Protecting Information Assets

- Week 8 -

Business Continuity and Disaster Recovery Planning

MIS5206 Week 8

- Lecture: BCP/DRP
- Mid-term Review
- Test Taking Tip
- Quiz
- Next week – guest lecturer

Reading

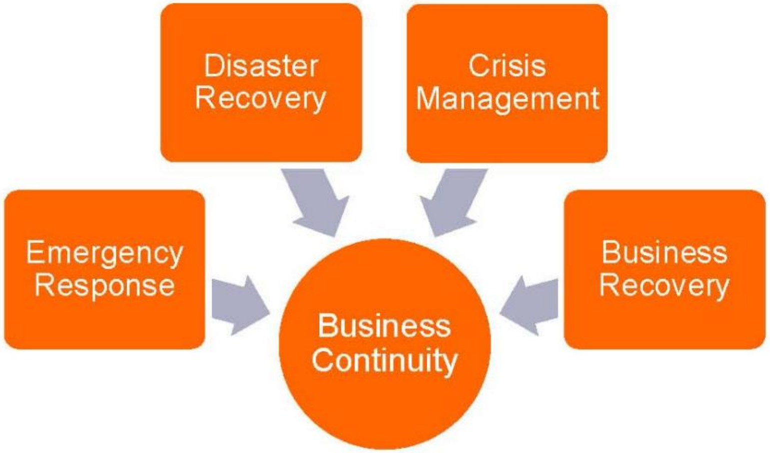
- Vacca Chapter 36
- ISACA Assignments:
  - ISACA Assignment 1: “Disaster Recovery and Business Continuity Planning: Testing an Organization’s Plans” http://www.isaca.org/Journal/Past-Issues/2002/Volume-1/Pages/Disaster-Recovery-andBusiness-Continuity-Planning.aspx
  - ISACA Assignment 2: “What Every IT Auditor Should Know About Backup and Recovery” http://www.isaca.org/Journal/Past-Issues/2011/Volume-6/Pages/What-EveryIT-Auditor-Should-Know-About-Backup-and-Recovery.aspx

Business Continuity Planning (BCP) and Disaster Recovery Planning (DRP)

- *Operating disruptions can occur with or without warning*
- *Results may be predictable or unanticipated*
- *It is important that the mission of the enterprise is sustained during any emergency*

- ***The first priority is always the safety of the people:*** *Employees, Service and Support Staff and Visitors*

Business Continuity
- versus -
Disaster Recovery



Business Continuity Plan (BCP)	Provides procedures for sustaining mission/business operations while recovering from a significant disruption caused by a natural or human-induced disaster
Disaster Recovery Planning (DRP)	Provides procedures for relocating critical information systems operations to an alternative location after a significant disruption caused by a natural or human-induced disaster

Business Continuity Plan includes…

Many plans:

1. Continuity of operations plan
2. Disaster recovery plan
3. Business resumption plan

May also include:

4. Continuity of IT support plan
5. Crisis communications plan
6. Incident response plan
7. Transportation plan
8. Occupant emergency plan
9. Evacuation and emergency relocation plan

NIST Special Publication 800-34rev1: "Contingency Planning Guide for Federal Information Systems"

Business Continuity Management

- The Business Continuity Plan (BCP) is developed to help assure the organization’s ability to maintain, resume, and recover the business

  It is not just about recovering information technology capabilities

- Planning focuses on the entire enterprise’s mission critical infrastructure
  1. People
  2. Processes
  3. Technology

- Thorough business impact analysis (BIA) and risk assessment form the foundation of an effective Business Continuity Plan

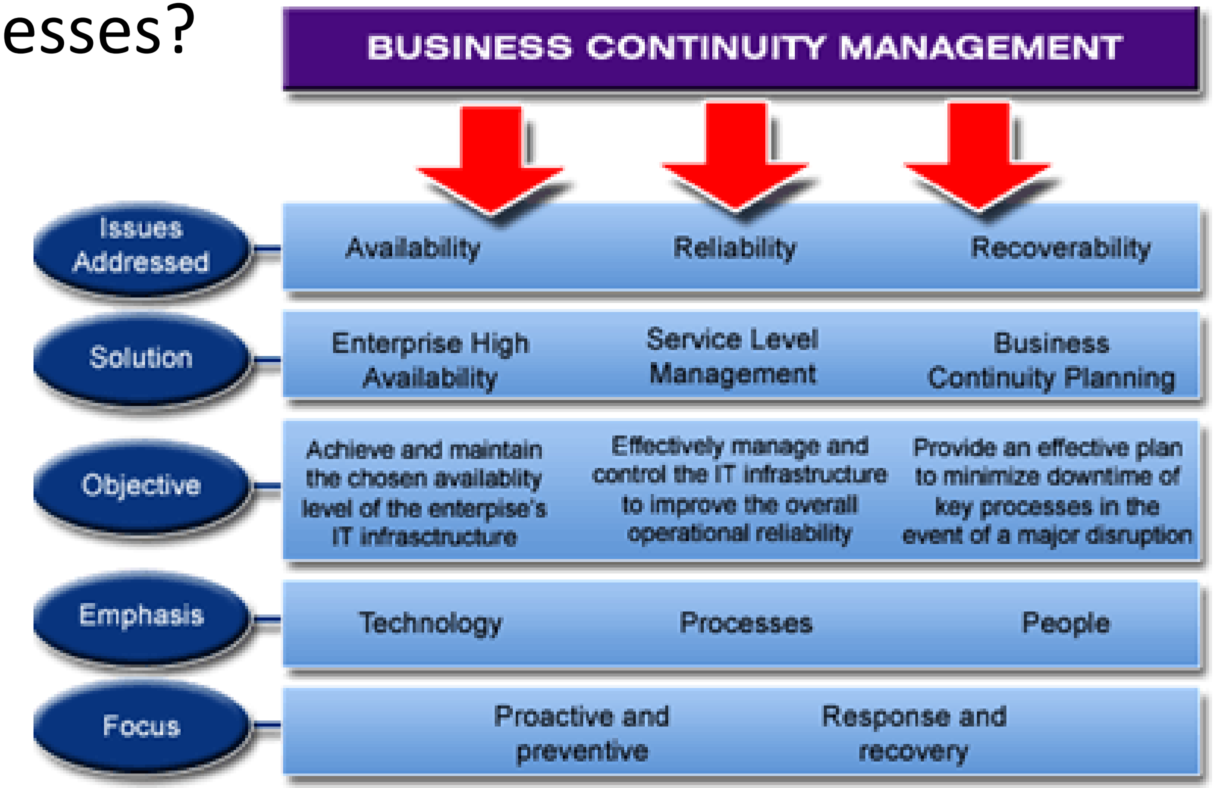
- BCP effectiveness can only be validated through testing and practical application

- At a minimum the BCP should be updated annually to reflect and respond to changes in the organization’s priorities, resources/capabilities, and risks - including its IT service provider(s)

Business Continuity Management (BCM)

An important and big topic:

- How to maintain the continued operation of the business’ processes?



BUSINESS CONTINUITY MANAGEMENT

Issues Addressed	Availability	Reliability	Recoverability
Solution	Enterprise High Availability	Service Level Management	Business Continuity Planning
Objective	Achieve and maintain the chosen availablity level of the enterprise's IT infrasctructure	Effectively manage and control the IT infrastructure to improve the overall operational reliability	Provide an effective plan to minimize downtime of key processes in the event of a major disruption
Emphasis	Technology	Processes	People
Focus	Proactive and preventive	Response and recovery	

Business Continuity Management (BCM)

Prerequisite: Good documented models of the business' processes, broken down into a series of hierarchical layers of sub-processes, sub-sub processes…

1. *Business processes*
2. *Resources needed to run processes*
3. *Threats, vulnerabilities and risks*
4. *Business Impact Analysis (BIA)*
5. *Develop recovery strategies*
6. *Plan, design and implement recovery plans* **Including disaster recovery plan**
7. *Testing*
   - *Maintenance (update), Awareness, Training (practice)*

… Repeat

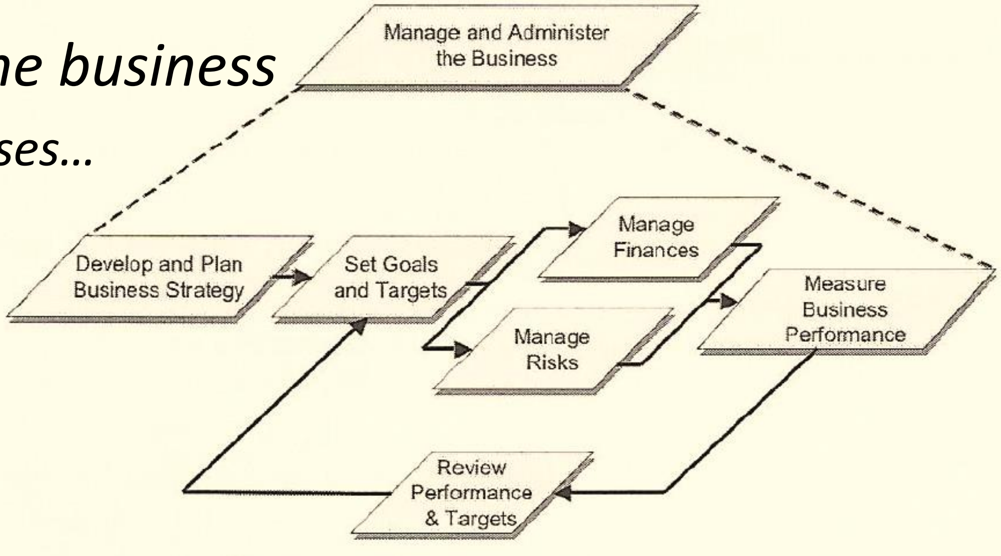
BCM: Meta processes of large enterprises

There may be 5 or 10 high-level business processes ("meta-processes"), for example:

1. *Develop product offerings*
2. *Bring product offerings to market*
3. *Acquire customer orders*
4. *Fulfill customer orders*
5. *Manage and administer the business*
   - *For example has 6 sub-processes…*

Each process can be decomposed into a further level of detailed sub-processes

- some run in parallel
- some in sequence…


Manage and Administer the Business
Develop and Plan Business Strategy
Set Goals and Targets
Manage Finances
Manage Risks
Measure Business Performance
Review Performance & Targets

Example of Top-Down Business Process Analysis

Sherwood, J., Clark, A. and Lynas D. (2005)

BCM: Top-down business process analysis

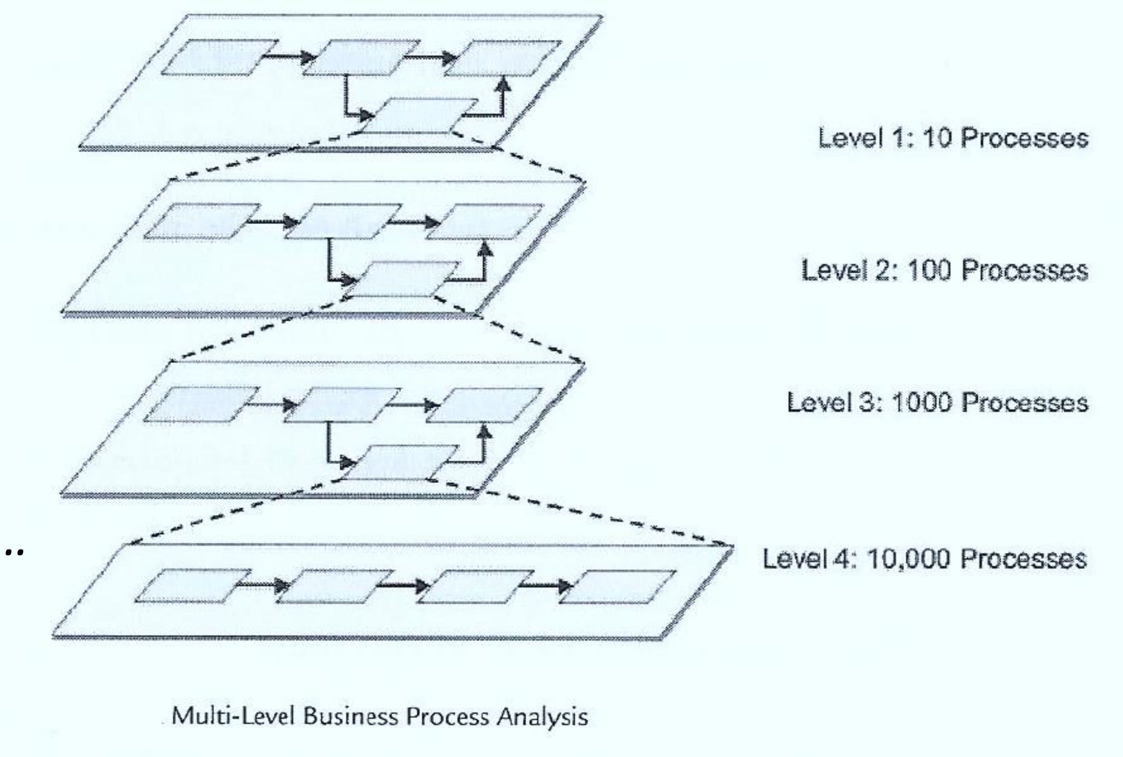
Also known as: Structured decomposition

If there are 10 'Level-1' processes,

each of which can be decomposed into 10 sub-processes at the next level of detail,

which in-turn each of which can be decomposed into 10 sub-sub-processes at the next level of detail…

…the total # of processes in the model can grow exponentially



Multi-Level Business Process Analysis

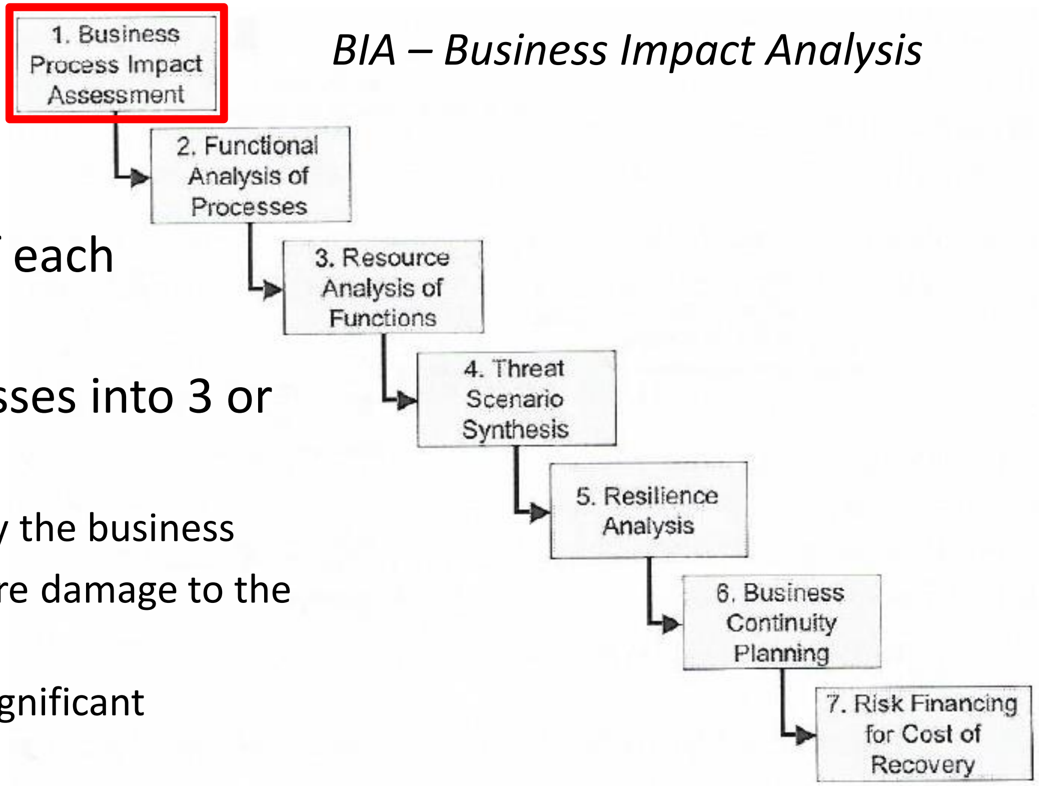
Organizations that achieve this level of detail have an excellent model for understanding their business and business continuity management

A professional automated tool is used to:

- Support this analysis
- Store the details
- Keep the model up to date
- Delegate process ownership at each level of detail to those with operational responsibility

Sherwood, J., Clark, A. and Lynas D. (2005)

Business Continuity Management Process


1. Business Process Impact Assessment
2. Functional Analysis of Processes
3. Resource Analysis of Functions
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6. Business Continuity Planning
7. Risk Financing for Cost of Recovery

