SAN DIEGO I-15 TEST BED FOR INTEGRATED CORRIDOR MANAGEMENT

Rule 940: Methodology, Madness, and Measures Materialize

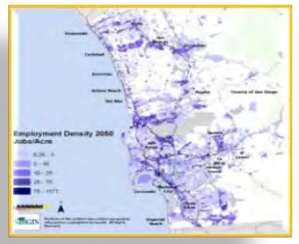
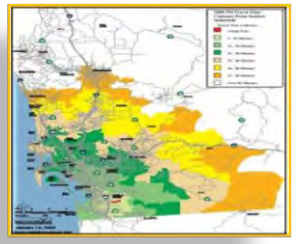
January 27th, 2015

8:30am – 12:00pm

SANDAG

Overview of SANDAG's Regional Work

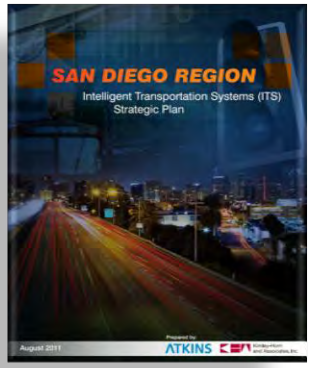


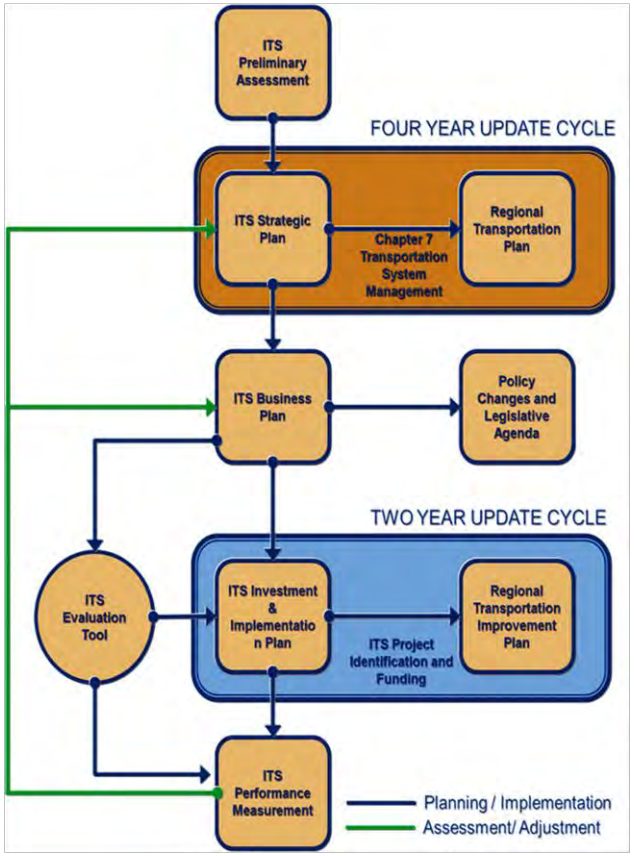




- Population growth
- Transportation
- Transit construction
- Habitat planning
- Housing
- Census
- Energy
- Economic prosperity
- Public safety
- Binational planning
- Shoreline preservation
- Interregional planning

