Sighting
MSS Truck	OBP Sector HQ	Other Facility	SIR
NPS	OBP Station	Petroleum Refinery	Smuggling
Nuclear Power Plant	OBP Station (egis)	Pick-up	State EOC
OAM	Office of Chief Counsel	Predator	Terrorism
OAM Air Branch	Office of Internal Affairs	RCMP	Tower
OAM Air Unit	Office of Training and Development	Report	Transportation Check
OAM Branch HQ	Officer Safety	Rescue Beacon	Travel
OAM Dock	OFO - Agriculture Inspection	RVSS	Tropical Storm
OAM Facility	OFO - Airport Passenger Inspection	SBInet CRT	TSA
OAM Marine Unit	OFO - Cargo Inspection	SBInet Notional	Tunnel
OAM Operations Center	OFO - CSI Port	SBInet RRVS	U.S. Flag
OAM Regional Director	OFO - Field Office	SBInet RRVS	Urgent Care Center
OAM Support	OFO - Mail Inspection	SBInet RVS	USCG
OAM UAS	OFO - Port of Entry	Scope Sight	USCG
OAM Training	OFO - Radiation Portal	Seizure	Wanted Person
OBP	OFO K-9 Unit	Sensor Infrared	Weapon
OBP Camp	OFO Seaport	Sensor Magnetic	WMD CST

Process

Results
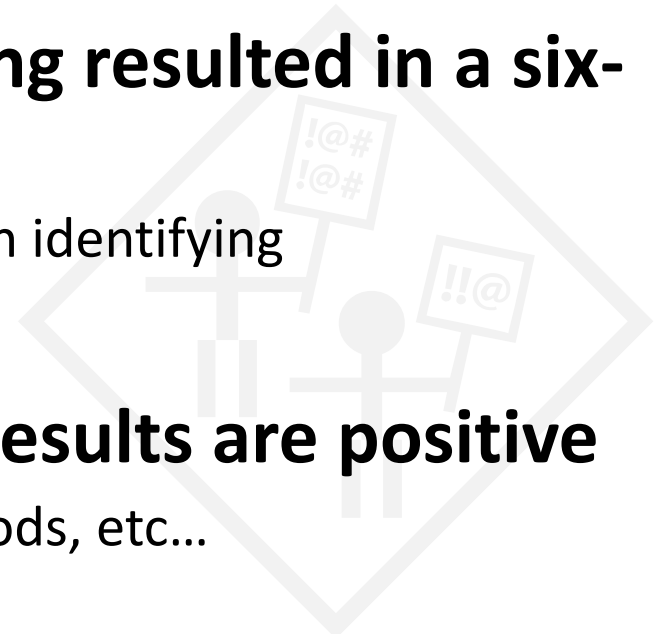
Results

- **Participants identified 56 symbol issues**
  - new symbols, duplicate symbols, symbol definitions, symbol designs

- **Multiple rounds of card sorting resulted in a six-category standard**
  - this activity required more effort than identifying

- **Participant feedback survey results are positive**
  - usefulness, time commitment, methods, etc…
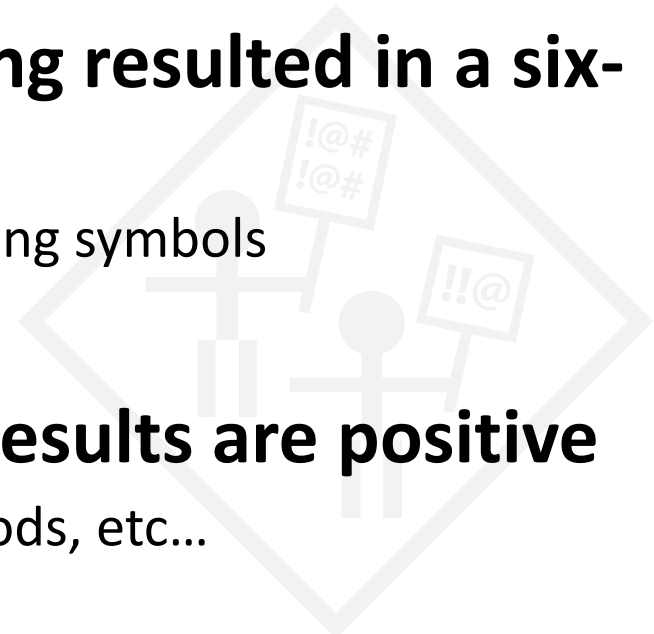
Final Categorized Symbol Matrix