BIA – Business Impact Analysis

Step 1

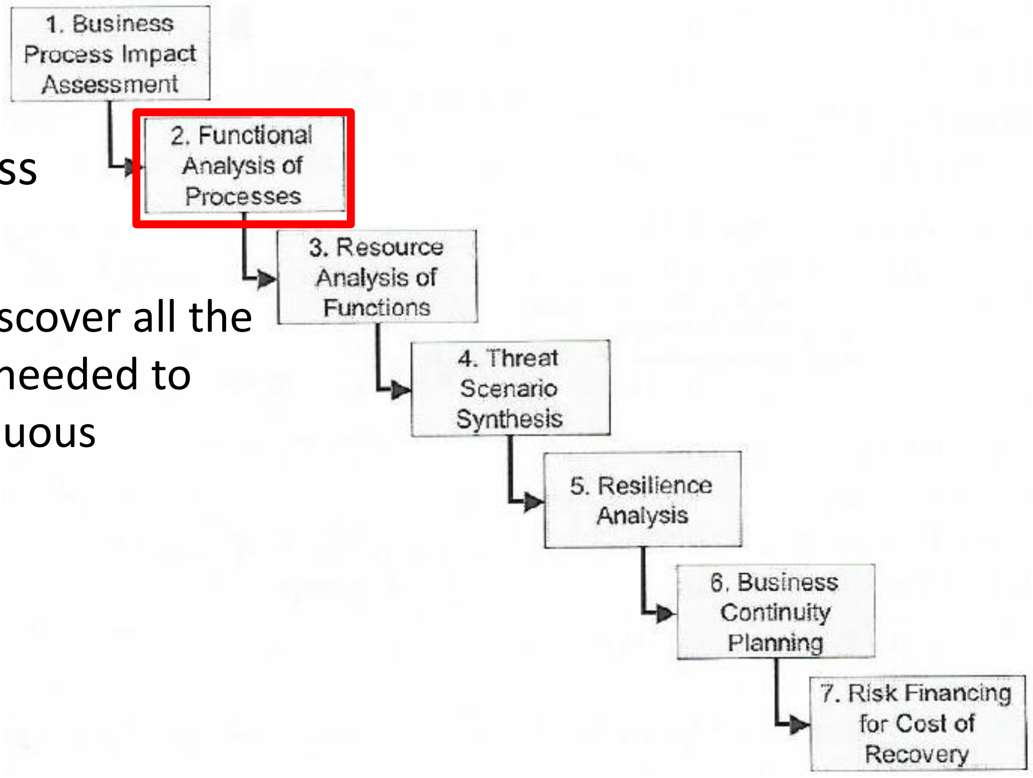
- Identify and map business processes
- Assess the business impact of loss of each business process
- Classify and rank the business processes into 3 or 4 groups
  1. **Critical** – Loss of this process will destroy the business
  2. **Severe** – Loss will cause persistent, severe damage to the business
  3. **Significant** (optional) – Loss will cause significant damage
  4. **Other** – Damage caused by loss of this process can be absorbed

Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

Business Continuity Management Process

Step 2

- Select each Critical and Severe process
- Analyze all sub-processes
  - Down to single functional steps to discover all the process and functional components needed to keep this high-level process in continuous operation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Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

Methodology

1. Identify mission-critical work processes to support
2. Analyze “as-is” work processes
   – Identify users
   – Document work processes
   – BIA
3. Prioritize work processes for supported
4. Train users, test
5. Measure and analyze performance (Metrics!)
6. Make improvements

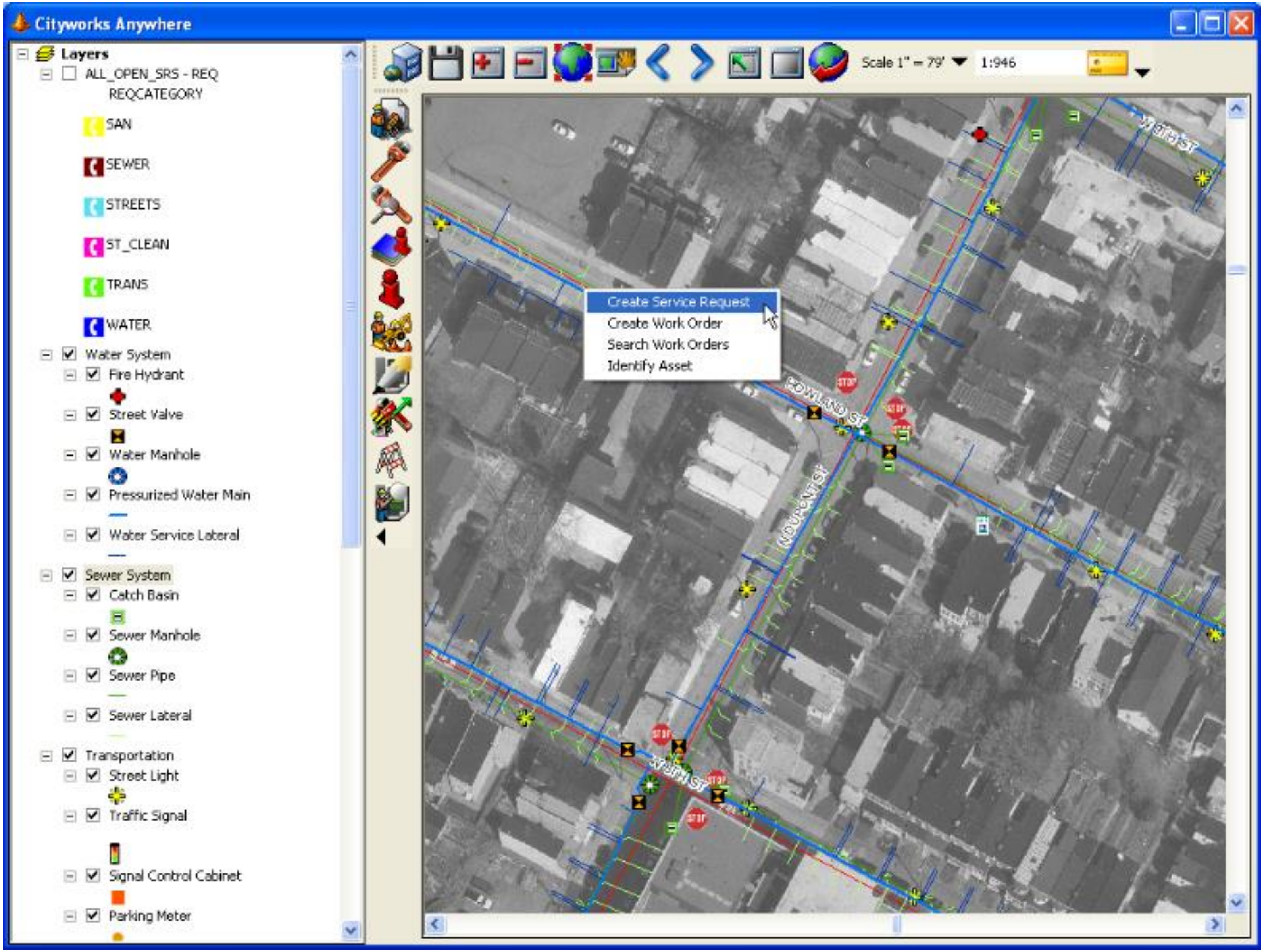
Work processes to support

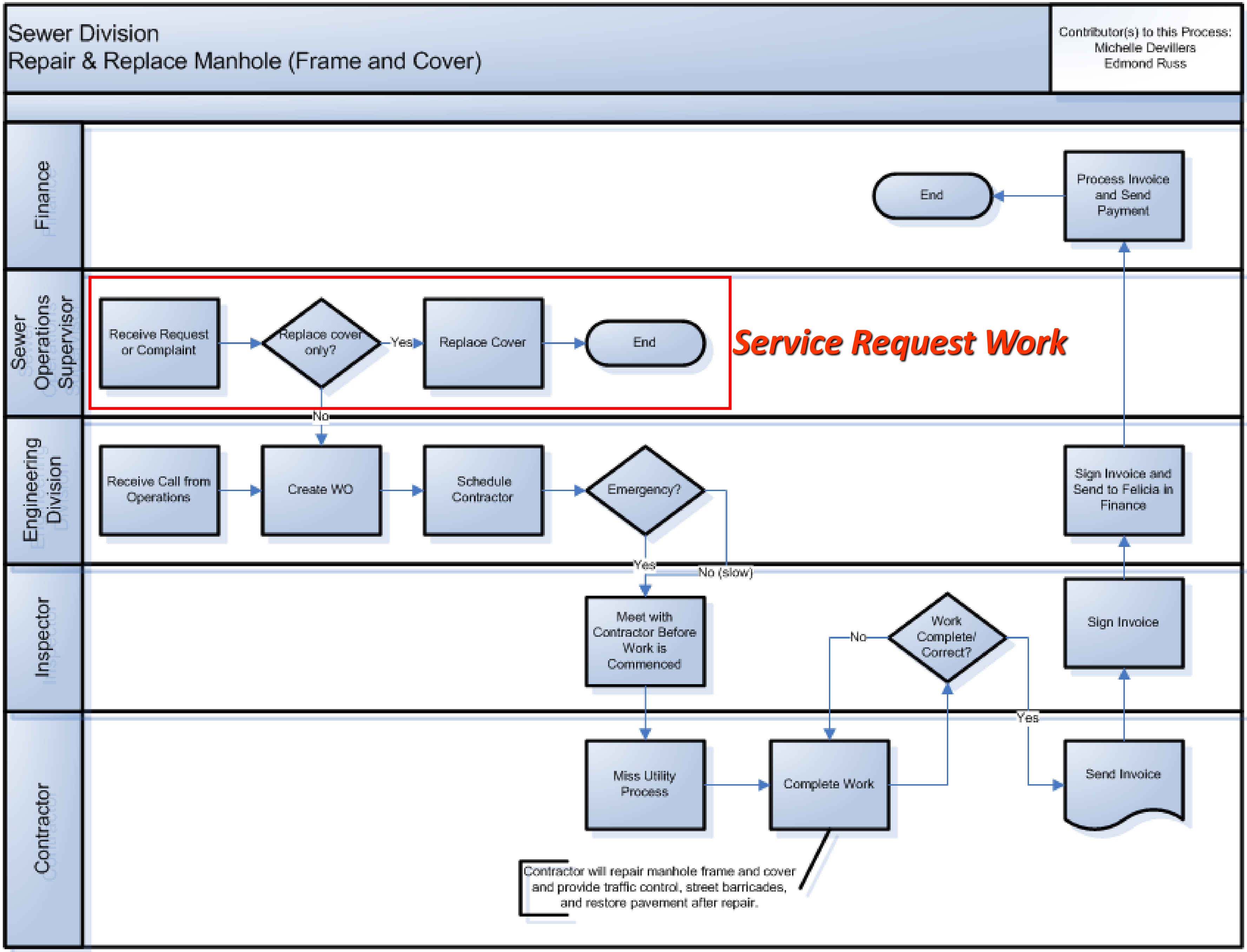
Service requests and utility maintenance management work orders

- City’s Public Works Department
- 4 Divisions (230 employees)
  - Operations
  - Transportation
  - Sewer
  - Water

Service Request / Work Order

Computerized Maintenance Management System (CMMS)



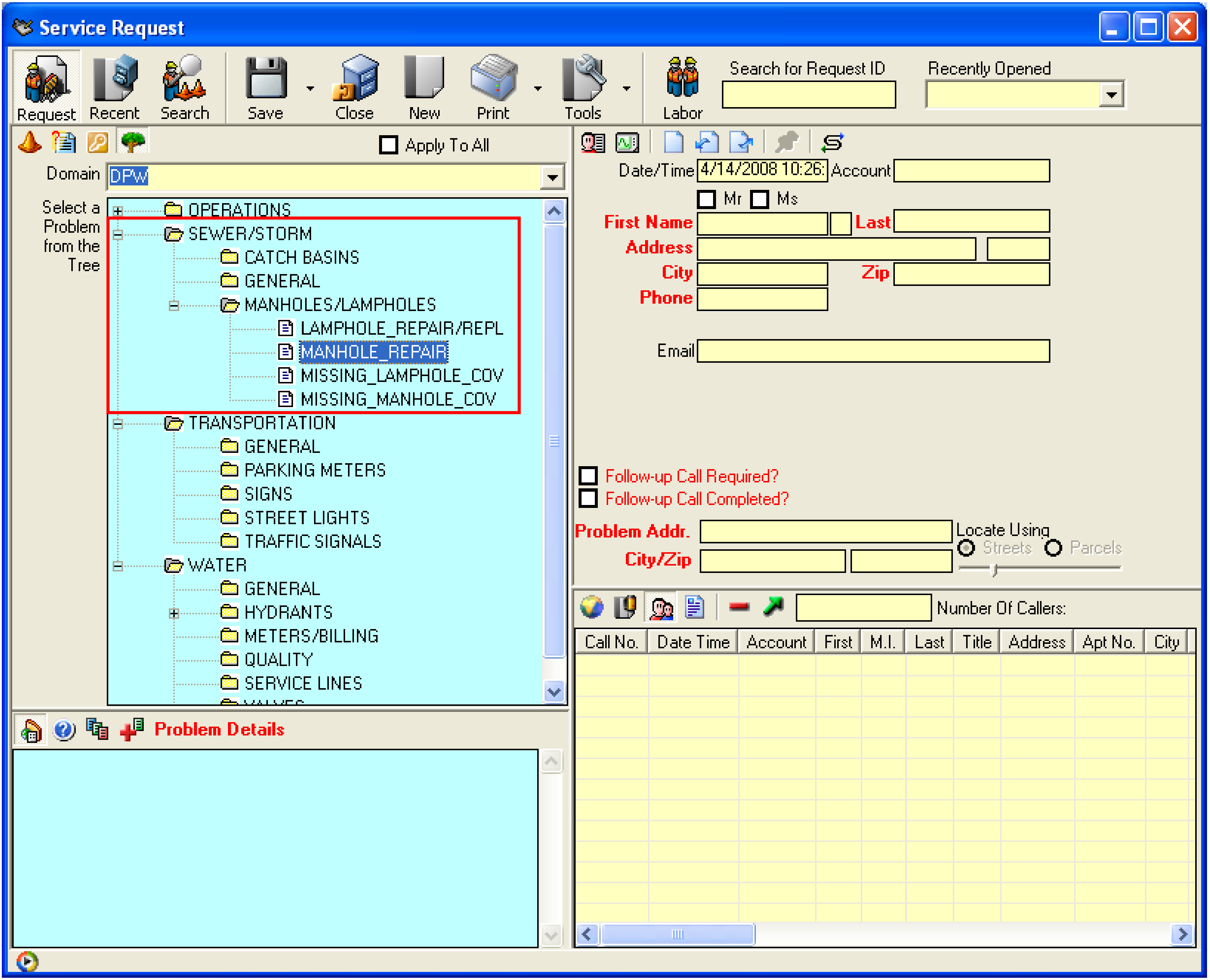


Sewer Division
Repair & Replace Manhole (Frame and Cover)

Contributor(s) to this Process:
Michelle Devillers
Edmond Russ

Service Request Work

Contractor will repair manhole frame and cover and provide traffic control, street barricades, and restore pavement after repair.



Service Request

Request | Recent | Search | Save | Close | New | Print | Tools | Labor

Search for Request ID

Recently Opened

□ Apply To All

Domain: DPW

Select a Problem from the Tree

- OPERATIONS
- SEWER/STORM
  - CATCH BASINS
  - GENERAL
  - MANHOLES/LAMPHOLES
    - LAMPHOLE_REPAIR/REPL
    - MANHOLE_REPAIR
    - MISSING_LAMPHOLE_COV
    - MISSING_MANHOLE_COV
- TRANSPORTATION
  - GENERAL
  - PARKING METERS
  - SIGNS
  - STREET LIGHTS
  - TRAFFIC SIGNALS
- WATER
  - GENERAL
  - HYDRANTS
  - METERS/BILLING
  - QUALITY
  - SERVICE LINES
  - VALVES

Problem Details

Date/Time: 4/14/2008 10:26

Account:

□ Mr □ Ms

First Name:

Last:

Address:

City:

Zip:

Phone:

Email:

□ Follow-up Call Required?

□ Follow-up Call Completed?