Planning for Transportation Technology Adoption

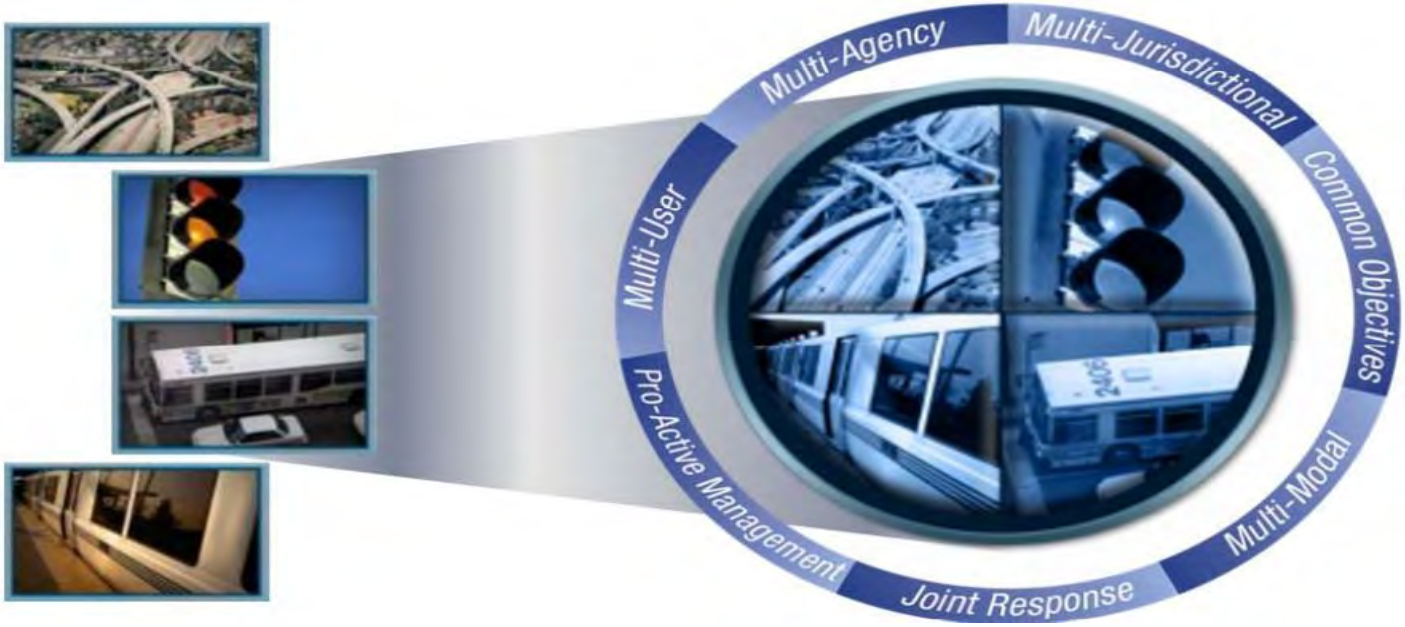
- Multimodal Integration and Performance Based Management
- Traveler Information
- Arterial Management
- Freeway Management
- Transit Management
- Electronic Payment System



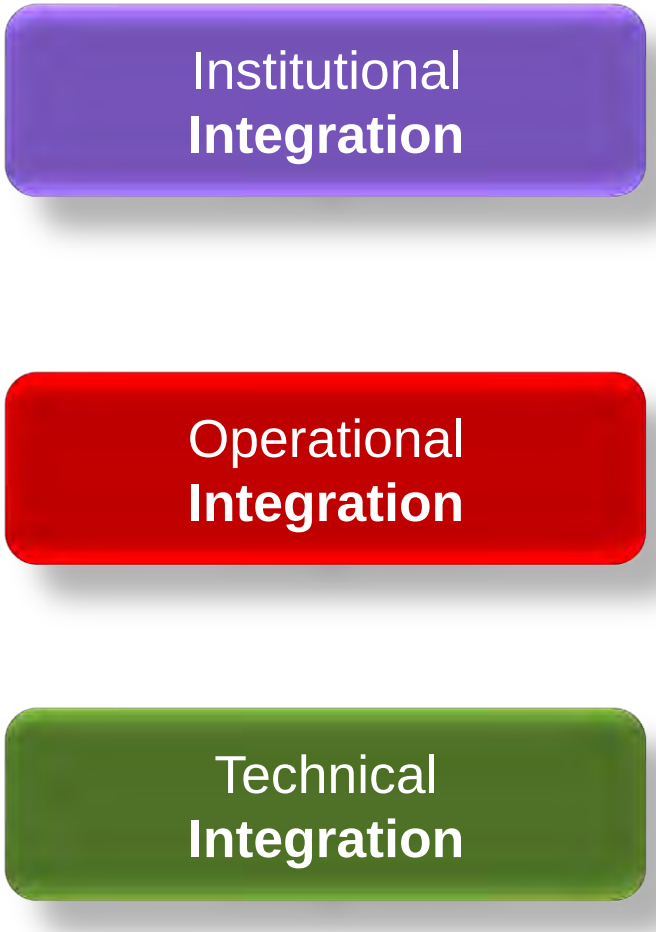


USDOT ICM Vision Background

- Utilize technology and partnerships
- Manage corridor as system
- Provide travelers decision quality information
- Maximize corridor capacity