Miscellaneous					
Miscellaneous	Aircraft	no categories			
Miscellaneous	Airport	no categories			
Miscellaneous	American Red Cross	no categories	symbol too similar to Rescue Beacon BSI Dea	amend	
Miscellaneous	Bridge	no categories	symbol difficult to interpret		simplify
Miscellaneous	Bus	no categories			
Miscellaneous	Capital	no categories			
Miscellaneous	City	no categories			
Miscellaneous	Correctional facility	no categories	symbol too complex | symbol difficult to inte	simplify	
Miscellaneous	Electric Power Plant	no categories	symbol too complex		simplify
Miscellaneous	EMS Operations	no categories	symbol too similar to FEMA USAR	amend	
Miscellaneous	Fire Station	no categories	symbol too complex		simplify
Miscellaneous	Heliport	no categories	symbol too complex		simplify
Miscellaneous	Hospital	no categories			
Miscellaneous	House	no categories			
Miscellaneous	Nucelar Power Plant	no categories			
Miscellaneous	Oil Platform	no categories			
Miscellaneous	Olympic Rings	no categories	identified as a symbol to possibly delete (but voted not to)		
Miscellaneous	Other	no categories	identified as a symbol to possibly delete (but voted not to)		
Miscellaneous	Petroleum Refinery	no categories			
Miscellaneous	Travel	no categories	symbol too complex | symbol difficult to inte	simplify	
Miscellaneous	Urgent Care Center	no categories			
Miscellaneous	US Flag	no categories	identified as a symbol to possibly delete (but voted not to)		

Results

- **Participants identified 56 symbol issues**
  - new symbols, duplicate symbols, symbol definitions, symbol designs

- **Multiple rounds of card sorting resulted in a six-category standard**
  - this activity identifying and categorizing symbols

- **Participant feedback survey results are positive**
  - usefulness, time commitment, methods, etc…

Round-based discussion & voting

Which of the following categories should be included in the final symbology standard?

| view | edit | outline | track |

Submitted by **arobinson** on Mon, 03/08/2010 - 14:47

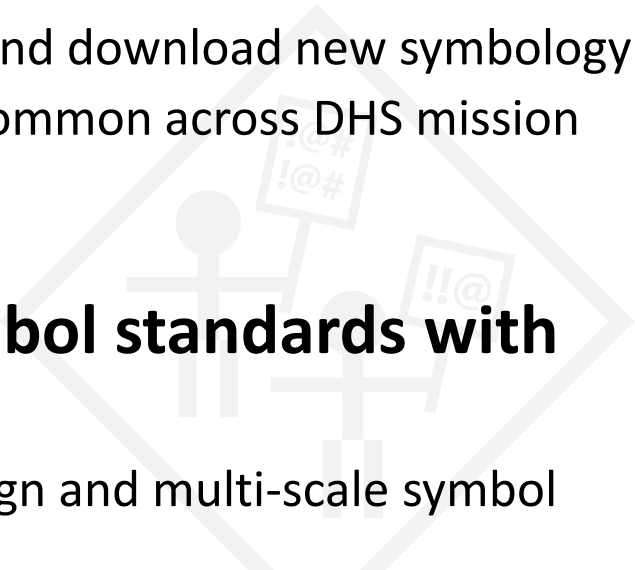Please select all of the categories you think should be included in the final CBP symbology standard.

CBP (which includes sub-categories OBP, OMA, OFO, Facilities, Intel)

100% (6 votes)

Events

100% (6 votes)

Miscellaneous

100% (6 votes)

General Government

100% (6 votes)

Assets

67% (4 votes)

DHS

67% (4 votes)

BP Reference / Waypoint

67% (4 votes)

Picture Symbols
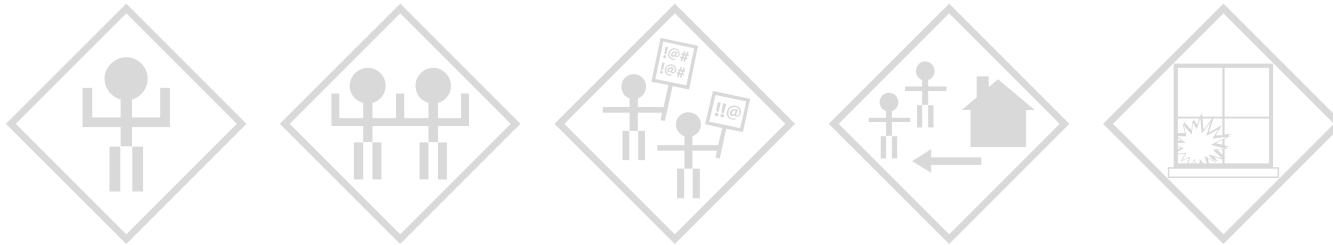
50% (3 votes)

Total voters: 6

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Future Work

- **Complete process with another group**
  - Operational Center, FEMA

- **Create an on-line Symbol Store**
  - Place for users to upload, share, search, and download new symbology
  - Will also allow us to identify symbols in common across DHS mission areas

- **Determine ways to integrate symbol standards with Virtual USA effort**
  - Including a focus on dynamic symbol design and multi-scale symbol design

Thanks for your attention!

for more information: arobinson@psu.edu

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