Problem Addr.:

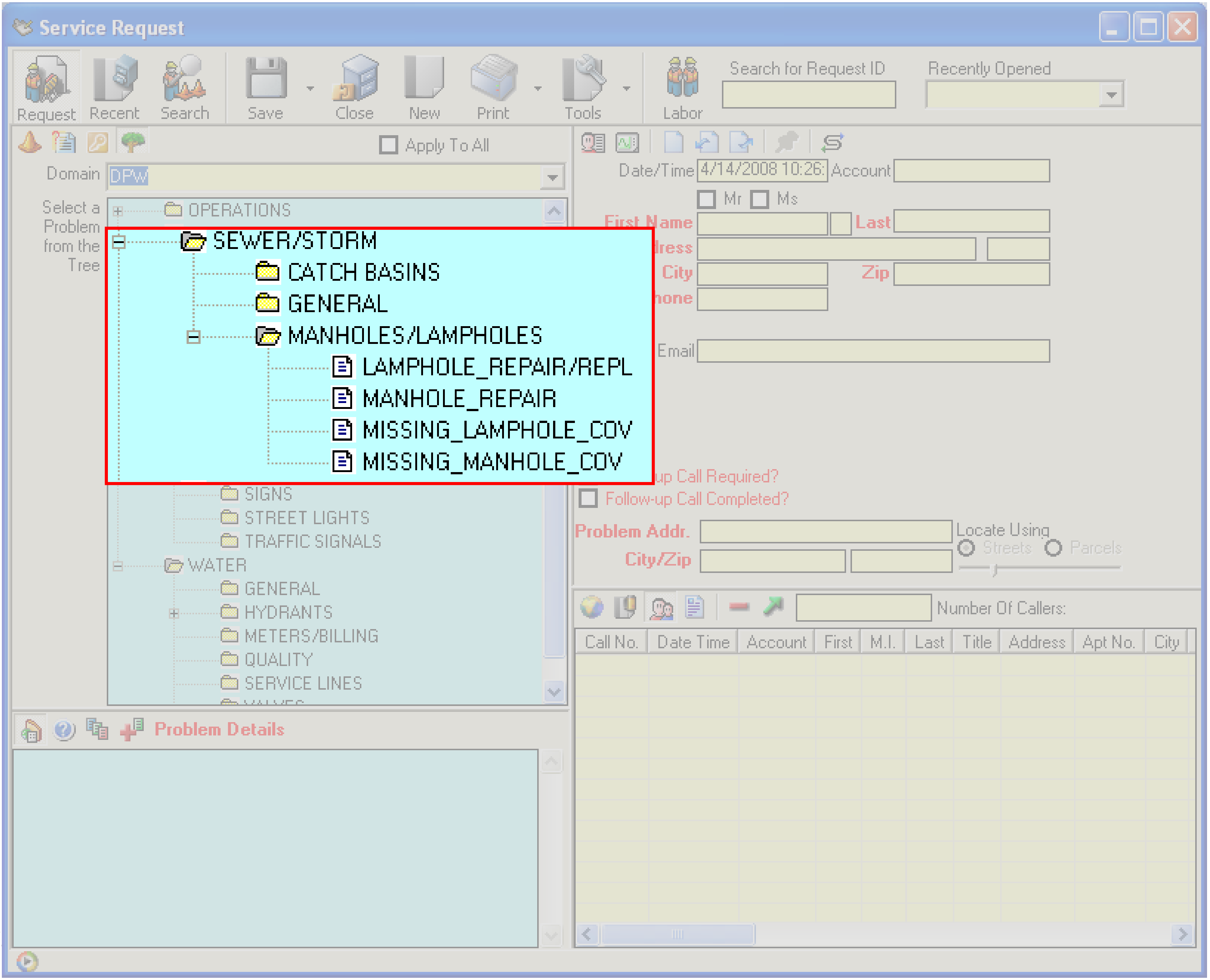
City/Zip:

Locate Using: ○ Streets ○ Parcels

Number Of Callers:

Call No.	Date Time	Account	First	M.I.	Last	Title	Address	Apt No.	City

M



□ Apply To All

Domain DPW

Select a Problem from the Tree

- OPERATIONS
- SEWER/STORM
  - CATCH BASINS
  - GENERAL
  - MANHOLES/LAMPHOLES
    - LAMPHOLE_REPAIR/REPL
    - MANHOLE_REPAIR
    - MISSING_LAMPHOLE_COV
    - MISSING_MANHOLE_COV
  - SIGNS
  - STREET LIGHTS
  - TRAFFIC SIGNALS
- WATER
  - GENERAL
  - HYDRANTS
  - METERS/BILLING
  - QUALITY
  - SERVICE LINES
  - VALVES

Date/Time 4/14/2008 10:26 Account

□ Mr □ Ms

First Name Last

dress

City Zip

hone

Email

up Call Required?

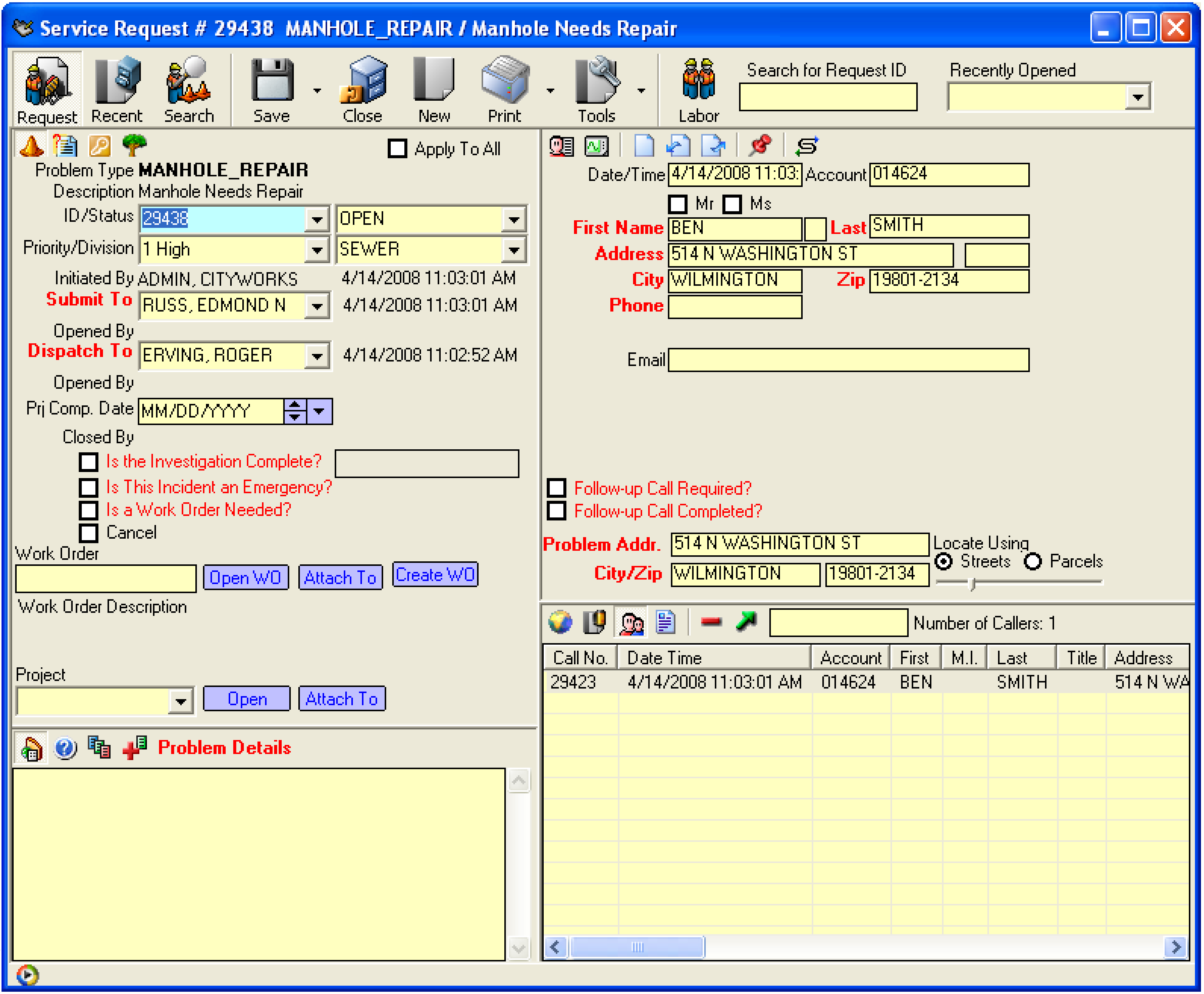
□ Follow-up Call Completed?

Problem Addr. Locate Using ○ Streets ○ Parcels

City/Zip

Call No.	Date Time	Account	First	M.I.	Last	Title	Address	Apt No.	City

M



Service Request # 29438 MANHOLE_REPAIR / Manhole Needs Repair

Search for Request ID

Recently Opened

□ Apply To All

Problem Type **MANHOLE_REPAIR**

Description Manhole Needs Repair

ID/Status 29438 OPEN

Priority/Division 1 High SEWER

Initiated By ADMIN, CITYWORKS 4/14/2008 11:03:01 AM

Submit To RUSS, EDMOND N 4/14/2008 11:03:01 AM

Opened By

Dispatch To ERVING, ROGER 4/14/2008 11:02:52 AM

Opened By

Prj Comp. Date MM/DD/YYYY

Closed By

□ Is the Investigation Complete?

□ Is This Incident an Emergency?

□ Is a Work Order Needed?

□ Cancel

Work Order

Work Order Description

Project

Date/Time 4/14/2008 11:03: Account 014624

□ Mr □ Ms

First Name BEN **Last** SMITH

Address 514 N WASHINGTON ST

City WILMINGTON **Zip** 19801-2134

Phone

Email

□ Follow-up Call Required?

□ Follow-up Call Completed?

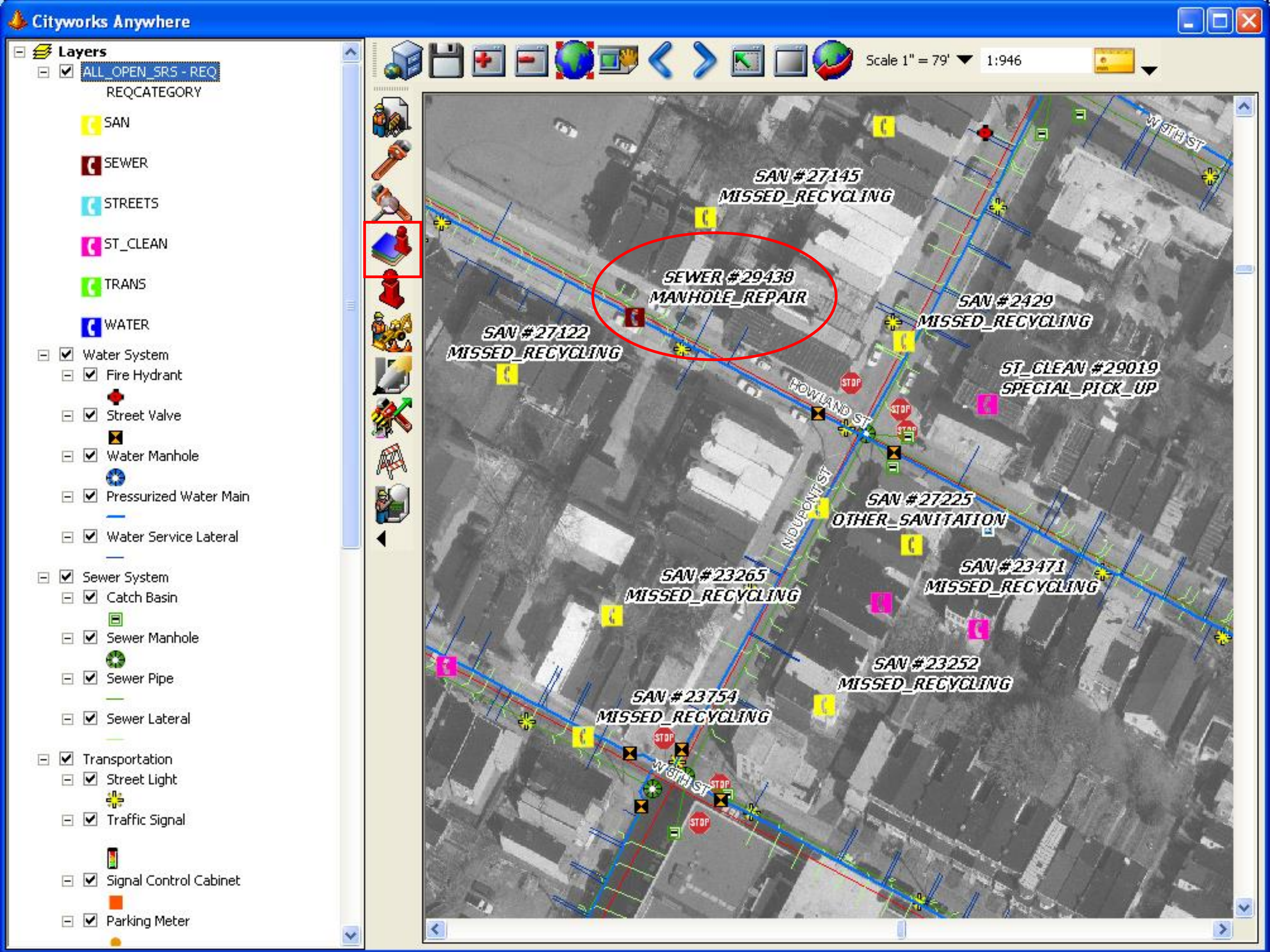
Problem Addr. 514 N WASHINGTON ST

City/Zip WILMINGTON 19801-2134

Locate Using ● Streets ○ Parcels

Number of Callers: 1

Call No.	Date Time	Account	First	M.I.	Last	Title	Address
29423	4/14/2008 11:03:01 AM	014624	BEN		SMITH		514 N WA



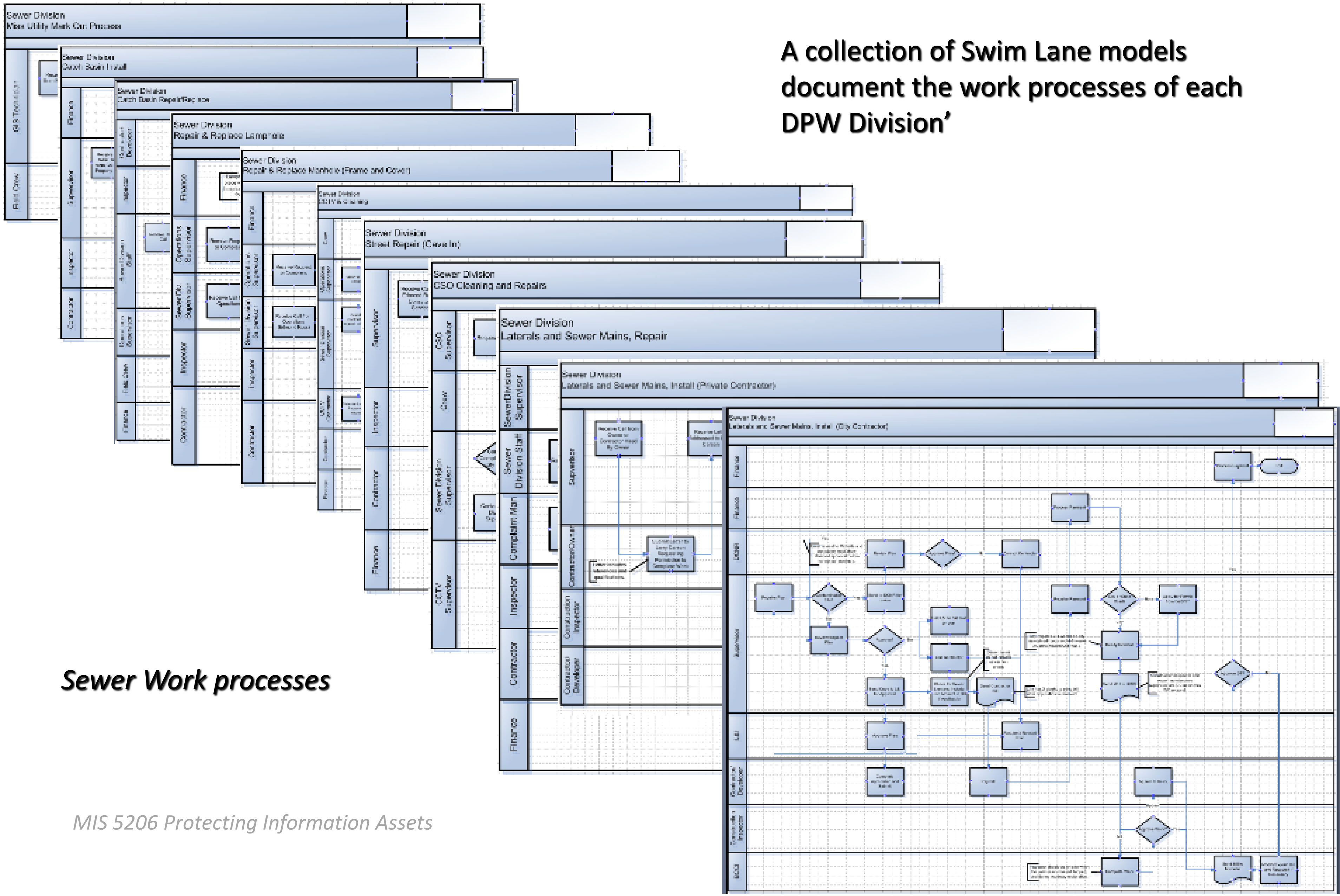
Cityworks Anywhere

Scale 1" = 79' 1:946

- Layers
  - ☑ ALL_OPEN_SRS - REQ
    - REQCATEGORY
    - SAN
    - SEWER
    - STREETS
    - ST_CLEAN
    - TRANS
    - WATER
  - ☑ Water System
    - ☑ Fire Hydrant
    - ☑ Street Valve
    - ☑ Water Manhole
    - ☑ Pressurized Water Main
    - ☑ Water Service Lateral
  - ☑ Sewer System
    - ☑ Catch Basin
    - ☑ Sewer Manhole
    - ☑ Sewer Pipe
    - ☑ Sewer Lateral
  - ☑ Transportation
    - ☑ Street Light
    - ☑ Traffic Signal
    - ☑ Signal Control Cabinet
    - ☑ Parking Meter