Experience Using Systems Engineering



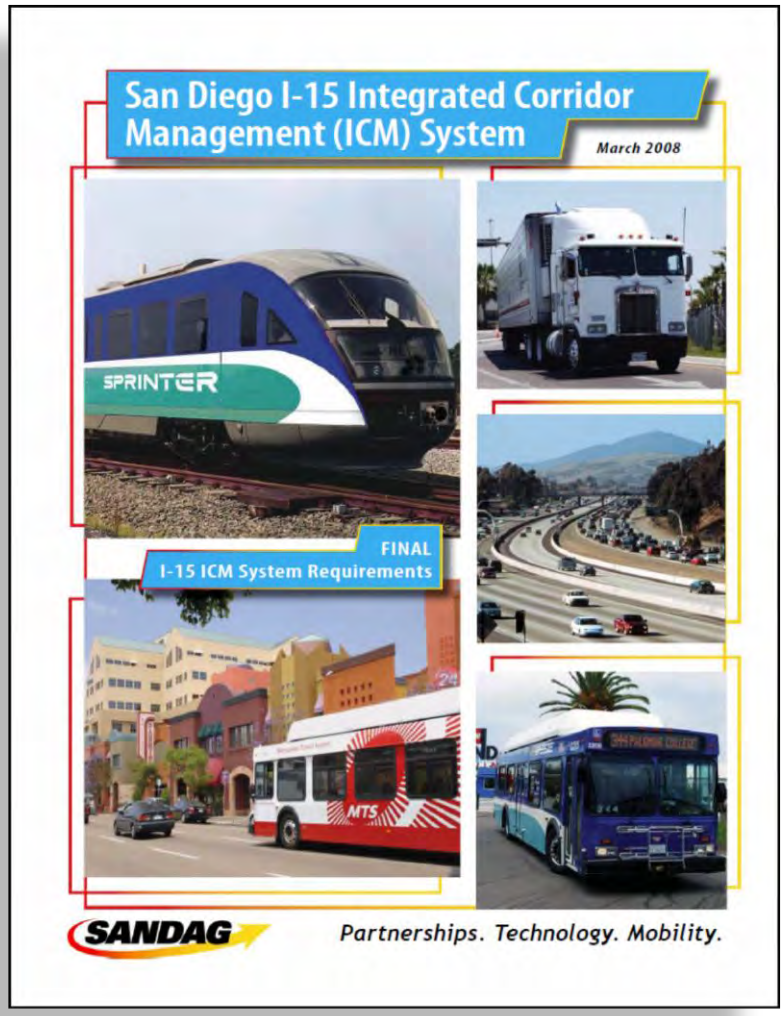
- **Coordination** to **collaboration** between various agencies, modes, and jurisdictions that transcends institutional boundaries
- **Joint** operational objectives and strategies to manage and balance the total capacity and demand of the corridor
- **Sharing** and **distribution** of information and system operations control functions to support the analysis and immediate response