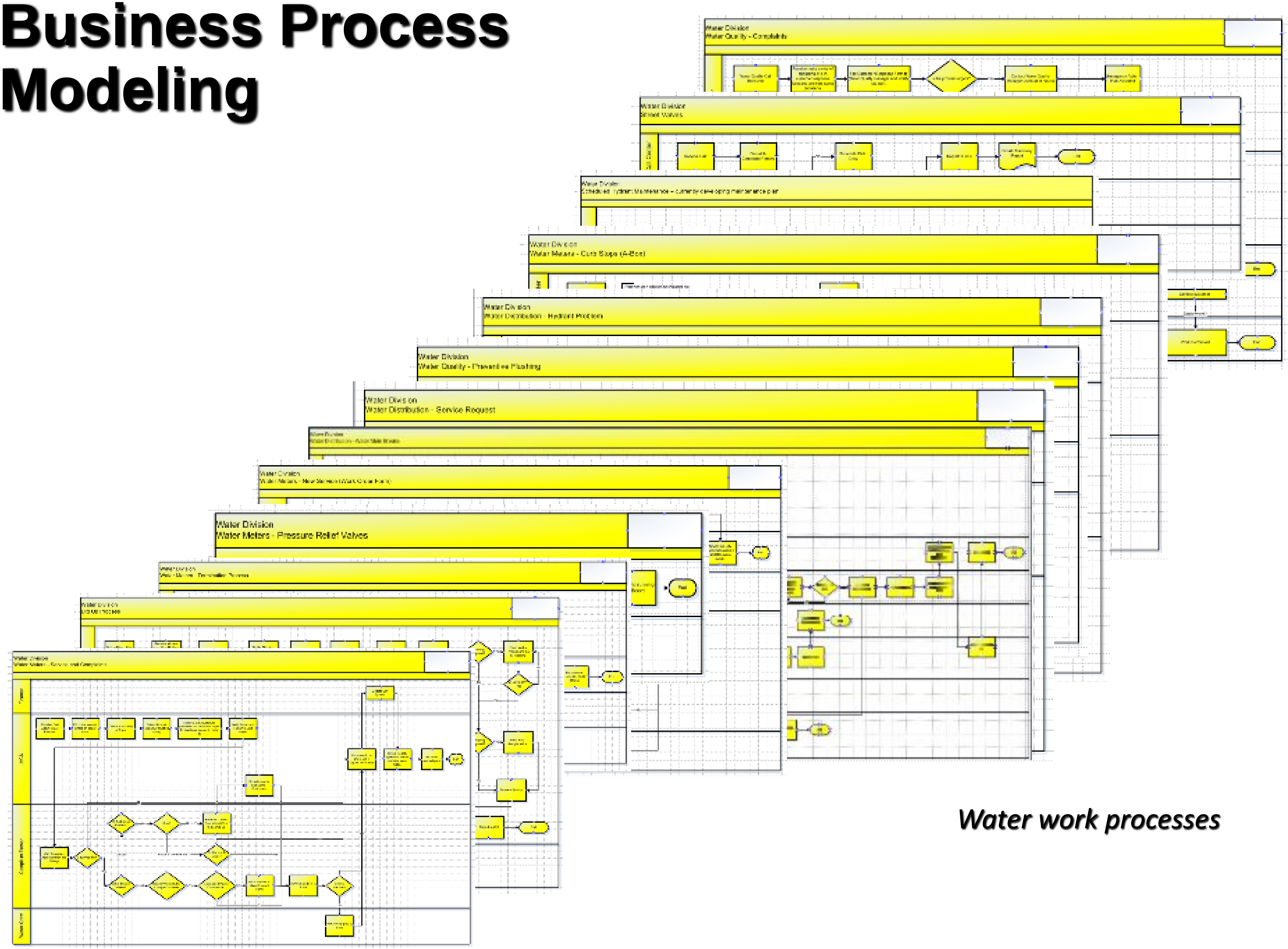
Business Process Modeling

A collection of Swim Lane models document the work processes of each DPW Division’



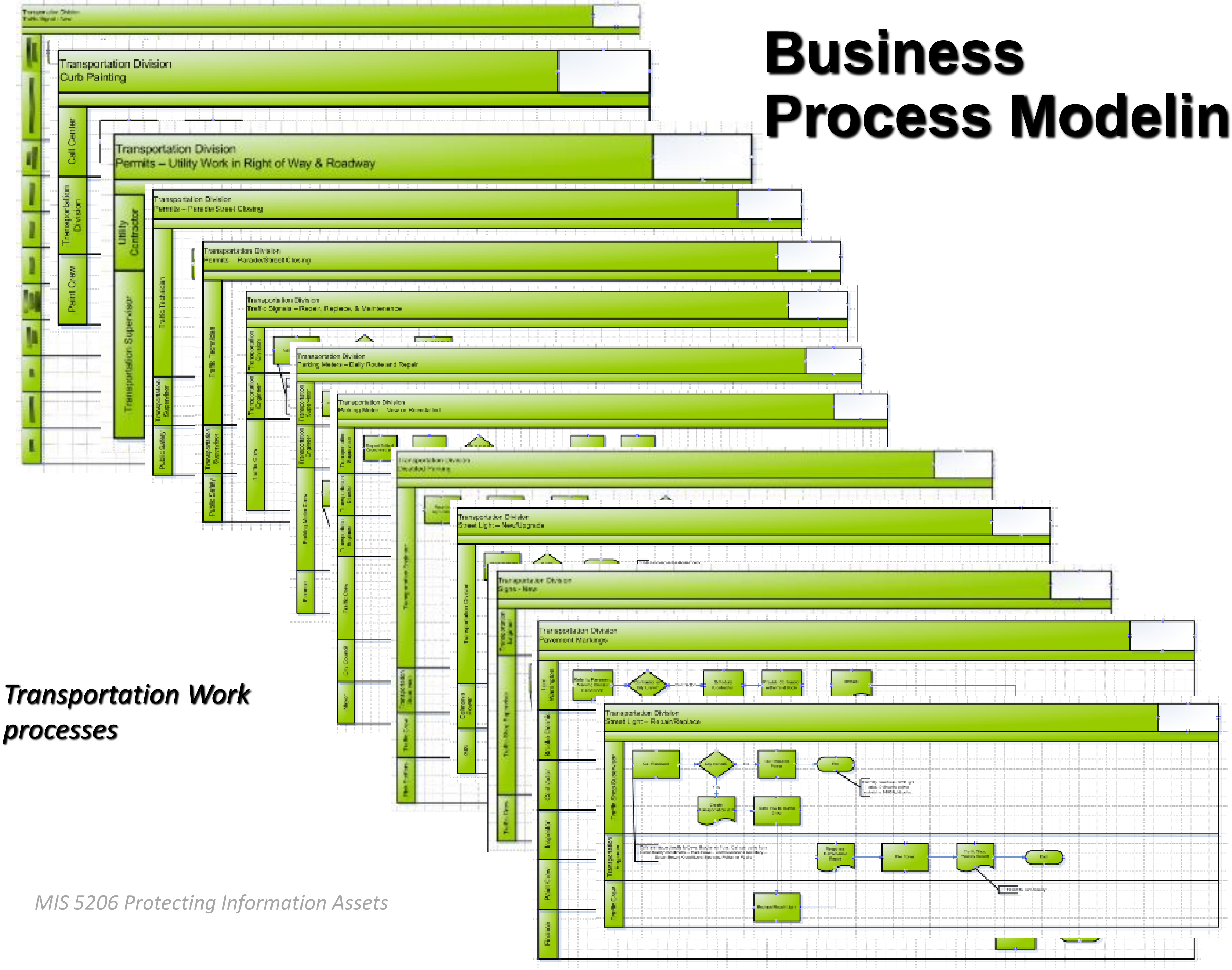
Sewer Work processes

Business Process Modeling

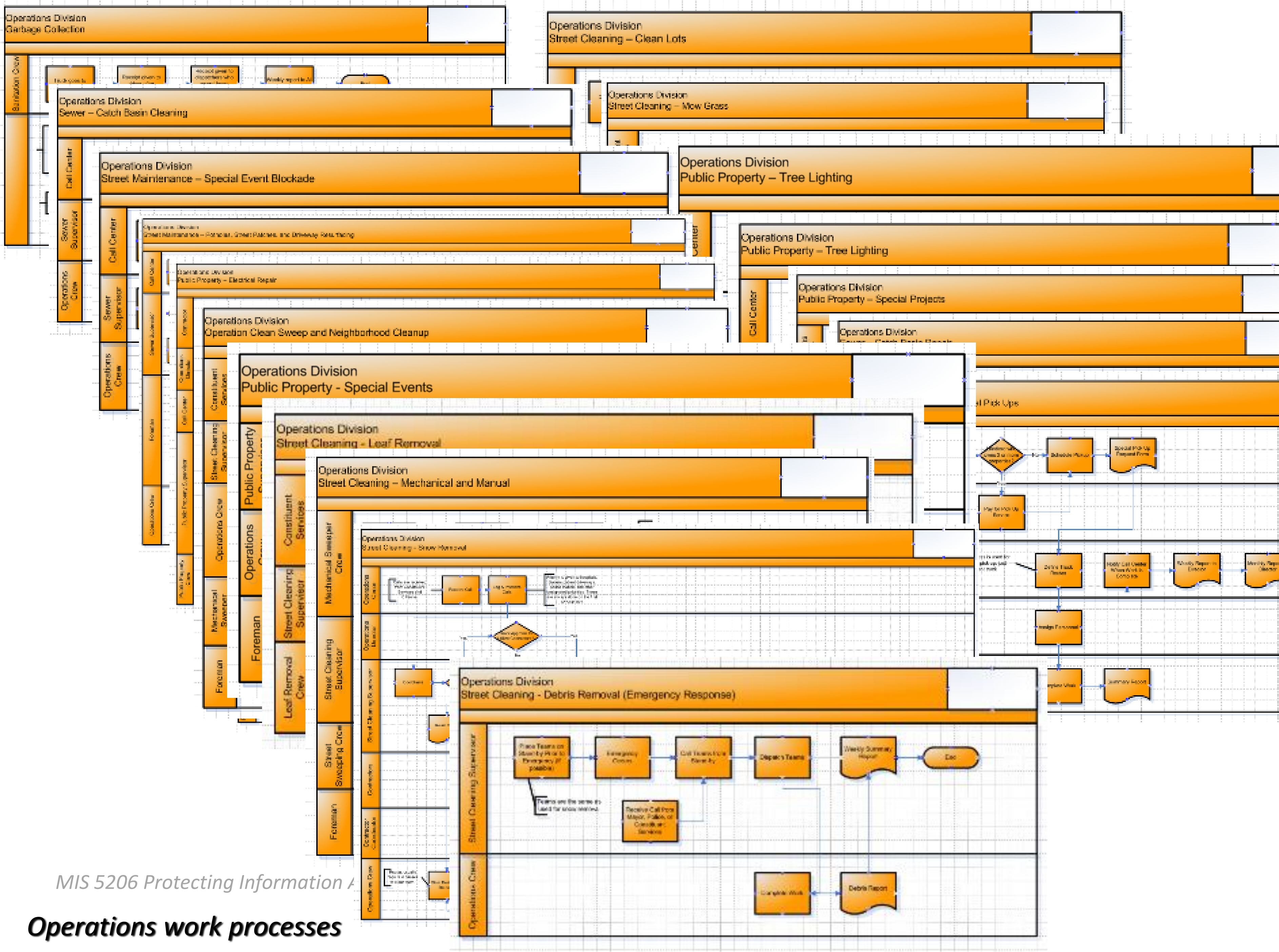

Water Division
Water Quality - Complaints
Water Division
Street Valves
Water Division
Scheduled Hydrant Maintenance - currently developing maintenance plan
Water Division
Water Meters - Curb Stops (A-Box)
Water Division
Water Distribution - Hydrant Protection
Water Division
Water Quality - Preventive Flushing
Water Division
Water Distribution - Service Request
Water Division
Water Meters - Pressure Relief Valves
End

Water work processes

Business Process Modeling



Transportation Work processes

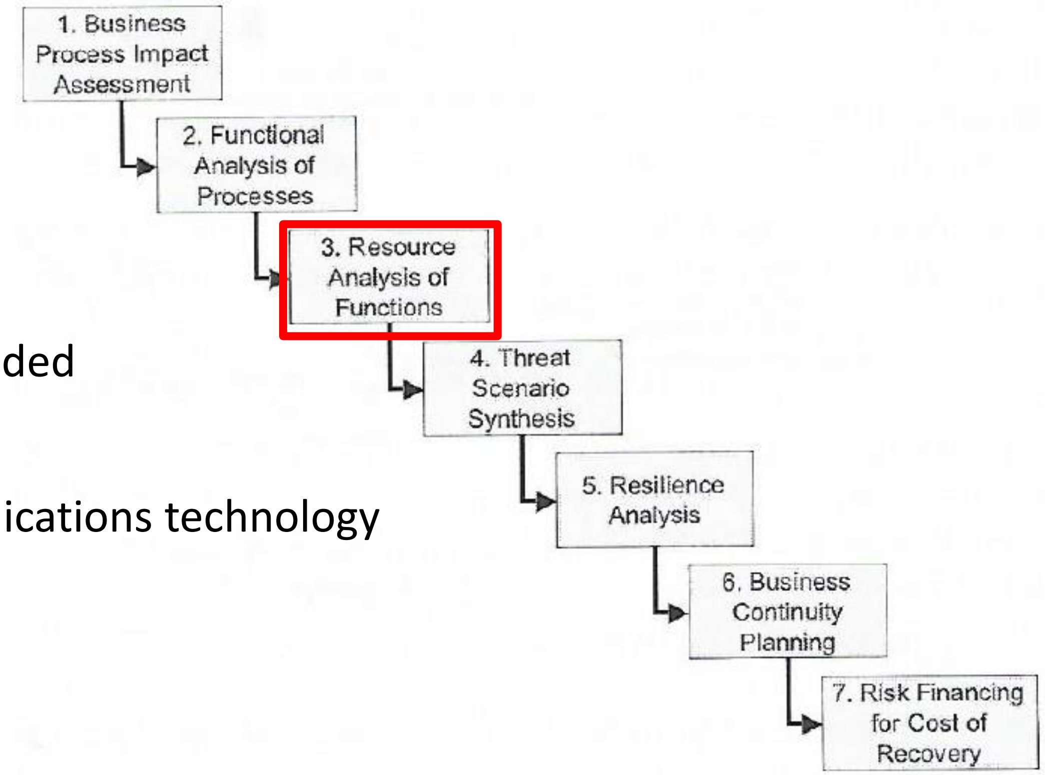

Operations Division
Garbage Collection
Operations Division
Street Cleaning – Clean Lots
Operations Division
Street Cleaning – Mow Grass
Operations Division
Sewer – Catch Basin Cleaning
Operations Division
Street Maintenance – Special Event Blockade
Operations Division
Public Property – Tree Lighting
Operations Division
Public Property – Tree Lighting
Operations Division
Public Property – Special Projects
Operations Division
Public Property – Electrical Repair
Operations Division
Operation Clean Sweep and Neighborhood Cleanup
Operations Division
Public Property - Special Events
Operations Division
Street Cleaning - Leaf Removal
Operations Division
Street Cleaning – Mechanical and Manual
Operations Division
Street Cleaning – Snow Removal
Operations Division
Street Cleaning - Debris Removal (Emergency Response)
Call Center
Sewer Supervisor
Operations Crew
Constituent Services
Street Cleaning Supervisor
Mechanical Sweeper Crew
Street Sweeping Crew
Leaf Removal Crew
Foreman
Place Teams on Stand-by Prior to Emergency (if possible)
Emergency Occurs
Call Teams from Stand-by
Dispatch Teams
Weekly Summary Report
End
Receive Call from Mayor, Police, or Constituent Services
Complete Work
Debris Report
Summary Report

Operations work processes

Business Continuity Management Process

Step 3

- For each sub-process or function identified in Step 2:
  - What resources are needed
  - How much of each resource is needed
    - People
    - Information and communications technology
    - Equipment
    - Raw materials
    - Accommodations
    - Communications
    - …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Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

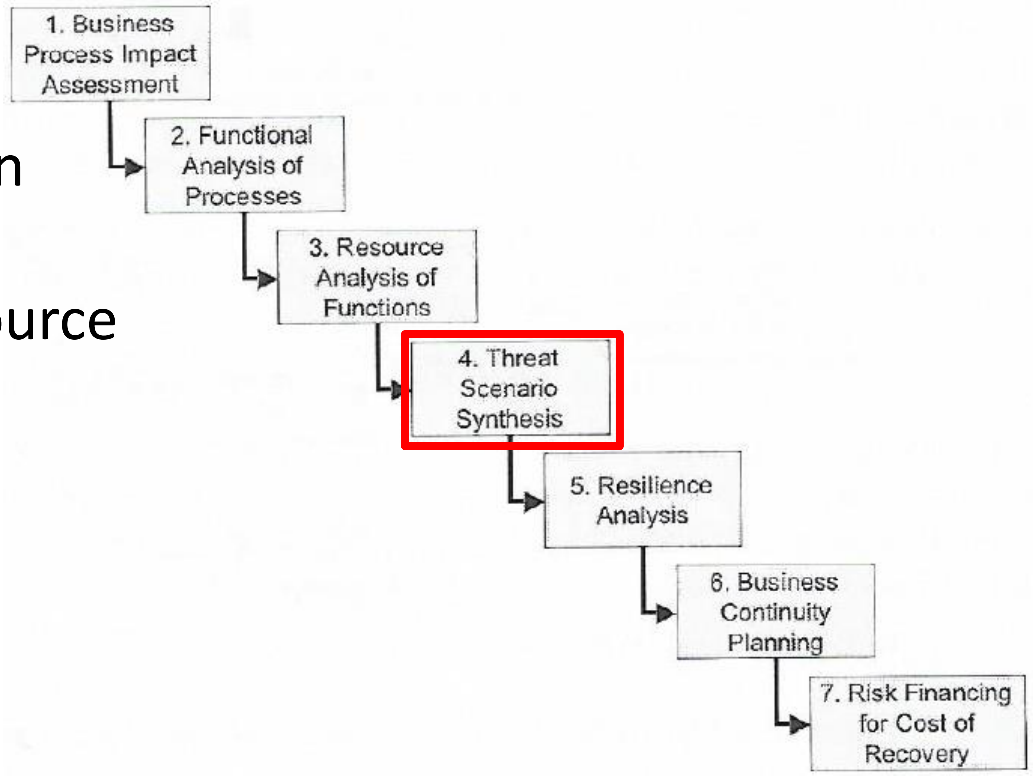
BIA goals:

- Identify the most critical business functions necessary for the survival of the company
- Identify the necessary resources for those critical functions
- Calculate:
  - **Recover time objective (RTO):** Maximum acceptable amount of downtime the company can endure for each resource
  - **Recovery point objective (RPO):** Maximum acceptable amount of data loss (measured in time, but implies # of data records)
  - **Interruption window:** Maximum period of time organization can wait from point of failure to critical services/applications restoration
  - **Service delivery objective (SDO):** Level of services to be reached during the alternative process mode until the normal situation is restored
  - **Maximum tolerable outage (MTO):** Maximum time the organization can support processing in alternative mode

Business Continuity Management Process

Step 4

- For each resource identified in Step 3, what is the high-level threat scenarios put that resource at risk?
- Focus on effects, not cause



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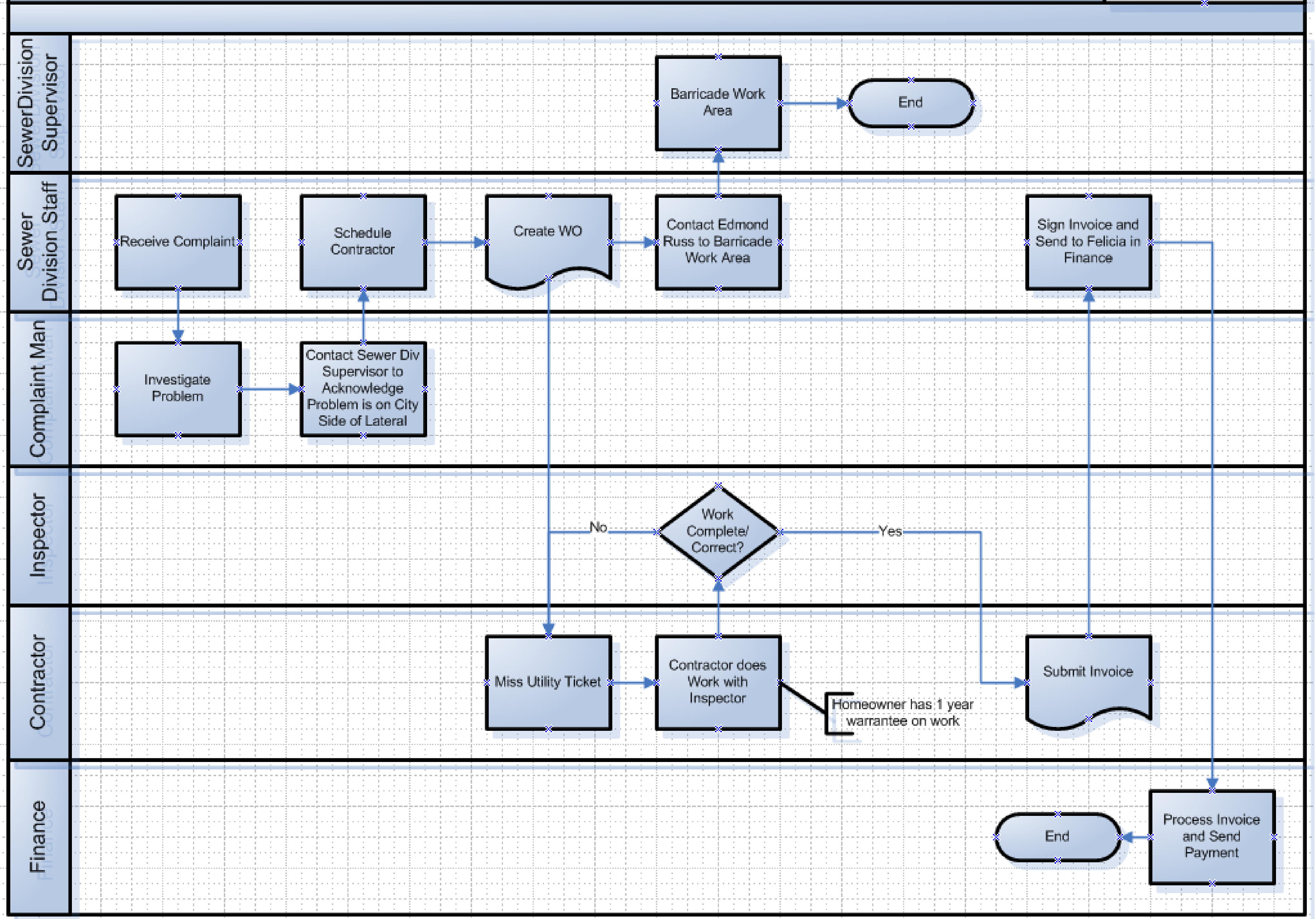
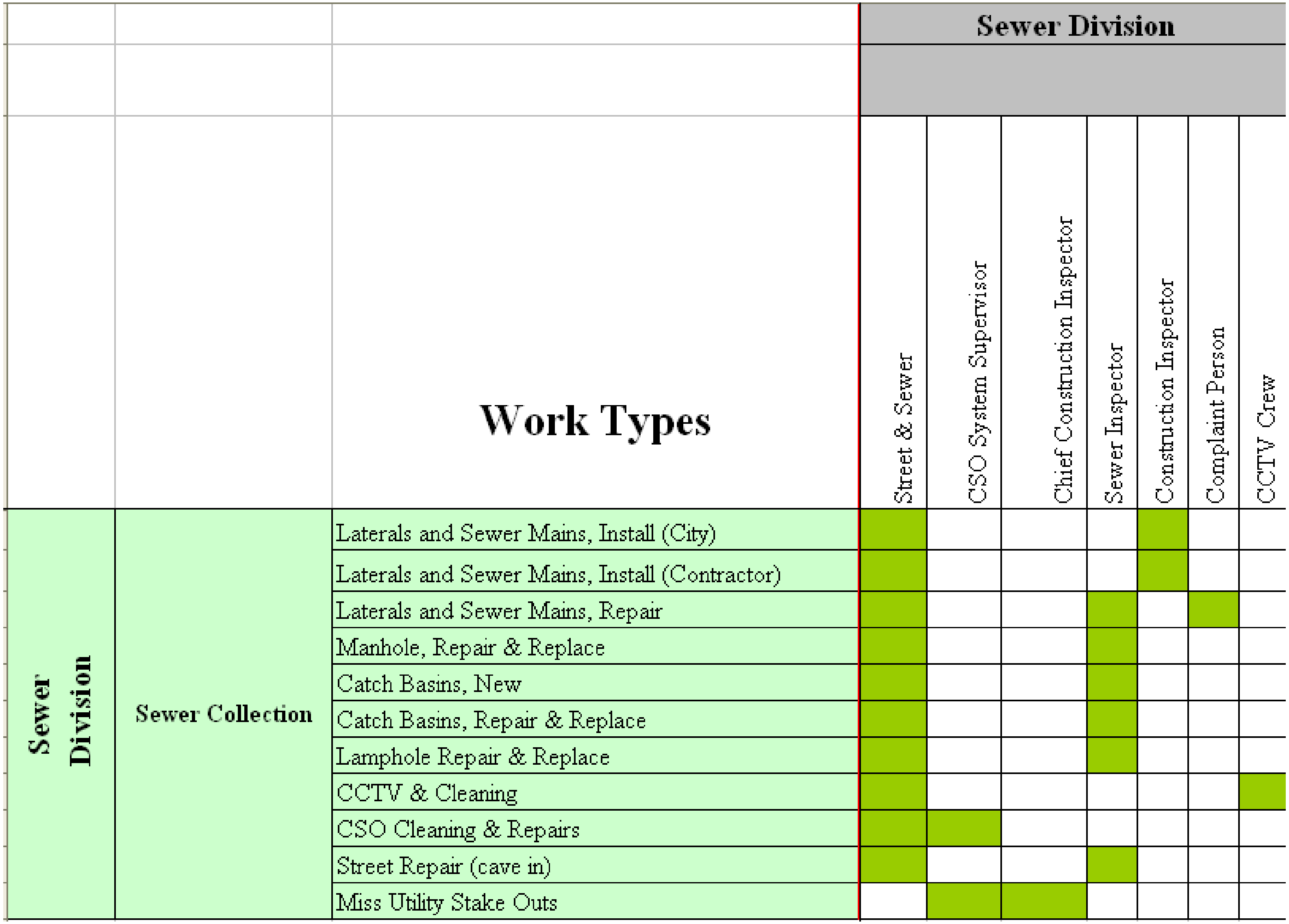
Sewer Division
Laterals and Sewer Mains, Repair

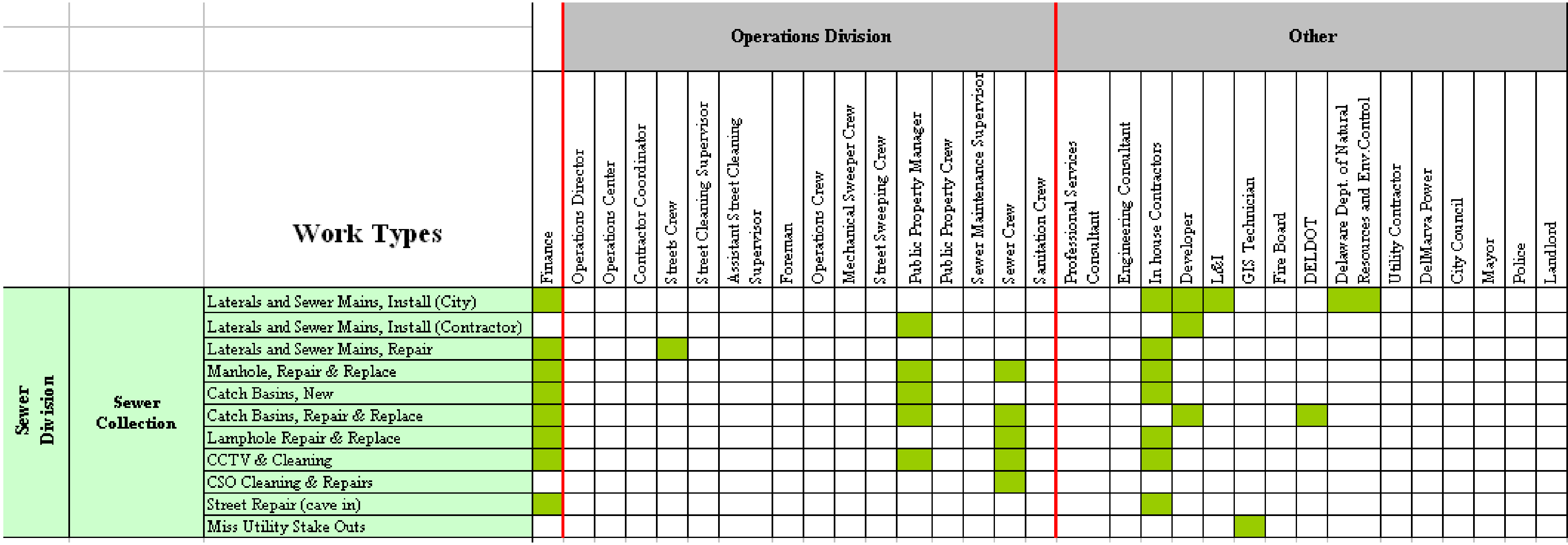

SewerDivision Supervisor
Sewer Division Staff
Complaint Man
Inspector
Contractor
Finance
Receive Complaint
Investigate Problem
Contact Sewer Div Supervisor to Acknowledge Problem is on City Side of Lateral
Schedule Contractor
Create WO
Contact Edmond Russ to Barricade Work Area
Barricade Work Area
End
Miss Utility Ticket
Contractor does Work with Inspector
Homeowner has 1 year warrantee on work
Work Complete/ Correct?
No
Yes
Submit Invoice
Sign Invoice and Send to Felicia in Finance
Process Invoice and Send Payment
End

Inventory of Work Processes and Staff needed from a Single DPW Division



			Sewer Division						
		Work Types	Street & Sewer	CSO System Supervisor	Chief Construction Inspector	Sewer Inspector	Construction Inspector	Complaint Person	CCTV Crew
Sewer Division	**Sewer Collection**	Laterals and Sewer Mains, Install (City)	🟩				🟩		
		Laterals and Sewer Mains, Install (Contractor)	🟩				🟩		
		Laterals and Sewer Mains, Repair	🟩			🟩		🟩	
		Manhole, Repair & Replace	🟩			🟩			
		Catch Basins, New	🟩			🟩			
		Catch Basins, Repair & Replace	🟩			🟩			
		Lamphole Repair & Replace	🟩			🟩			
		CCTV & Cleaning	🟩						🟩
		CSO Cleaning & Repairs	🟩	🟩					
		Street Repair (cave in)	🟩			🟩			
		Miss Utility Stake Outs		🟩	🟩				