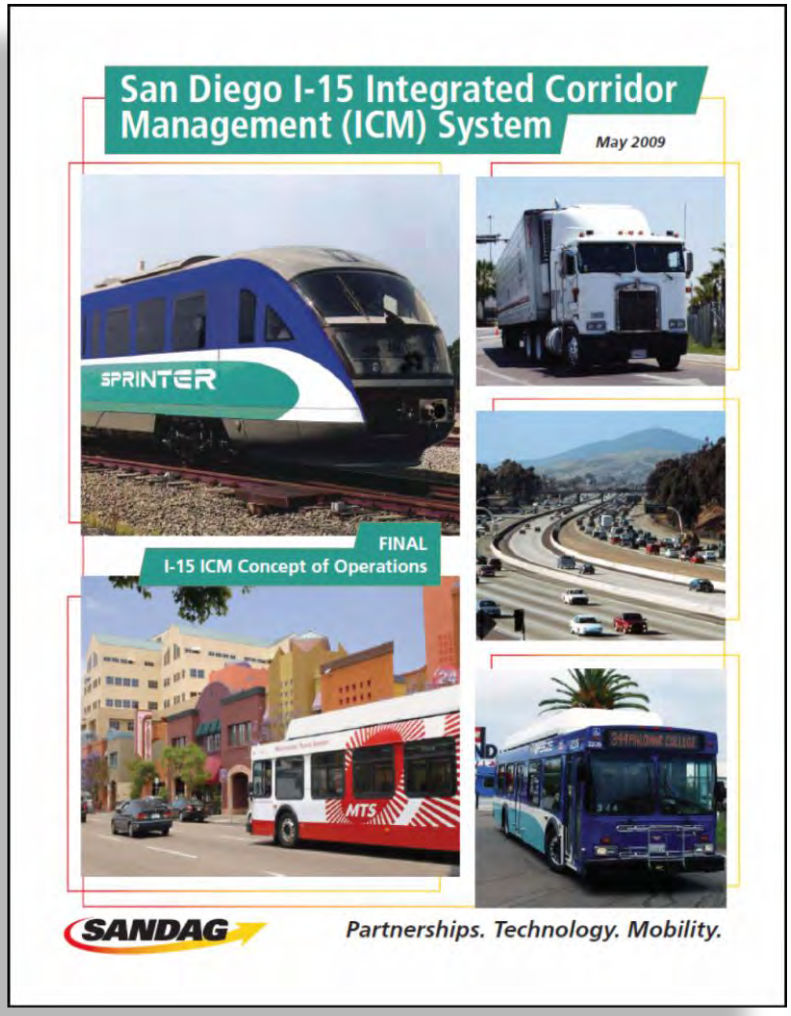
http://www.its.dot.gov/icms/

Strategic Assessment

	Level 1 Silo	Level 2 Centralized	Level 3 Integrated	Level 4 Multimodal Integrated	Level 5 Multimodal Optimized
Planning	Functional Area Planning (single mode)	Project-based Planning (single mode)	Integrated agency wide planning (single mode)	Integrated corridor-based multimodal planning	Integrated regional multimodal planning
Data Collection (vehicle tracking)	Limited or Manual Input	Near real-time for major routes	Real-time for major routes using multiple inputs	System-wide Real-time data collection (single mode)	System-wide Real-time data collection across all modes
Data Integration	Limited	Networked	Common user interface	2-way system integration	Extended integration
Network Operations	Ad-Hoc, Single Mode	Centralized, Single Mode	Automated, Single Mode	Automated, Multimodal	Multimodal Real-time Optimized
Incident Management	Manual detection, response and recovery	Manual detection, coordinated response, manual recovery	Automatic detection, coordinated response and manual recovery	Automated pre-planned multimodal recovery plans	Dynamic multimodal recovery plans based on real-time data
Analytics	Ad-hoc analysis	Periodic, Systematic analysis	High-level analysis in near real-time	Detailed analysis in real-time	Multi-modal analysis in real-time
Demand Management	Individual static measures	Individual measures, with long term variability	Coordinated measures, with short term variability	Dynamic pricing	Multimodal dynamic pricing
Payment Methods	Manual Cash Collection	Automatic Cash Machines	Electronic Payments	Multimodal integrated fare card	Multimodal, multi-channel (fare cards, cell phones, etc)
User Information Services	Static Information	Real-time information by mode	Multimodal Real-time trip planning.	Location-based, on-journey multimodal information	Location-based, multimodal proactive re-routing
Performance Measurement	Minimal	Defined metrics by mode	Limited multimodal metrics	System-wide multimodal system-wide metrics	Continuous system-wide performance measurement