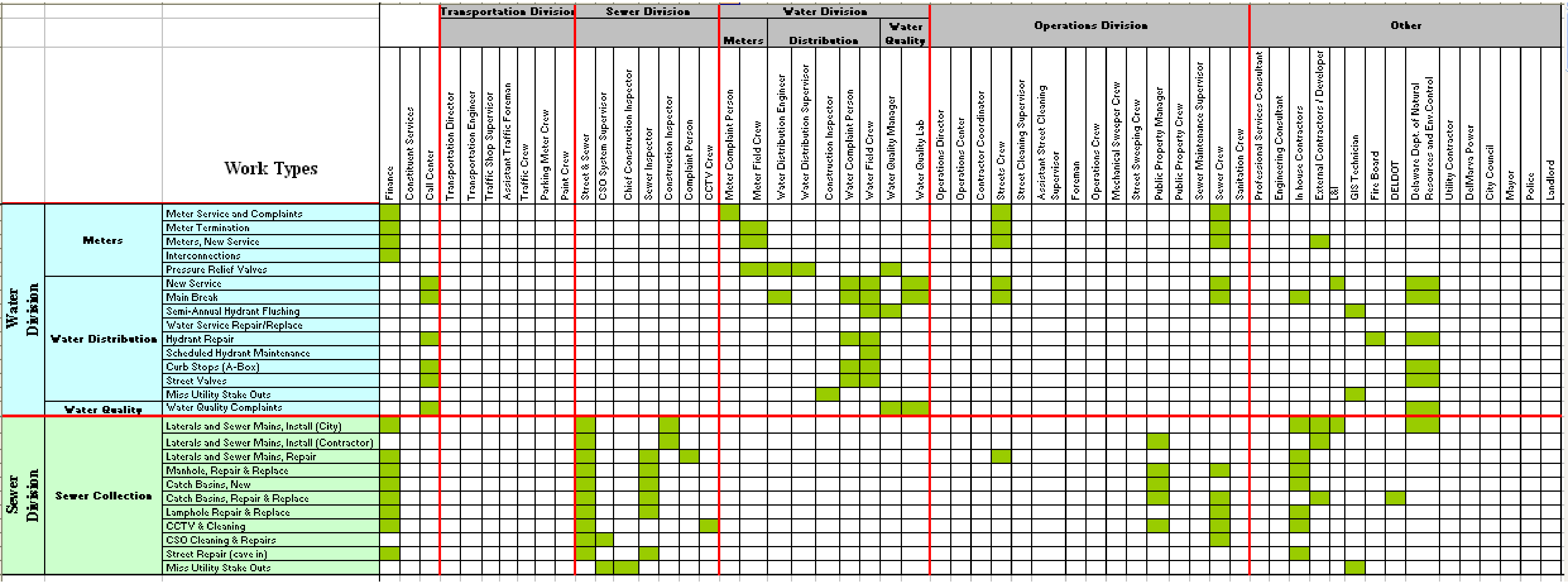
Understanding cross organizational workflows…



				Operations Division															Other														
		Work Types	Finance	Operations Director	Operations Center	Contractor Coordinator	Streets Crew	Street Cleaning Supervisor	Assistant Street Cleaning Supervisor	Foreman	Operations Crew	Mechanical Sweeper Crew	Street Sweeping Crew	Public Property Manager	Public Property Crew	Sewer Maintenance Supervisor	Sewer Crew	Sanitation Crew	Professional Services Consultant	Engineering Consultant	In house Contractors	Developer	L&I	GIS Technician	Fire Board	DELDOT	Delaware Dept. of Natural Resources and Env.Control	Utility Contractor	DelMarva Power	City Council	Mayor	Police	Landlord
Sewer Division	Sewer Collection	Laterals and Sewer Mains, Install (City)	🟩																		🟩	🟩	🟩				🟩						
		Laterals and Sewer Mains, Install (Contractor)												🟩								🟩											
		Laterals and Sewer Mains, Repair	🟩				🟩														🟩												
		Manhole, Repair & Replace	🟩											🟩			🟩				🟩												
		Catch Basins, New	🟩											🟩							🟩												
		Catch Basins, Repair & Replace	🟩											🟩			🟩					🟩				🟩							
		Lamphole Repair & Replace	🟩														🟩				🟩												
		CCTV & Cleaning	🟩											🟩			🟩				🟩												
		CSO Cleaning & Repairs															🟩																
		Street Repair (cave in)	🟩																		🟩												
		Miss Utility Stake Outs																						🟩									

Identifying dependencies on critical paths for completing prioritized work processes

Gaining an Understanding of Staff Needed to Support Mission Critical Work



						Transportation Division							Sewer Division							Water Division									Operations Division															Other														
																				Meters		Distribution					Water Quality																															
		Work Types	Finance	Constituent Services	Call Center	Transportation Director	Transportation Engineer	Traffic Shop Supervisor	Assistant Traffic Foreman	Traffic Crew	Parking Meter Crew	Paint Crew	Street & Sewer	CSO System Supervisor	Chief Construction Inspector	Sewer Inspector	Construction Inspector	Complaint Person	CCTV Crew	Meter Complaint Person	Meter Field Crew	Water Distribution Engineer	Water Distribution Supervisor	Construction Inspector	Water Complaint Person	Water Field Crew	Water Quality Manager	Water Quality Lab	Operations Director	Operations Center	Contractor Coordinator	Streets Crew	Street Cleaning Supervisor	Assistant Street Cleaning Supervisor	Foreman	Operations Crew	Mechanical Sweeper Crew	Street Sweeping Crew	Public Property Manager	Public Property Crew	Sewer Maintenance Supervisor	Sewer Crew	Sanitation Crew	Professional Services Consultant	Engineering Consultant	In house Contractors	External Contractors / Developer	L&I	GIS Technician	Fire Board	DELDOT	Delaware Dept. of Natural Resources and Env.Control	Utility Contractor	DelMarva Power	City Council	Mayor	Police	Landlord
Water Division	Meters	Meter Service and Complaints	🟩																	🟩												🟩										🟩																
		Meter Termination	🟩																		🟩											🟩										🟩																
		Meters, New Service	🟩																		🟩											🟩										🟩					🟩											
		Interconnections	🟩																																																					
		Pressure Relief Valves																			🟩	🟩	🟩				🟩																															
	Water Distribution	New Service			🟩																				🟩	🟩		🟩				🟩										🟩						🟩				🟩						
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		Manhole, Repair & Replace	🟩										🟩			🟩																							🟩			🟩				🟩												
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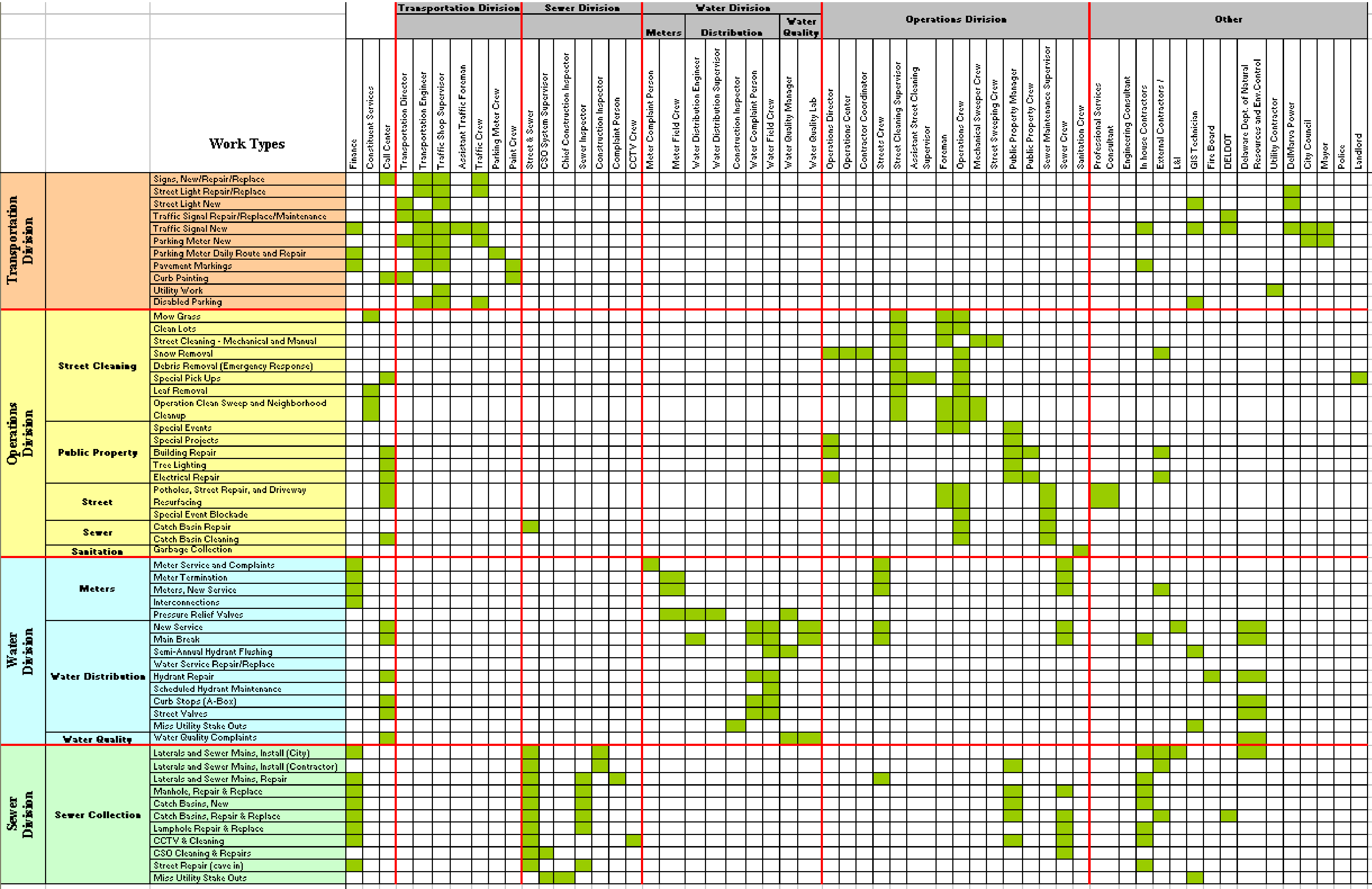
DPW work is often supported by staff of a number of DPW Divisions, other City offices, and outside agencies

Business Process Analysis Results in an Integrated Overview of how DPW Work is Coordinated



						Transportation Division							Sewer Division							Water Division									Operations Division															Other														
																				Meters		Distribution					Water Quality																															
		Work Types	Finance	Constituent Services	Call Center	Transportation Director	Transportation Engineer	Traffic Shop Supervisor	Assistant Traffic Foreman	Traffic Crew	Parking Meter Crew	Paint Crew	Street & Sewer	CSO System Supervisor	Chief Construction Inspector	Sewer Inspector	Construction Inspector	Complaint Person	CCTV Crew	Meter Complaint Person	Meter Field Crew	Water Distribution Engineer	Water Distribution Supervisor	Construction Inspector	Water Complaint Person	Water Field Crew	Water Quality Manager	Water Quality Lab	Operations Director	Operations Center	Contractor Coordinator	Streets Crew	Street Cleaning Supervisor	Assistant Street Cleaning Supervisor	Foreman	Operations Crew	Mechanical Sweeper Crew	Street Sweeping Crew	Public Property Manager	Public Property Crew	Sewer Maintenance Supervisor	Sewer Crew	Sanitation Crew	Professional Services Consultant	Engineering Consultant	In house Contractors	External Contractors /	I&I	GIS Technician	Fire Board	DELDOT	Delaware Dept. of Natural Resources and Env.Control	Utility Contractor	DelMarva Power	City Council	Mayor	Police	Landlord
Transportation Division		Signs, New/Repair/Replace		|🟩| |🟩|🟩| |🟩|																																																			
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		Debris Removal (Emergency Response)																															🟩			🟩																							
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		Operation Clean Sweep and Neighborhood Cleanup		🟩																													🟩		🟩	🟩	🟩																						
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		Tree Lighting			🟩																																	🟩																				
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Water Division	Meters	Meter Service and Complaints	🟩																	🟩												🟩										🟩																
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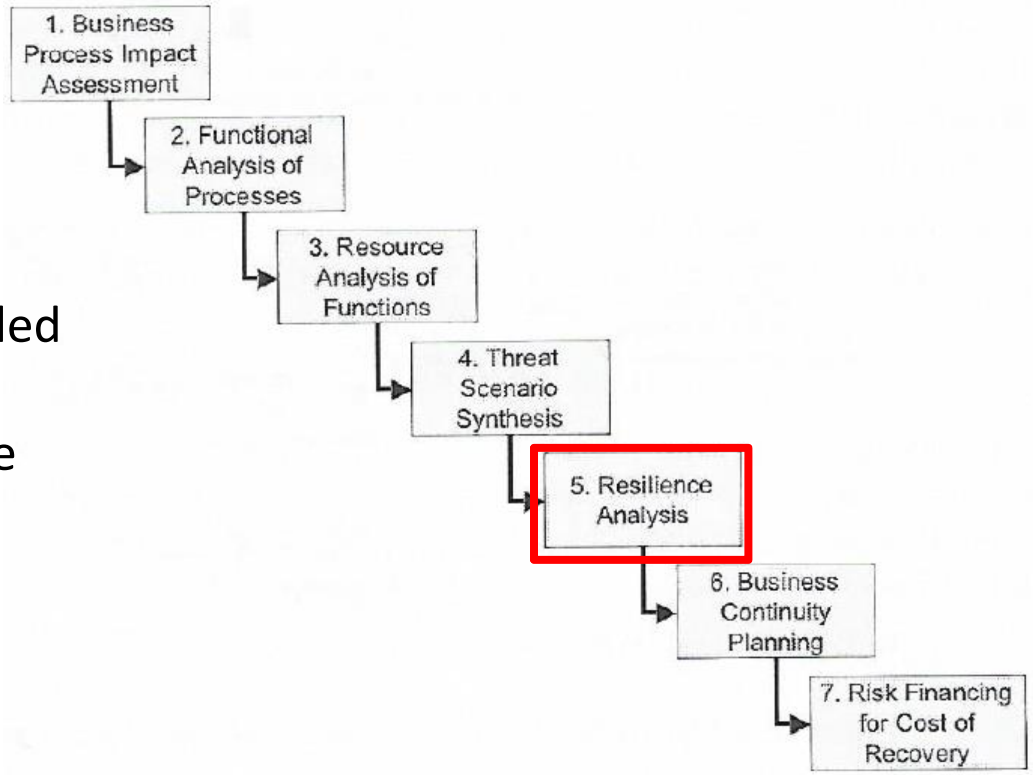
		Miss Utility Stake Outs												🟩	🟩																																	🟩									

Business Continuity Management Process

Step 5

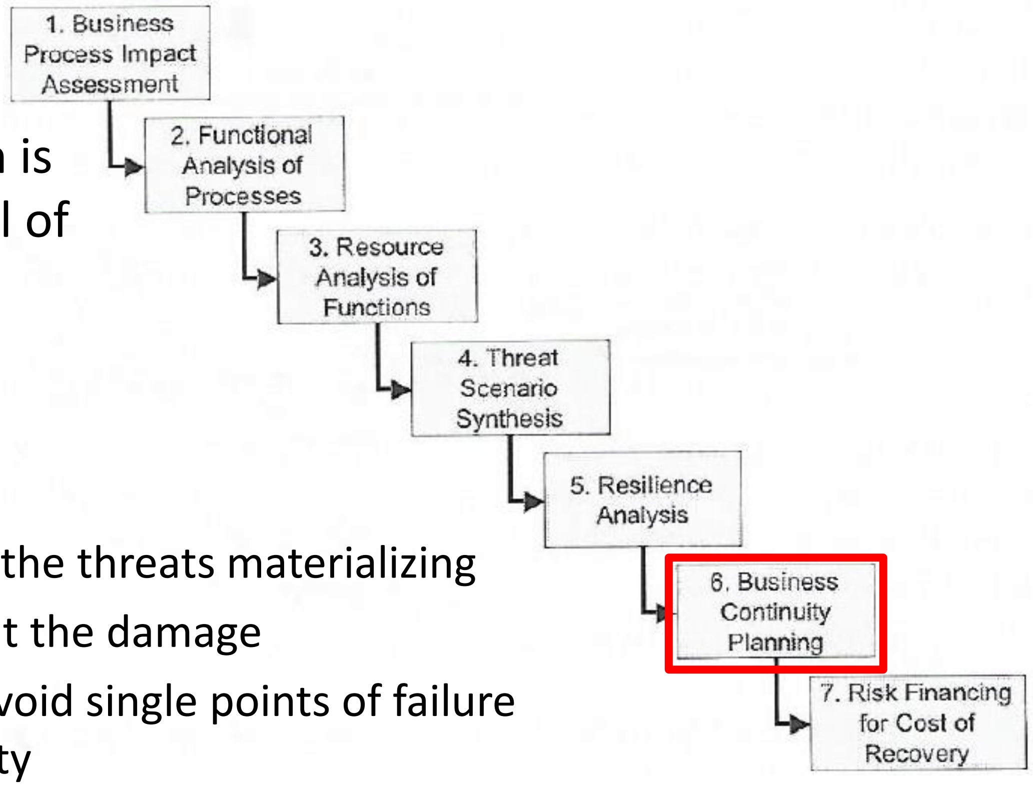
- For each resource/scenario combination
  - Are the current resources provided with sufficient resilience for the overall business to withstand the impacts of the scenario?
- Are there any single points of failure?



1. Business Process Impact Assessment
2. Functional Analysis of Processes
3. Resource Analysis of Functions
4. Threat Scenario Synthesis
5. Resilience Analysis
6. Business Continuity Planning
7. Risk Financing for Cost of Recovery

Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

Business Continuity Management Process


1. Business Process Impact Assessment
2. Functional Analysis of Processes
3. Resource Analysis of Functions
4. Threat Scenario Synthesis
5. Resilience Analysis
6. Business Continuity Planning
7. Risk Financing for Cost of Recovery

Step 6

- What additional resource protection is needed to provide the required level of resource resilience so the overall business can withstand the threat scenarios?
- For example:
  - Preventive measures to avoid the threats materializing
  - Containment measures to limit the damage
  - Redundancy of resources to avoid single points of failure and to provide fallback capacity
  - Incident management plans including (**DRP!**)
  - Recovery plans to resume business following an incident
  - Training and awareness

Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

Disaster Recovery Planning

- Establish a planning group
- Establish priorities for applications, data and networks
- Develop recovery strategies
- Prepare inventory and documentation of the plan
- Develop verification criteria and procedures
- Implement the plan

Disaster Recovery Plan

- **Primary facility recovery and backup sites:** If primary site is destroyed, where should processing take place
- **People:** Human resources is the resource that is most forgotten about
- **Hardware:** Replacement time requirements, SLAs from suppliers, dangers of legacy, and/or proprietary devices
- **Software:** Necessary applications, and supporting utilities and operating systems for production
- **Data:** If not fault-tolerant (e.g. mirroring), will need to load backed up data to restore processing
- **Communication to different entities after a disaster:** Employees, customers, stock holders, suppliers, media
- **Security:** Protecting against looting and fraudulent activities after a disaster
- **Legal responsibilities**
- **Employees' responsibilities to families:** May need to tend to their families instead of helping the company get back on its feet

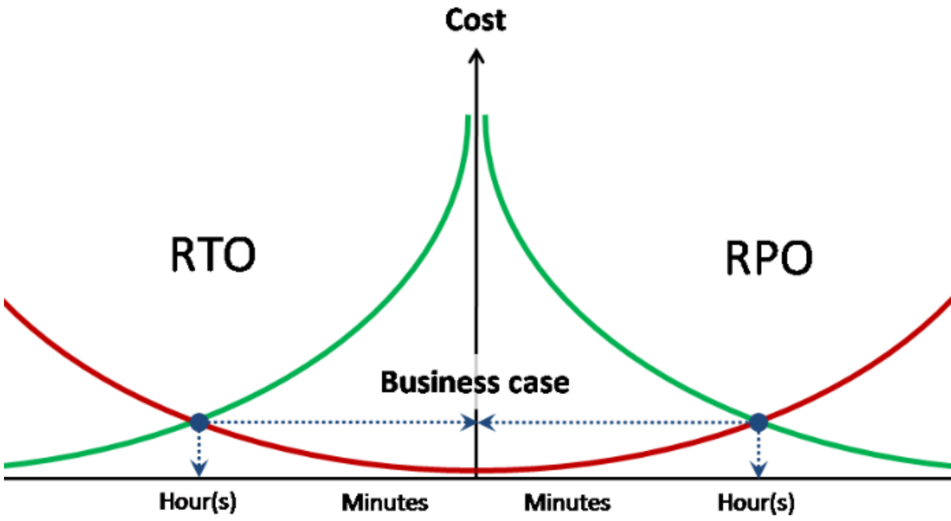
Disaster recovery time targets

Disaster recovery must be achieved within critical deadlines

- Need for careful analysis
  - Of business needs for recovery of services
  - Time-criticality of various information services

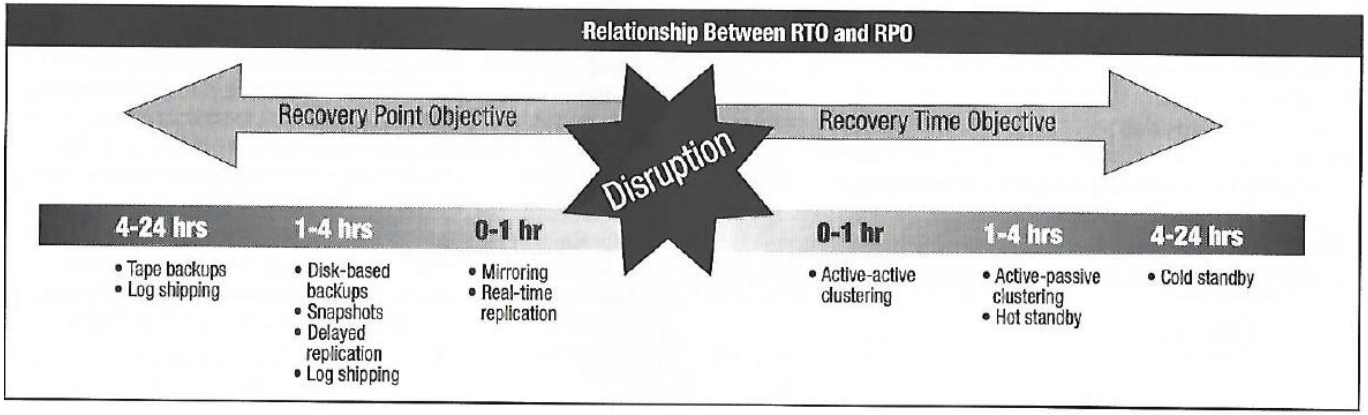
Speed of recovery must be traded off against cost

- If needed, non-stop 365 day by 24-hour service can be maintained, but it pushes the cost up very high
- Business needs and justifications must be worked out in detail to plan disaster recovery
  - Remember: *The only goal is to create effective business continuity, whatever that turns out to be*



Develop Recovery Strategies

- Strategies, resources, timelines and dependencies are documented



- Approaches to “re-initiate” crucial business functions and resume on-going operations are developed and documented

- These are reviewed and confirmed (signed off) by function owners in the business as well as executives

Graphic from CISA Review Manual 26th Edition, page 303

Computer Operations

Areas of Focus:

- Sites/ Locations/ Facilities
- Computers and Infrastructure (Hardware)
- Operating Systems
- Applications and supporting utilities (software)
- Data
- Supplies
- Documentation
- Personnel

Offsite recovery alternative facilities

Hot site: A geographically remote facility, fully equipped and ready to power up at a moments notice

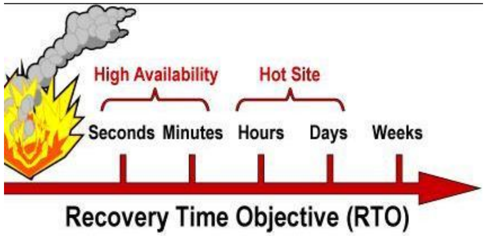
Mobile site: A packaged modular processing facility mounted on transportable vehicles and kept ready to be delivered and set up at a location specified on activation

Warm site: Less expensive alternative to hot site, includes communications components but computers are not installed – will need to be delivered and setup

Cold site: Less expensive than warm site, provides only the basic environment that can be outfitted with communication components and computers, though this may take from one to several weeks

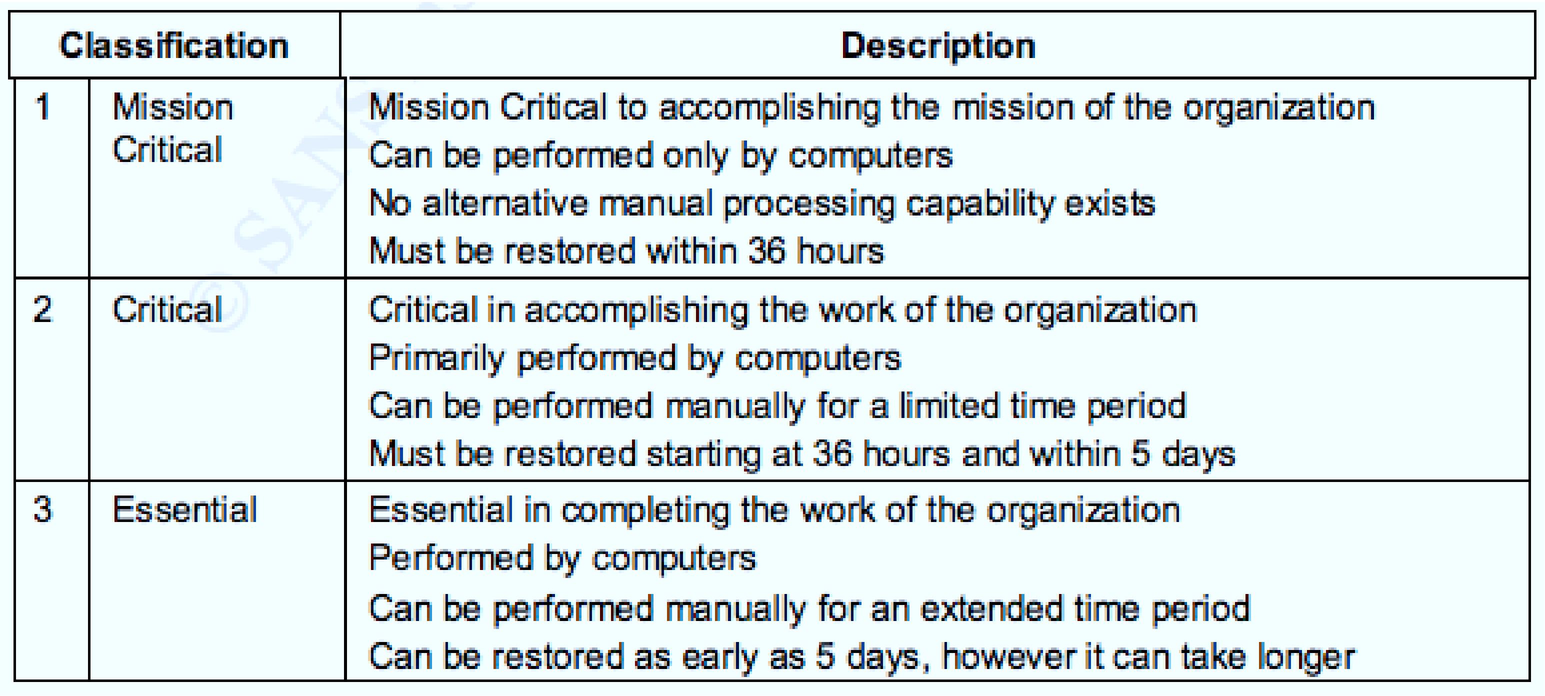
Shared site: Least expensive arrangement ("reciprocal agreements") with compatible companies who agree to host each other's employees and business functions in the event of a disaster

- *Most risky alterative - few companies maintain extra capacity and equipment suitable to host another company's business processes*
- *Better than having no plan at all*



Application Systems

Classification of Applications*



Classification		Description
1	Mission Critical	Mission Critical to accomplishing the mission of the organization Can be performed only by computers No alternative manual processing capability exists Must be restored within 36 hours
2	Critical	Critical in accomplishing the work of the organization Primarily performed by computers Can be performed manually for a limited time period Must be restored starting at 36 hours and within 5 days
3	Essential	Essential in completing the work of the organization Performed by computers Can be performed manually for an extended time period Can be restored as early as 5 days, however it can take longer

* From SANS

Availability of replacement software

- Operating systems, programs and utilities used during regular business must also be backed up regularly to the offsite facility

- A program built for a particular version of an operating system, will not run if the wrong version of the operating system is installed at the offsite facility

- Data is formatted to a particular version of a program (e.g. spreadsheet), and that version is not also updated to the backup facility, it is possible that the data will not be available for use in the time of need

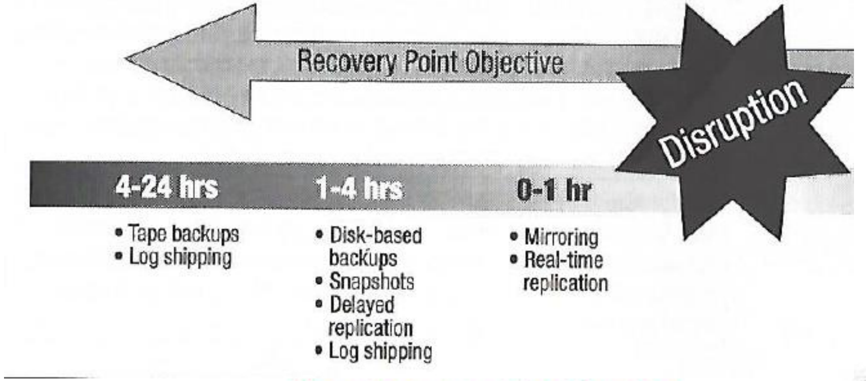
Availability of people after disaster

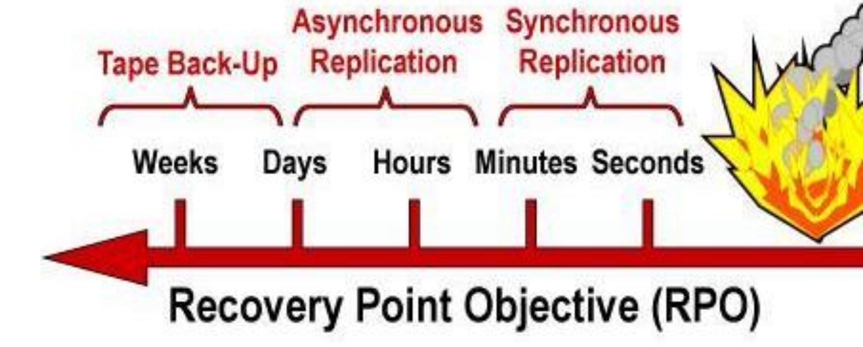
- Attention focused on backing up data and technology, often overlooks people and necessary skillsets for continuing the operation of the enterprise

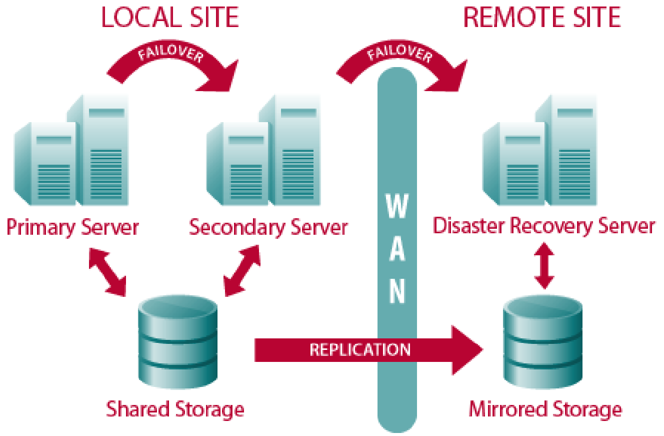
- Employees may not be available after a disaster:
  - Death, injury, or family responsibilities
  - Business continuity committee
    - Must identify the necessary skill set for each critical task
    - Come up with back up solutions (e.g. using temp agencies or cross training individuals)

Data backup systems and redundancies

- Database shadowing
- Electronic vaulting
- Remote journaling
- Storage area network and hierarchical storage management
- Shared storage
- RAID
- Failover clustering







Plan Design & Development

- Recovery Strategies Scenarios are integrated and synchronized

- Formal Plan document is created

- Stakeholder review and sign-off on the plan

Testing, Maintenance, Awareness, Training

- Testing is the ONLY way that a plan can be assessed for effectiveness
- Testing can be expensive and must be prioritized with high level sponsorship
- This requires an ongoing commitment by the business as the plan must be re-assessed on a regular basis

Recovery and testing

After a disaster two teams may be assembled:

- *Salvage team*
  - Assesses damage and works to bring the businesses' primary facility back on-line

- *Recovery team*
  - Coordinates bringing up the alternative site
  - To be sure everyone knows what to do, tests are conducted
    - Range from troubleshooting the plan by simply walking through the documents detailing the sequence of events, to actually rehearsing the plan up to the point of actual data or resource recovery at the main site.