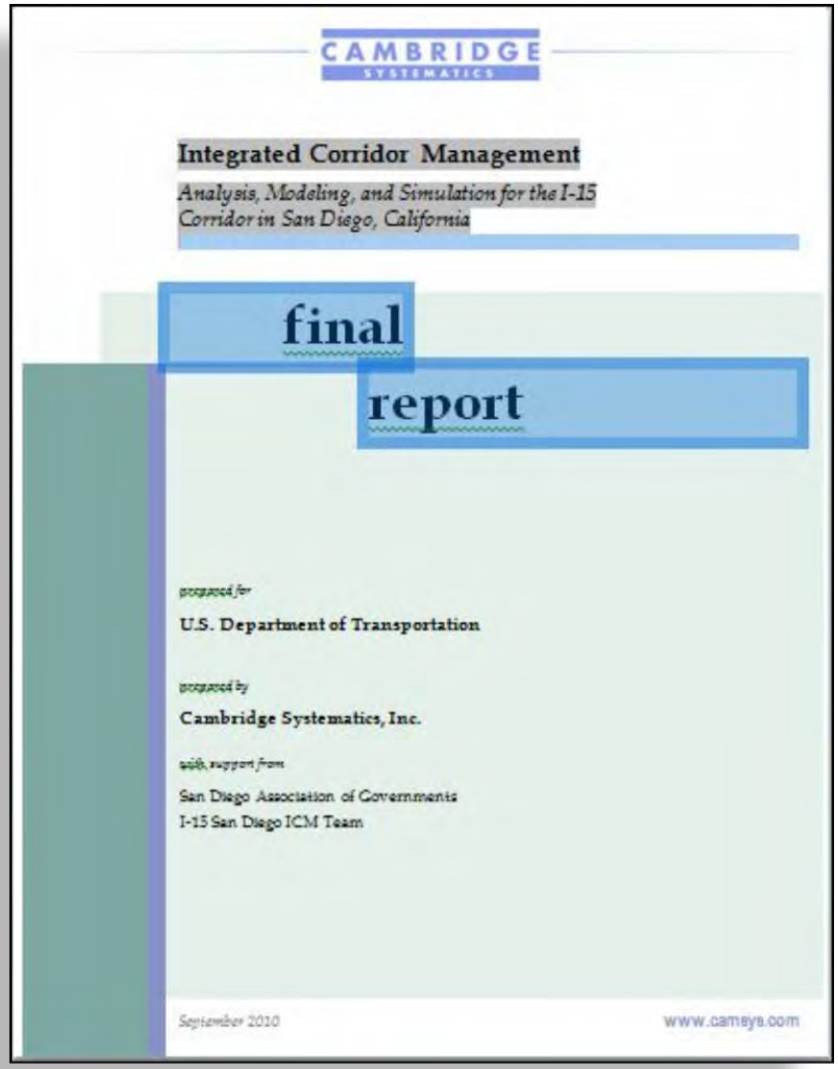
Phase I: Concept Development



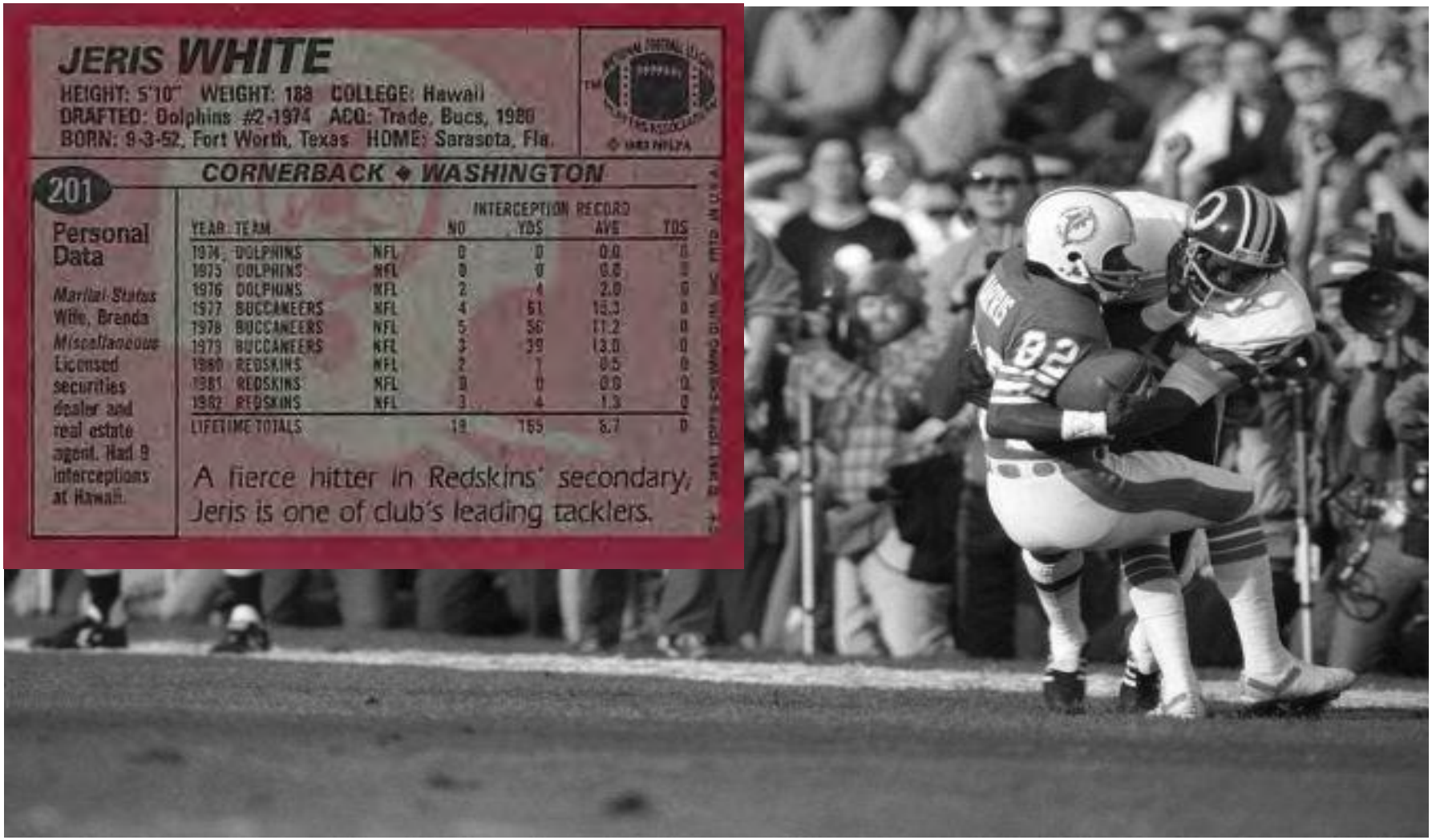


Phase II: Was it Feasible

- Overall, significant benefits
- Reduced travel time and improved travel time reliability are two largest expected benefits, followed by fuel consumption and emissions benefits.
- $13.7 million in user benefits per year
- 10-year life cycle total benefit of **$115.9 million**.
- Costs are estimated at $1.42 million per year. 10-year life-cycle cost at **$12.0 million**.
- Benefit/cost ratio over the 10 life cycle is **9.7:1**.



Phase III: Design



JERIS WHITE

HEIGHT: 5'10" WEIGHT: 188 COLLEGE: Hawaii
DRAFTED: Dolphins #2-1974 ACQ: Trade, Bucs, 1980
BORN: 9-3-52, Fort Worth, Texas HOME: Sarasota, Fla.

CORNERBACK ◆ WASHINGTON

201

Personal Data

Marital Status
Wife, Brenda
Miscellaneous
Licensed securities dealer and real estate agent. Had 9 interceptions at Hawaii.

INTERCEPTION RECORD

YEAR	TEAM		NO	YDS	AVE	TDS
1974	DOLPHINS	NFL	0	0	0.0	0
1975	DOLPHINS	NFL	0	0	0.0	0
1976	DOLPHINS	NFL	2	4	2.0	0
1977	BUCCANEERS	NFL	4	61	15.3	0
1978	BUCCANEERS	NFL	5	56	11.2	0
1979	BUCCANEERS	NFL	3	39	13.0	0
1980	REDSKINS	NFL	2	1	0.5	0
1981	REDSKINS	NFL	0	0	0.0	0
1982	REDSKINS	NFL	3	4	1.3	0
LIFETIME TOTALS			19	165	8.7	0

A fierce hitter in Redskins' secondary, Jeris is one of club's leading tacklers.

Phase III: Design Confirmation

- Federal INCOSE consulting support consultant NOBLIS recommend IEEE 1028 Requirements Walkthrough be conducted.
- 1098 page *workbook*
- 5 day workshop
- Partner specific scheduling

San Diego ICM Project
Project #
Conops/SyReqs Walkthrough Version 0.1

SANDAG

Date of Review	2/26/2010

Section 1: Verify the Need

Need ID	Need Title
13	Measure Corridor Performance

Need Text

Measure Corridor Performance User Need looks at multi-modal corridor data from both a short-term and long-term perspective. Existing historical databases for ATMS 2005, RTMS, RAMS, CAD systems, CPS, and Smart Parking provide mode-specific data. Likewise, Performance Measurement System (PeMS) provides a traffic and transit operations view of data. Based on these data sources, corridor demand will be analyzed using actual data or by demand modeling techniques. Using stored corridor configuration data, excess corridor capacity can be measured for any desired time period. This user need will be most valuable for long-term corridor management.