Mechanisms that support disaster recovery services include:

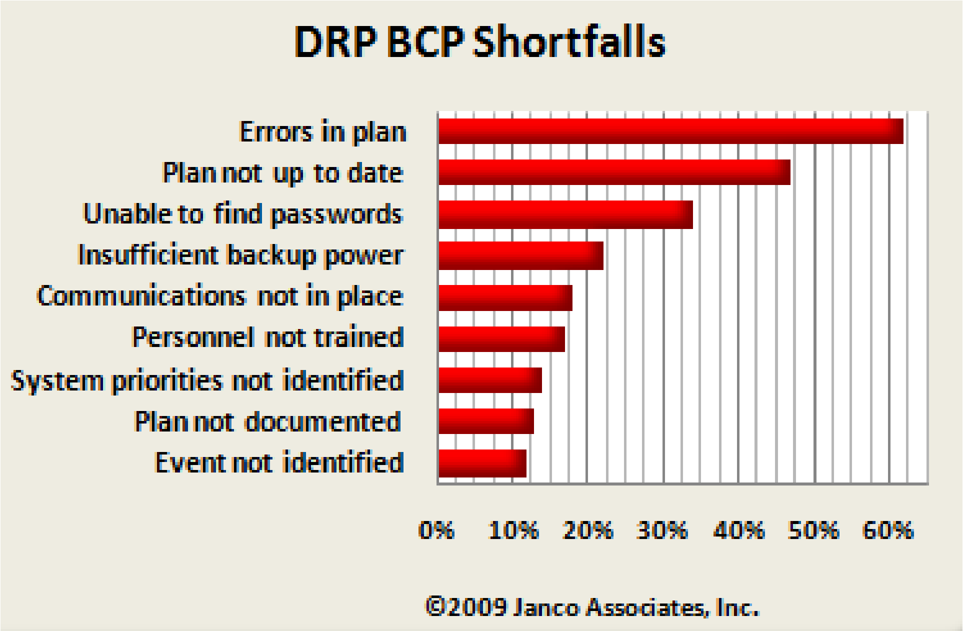
- Contingency sites
  - Redundancy of hardware and communications lines for resilient operations
- Data management tasks
  - Taking appropriate backups of data and software
  - Providing backup management: labeling, indexing, storage
  - Off-site storage
  - Data recovery and restoration procedures
- Recovery plans and procedures
- **Incident management responsibilities**
- **Activation plans**

DRP Testing Approaches

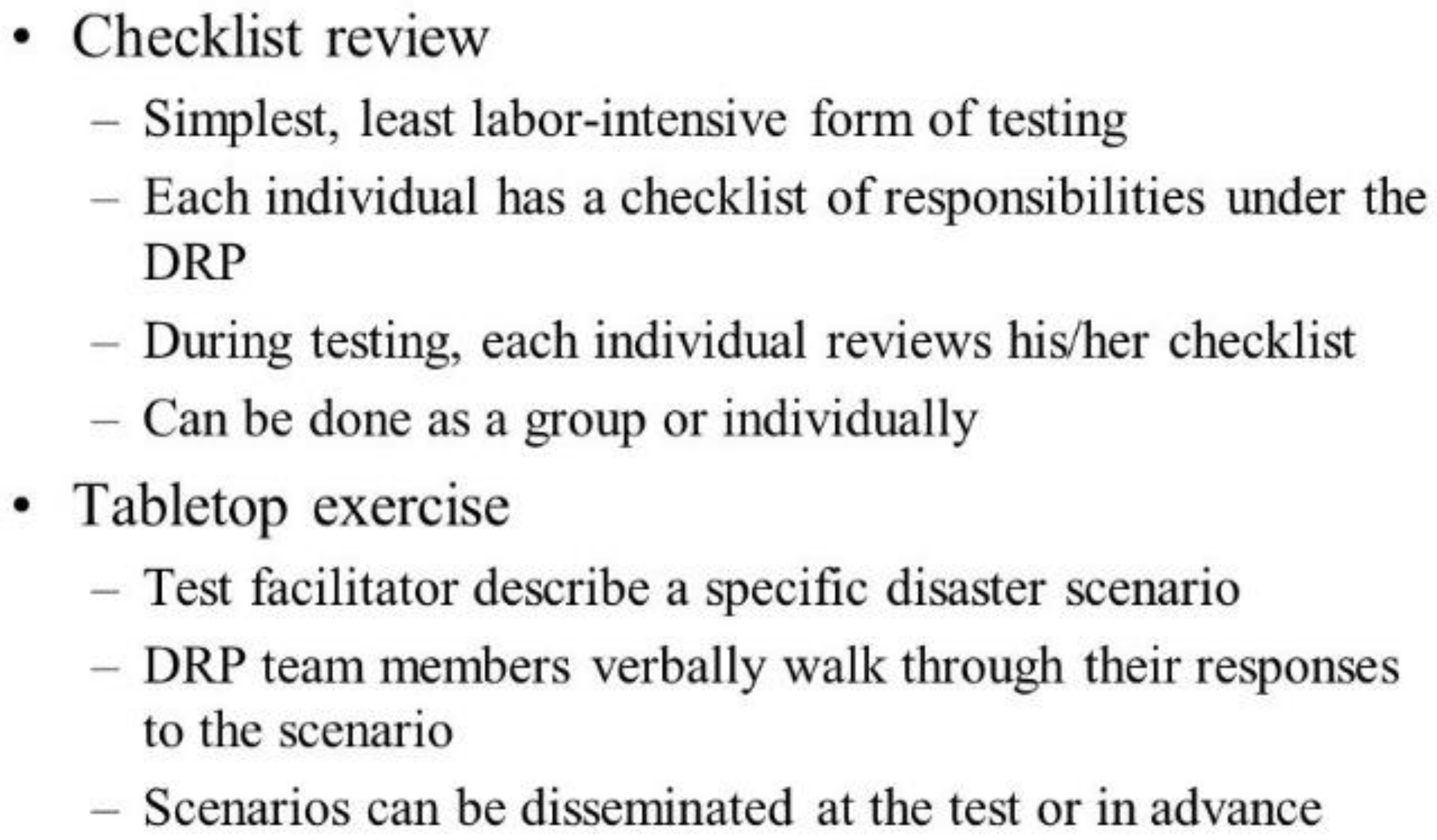
Tests are conducted to be sure plan is good, everyone is prepared and knows what to do

These can range from:

- Checklist review
- Tabletop exercise
- Structured walk-through
- Dry-Run tests



DRP Testing Approaches



- Checklist review
  - Simplest, least labor-intensive form of testing
  - Each individual has a checklist of responsibilities under the DRP
  - During testing, each individual reviews his/her checklist
  - Can be done as a group or individually
- Tabletop exercise
  - Test facilitator describe a specific disaster scenario
  - DRP team members verbally walk through their responses to the scenario
  - Scenarios can be disseminated at the test or in advance

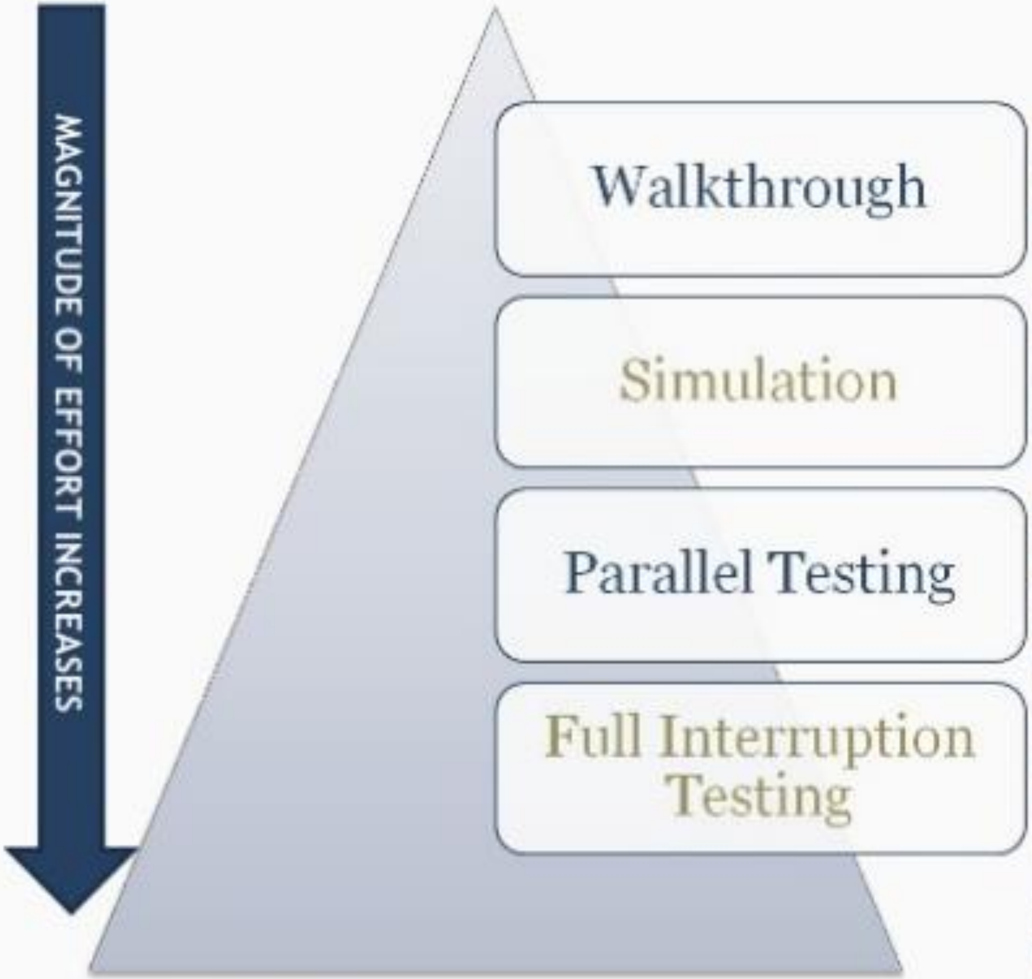
DRP Testing Approaches

- **Structured walk-through**
  - More formal troubleshooting of the plan by simply walking through the documents detailing the sequence of events

- **Dry-Run tests**
  - Can be conducted on a function by function basis
  - Do not have test all functions for each cycle
  - Tests should involve actual interruptions and recoveries
  - Actually rehearsing the plan up to the point of actual data or resource recovery at the main site

Testing is necessary for all DRPs

Perform testing on the DRP periodically to ensure that the plan works and that the entire organization knows what to do in the event of a disaster.



MAGNITUDE OF EFFORT INCREASES

Walkthrough

Requires no disruption to the organization's day-to-day activities. With this method, the plan is tested verbally with all of the DR Teams.

Simulation

Requires no disruption to the organization's day-to-day activities. With this method, the plan is tested in a disaster simulation, the standby facility is brought on-line to make sure that it is fully operational.

Parallel Testing

Requires no disruption to the organization's day-to-day activities. The plan is tested in the standby facility using the historical data. This data is processed to ensure the same results as the primary facility are produced.

Full Interruption Testing

Requires disruption to the organization's day-to-day activities. With this method, the plan is tested in a full disaster scenario where the primary facility is brought down and the business runs off of the standby facility alone. This method also tests whether the organization can successfully go back to the primary facility following a disaster.

Emergency response testing

Emergency response drills prepare the organization’s people to:

- Preserve life and minimize asset damage
- Reduce the chance of fraud, theft and vandalism
    - Security mechanisms usually in place may be completely disabled

By putting in place processes that:

- Identify actions taken immediately to avoid injury and loss of life
- Alert authorities and notify management
- Contain damages if possible
- Rescue critical data and equipment

Audit Focus Areas

Areas for audit evaluation:

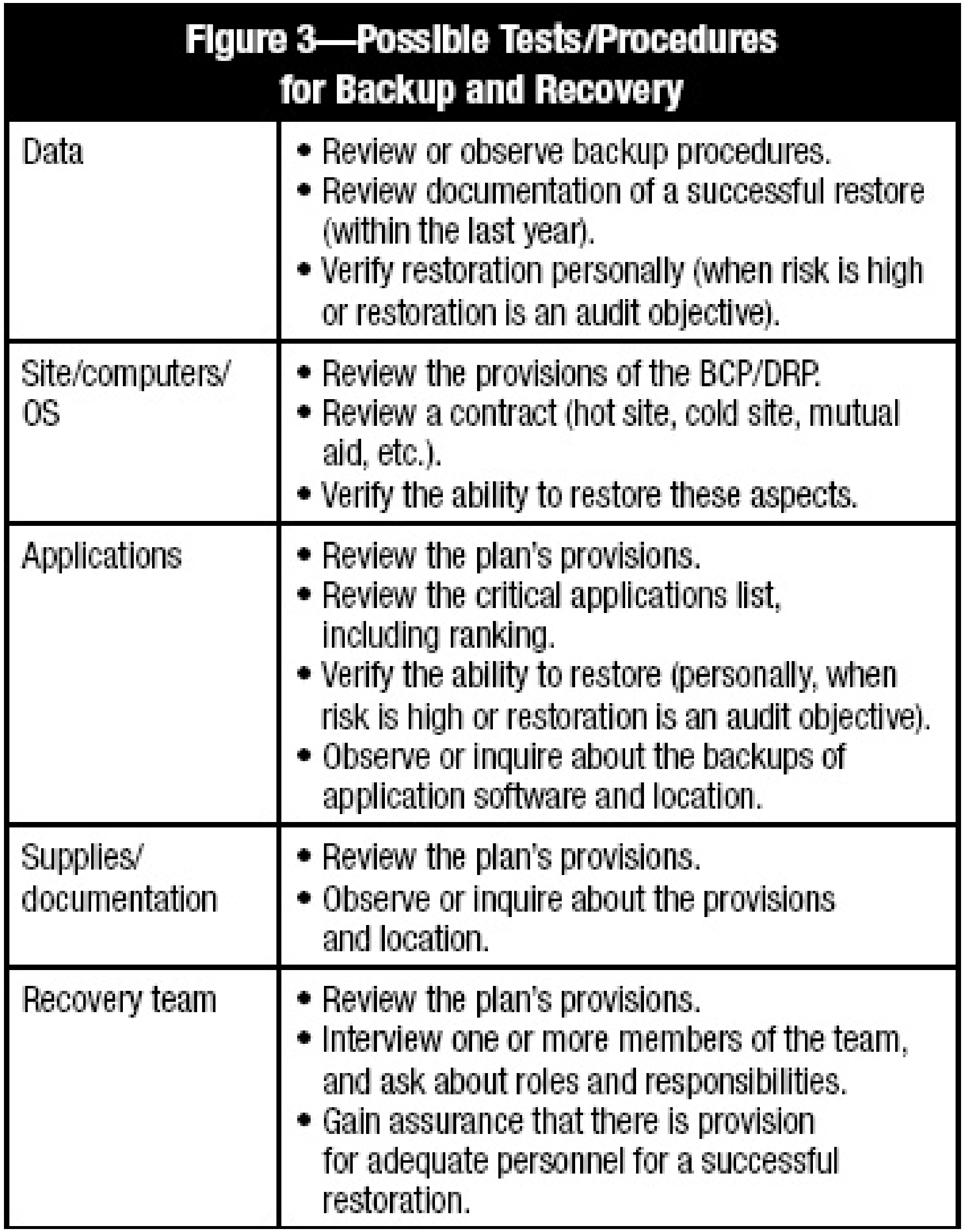


Figure 3—Possible Tests/Procedures for Backup and Recovery

Data	• Review or observe backup procedures. • Review documentation of a successful restore (within the last year). • Verify restoration personally (when risk is high or restoration is an audit objective).
Site/computers/ OS	• Review the provisions of the BCP/DRP. • Review a contract (hot site, cold site, mutual aid, etc.). • Verify the ability to restore these aspects.
Applications	• Review the plan's provisions. • Review the critical applications list, including ranking. • Verify the ability to restore (personally, when risk is high or restoration is an audit objective). • Observe or inquire about the backups of application software and location.
Supplies/ documentation	• Review the plan's provisions. • Observe or inquire about the provisions and location.
Recovery team	• Review the plan's provisions. • Interview one or more members of the team, and ask about roles and responsibilities. • Gain assurance that there is provision for adequate personnel for a successful restoration.

Test Taking Tip

Don’t Revise Your Answer

(without a very strong reason)

- Your first answer is probably the right one
- On an exam where there is no penalty for wrong answers, you are just using time that might have gone to getting another correct answer
- If you are having second thoughts, plan to come back to that question after you have completed the entire test

Quiz