Need Text (Comments/Changes)

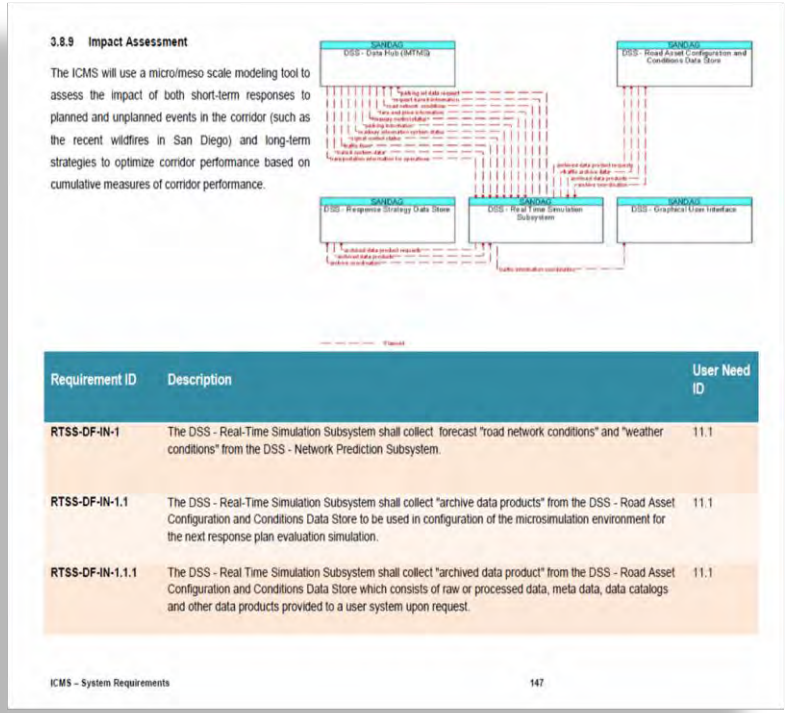
Need Criteria		Yes	No/Rank
1	Is the need well-written?		
2	Is the need unambiguous?		
3	Is the need uniquely identifiable?		
4	Does the need express a major desired capability?		
5	Is the need solution free?		
6	Does the need capture the intent and rational as to why it is needed?		

Note: An answer of no requires a comment or change in the Comments/Change field section above and a note in the "Overall evaluation of user need and associated requirements" section below

Friday, February 26, 2010 *Page 448 of 936*

Phase III: Re-Write….

- After “Requirements Walkthrough”
- 1007 consultant written requirements distill to 127 unique requirements
- Re-write takes 3 months
- Use Regional Architecture, and National Architecture to address NOBLIS comments
- Addition of “Performance Requirements” found to be most challenging for consultant to deliver
- New requirements require *second* walkthrough with stakeholders.
- Outcome:
  - Better definition
  - Expectations setting more robust
  - Test approach better understood
  - More easily phased for implementation



3.8.9 Impact Assessment

The ICMS will use a micro/meso scale modeling tool to assess the impact of both short-term responses to planned and unplanned events in the corridor (such as the recent wildfires in San Diego) and long-term strategies to optimize corridor performance based on cumulative measures of corridor performance.

Requirement ID	Description	User Need ID
RTSS-DF-IN-1	The DSS - Real-Time Simulation Subsystem shall collect forecast "road network conditions" and "weather conditions" from the DSS - Network Prediction Subsystem.	11.1
RTSS-DF-IN-1.1	The DSS - Real-Time Simulation Subsystem shall collect "archive data products" from the DSS - Road Asset Configuration and Conditions Data Store to be used in configuration of the microsimulation environment for the next response plan evaluation simulation.	11.1
RTSS-DF-IN-1.1.1	The DSS - Real Time Simulation Subsystem shall collect "archived data product" from the DSS - Road Asset Configuration and Conditions Data Store which consists of raw or processed data, meta data, data catalogs and other data products provided to a user system upon request.	11.1

ICMS – System Requirements 147

Phase III: Design DSS “Solution Clusters”

Data Integration / Fusion Engine

Business Rules Engine

Corridor Visualization

Real-Time Network Prediction Algorithm

Response Plan Evaluation Engine

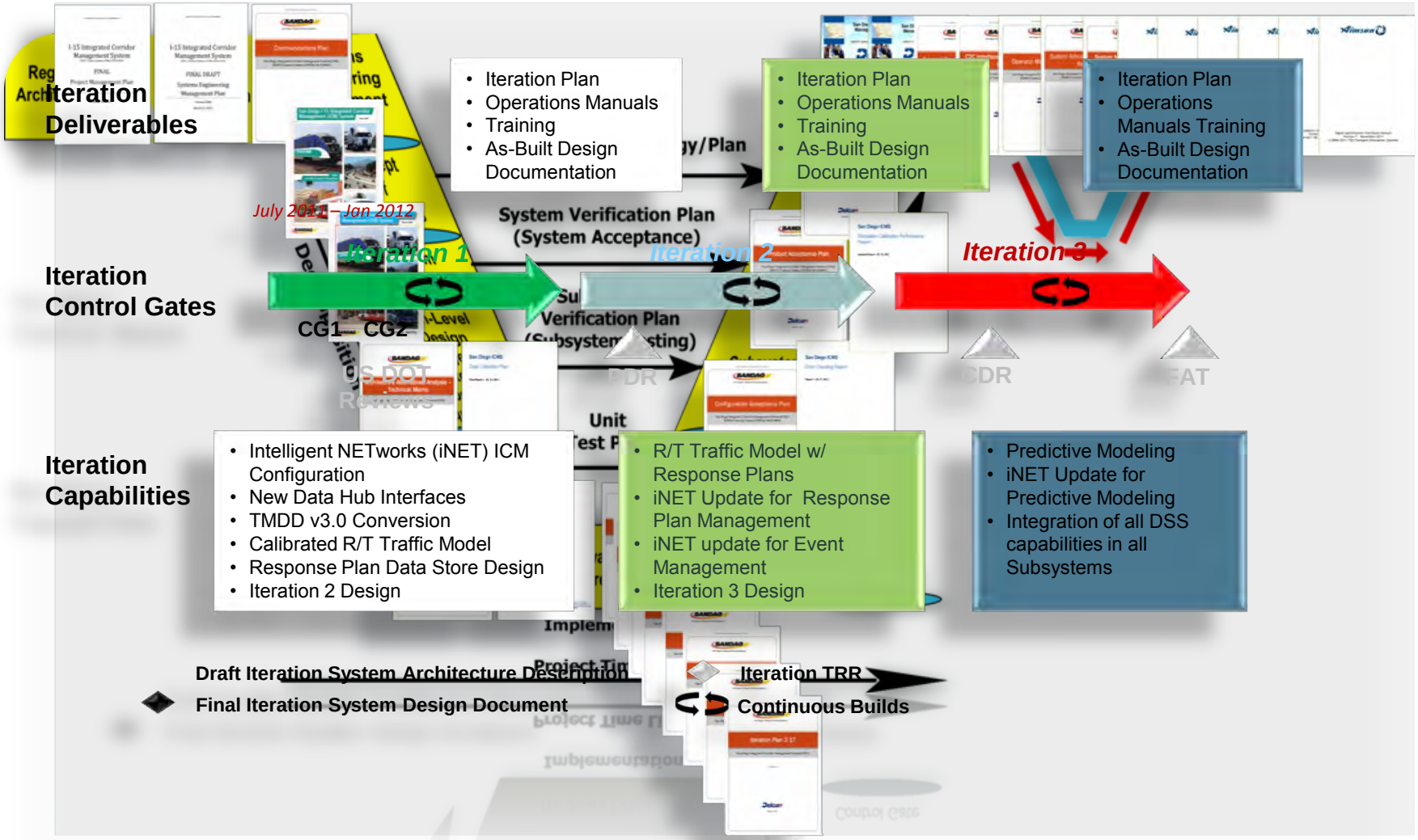
Performance Data Warehouse

Automation Workflow Engine

Expert System

Decision Support

Phase III: Delivery (with a twist)



Three Challenges

- **In-House**
  - Submissions from Regional Stakeholders can be ad-hoc & time dependent (in-house task at present)
  - Tools designed to "display" information, not produce *usable* artifacts (i.e. Statement of Work baseline)
- **Out-House**
  - Federal determination of "high risk" requirement to use full Systems Engineering methodology only made after a "risk" has triggered.
- **Under- House**
  - Federal documents or case studies where "*SE+*" or "*SE-Lite*" have been used. Difficulty getting *approval* to change "V" methodology.

Three Benefits

- Maintenance
  - Staff turnover happens
  - Corporate memory retained in document set. [now somebody just needs to read them again]
- Repeatability
  - From concept exploration to project execution.
- Choice
  - Reduced vendor “lock-in” risk

What can you do?

- Turn up the *volume* on the “Benefits”
- Certify (organization & individual)
- Get ready….V2I coming!