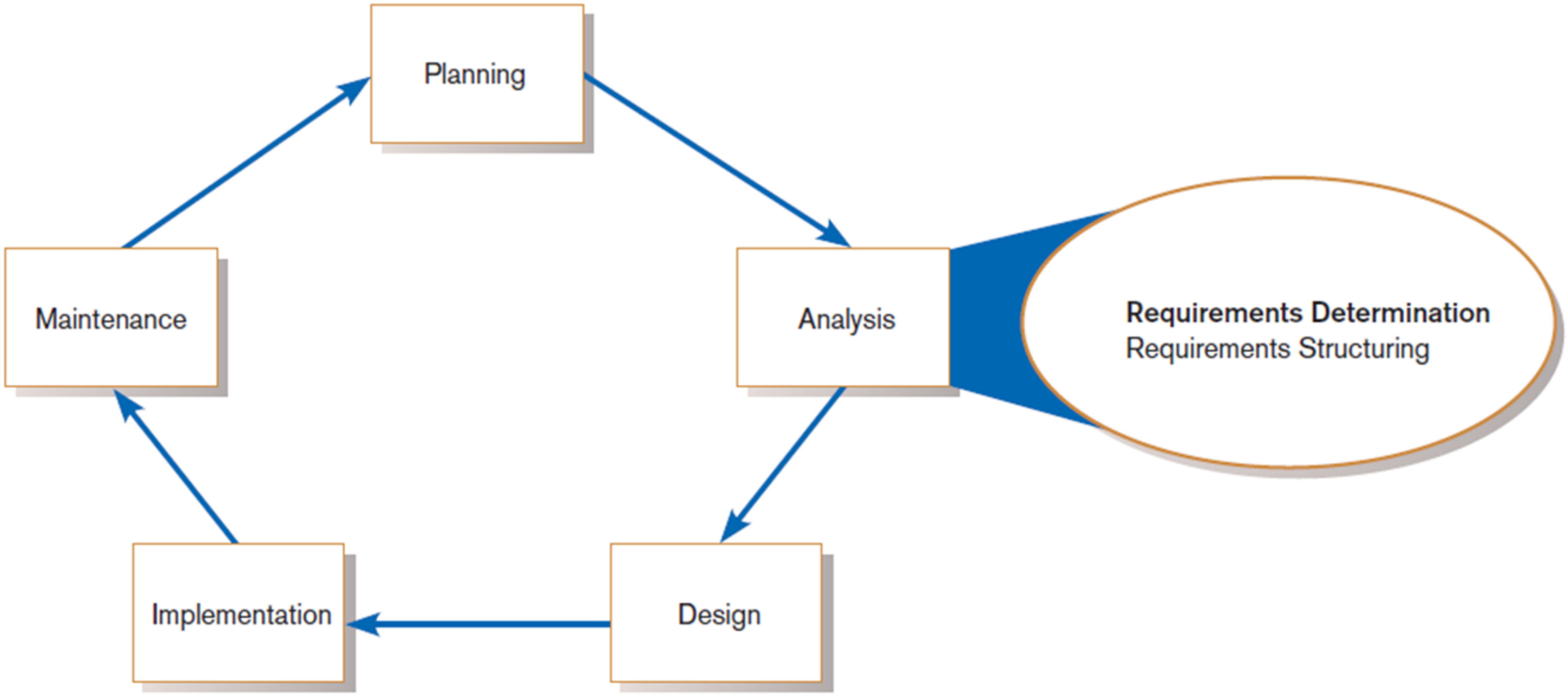
Requirements Analysis - Processes

- Unit 5 -

Agenda

- IT Auditor’s responsibility during SDLC – Requirements
- Requirements and requirements analysis
- Security requirements – brief introduction
- Requirements process modeling
- Use case modeling with security
- Quiz

Requirements Analysis - Determination



IT Auditor’s responsibilities during SDLC control stages

- **System requirements**
- System design
- System development
- System operation
- System utilization

System requirements questions:

- Have stakeholders/users determined that the requirements definition accurately and completely reflects the functional requirements for the proposed system?
- Is the requirements definition feasible within the technical infrastructure in place or envisioned?
- The proposed system will eventually require an IT Audit, and IT Audit has its own requirements
  - Have they been included in the requirements definition document?

What is a requirement?

An outcome for the proposed system

- Something it must perform
- A quality it must have

- Not a specification of how it should be accomplished

Requirements focus on

- Business objectives that drive what and how work is done
- Information people need to do their jobs
- Data movement, transformation and storage processes
- Data handling/processing rules
- Dependencies and sequences
- Key events

Characteristics of good requirements specifications

- Clear and unambiguous
- Complete and Comprehensive
- Consistent
- Traceable, verifiable, testable
- Modifiable
- Prioritized

Methods for Determining Requirements

- Interviewing individuals
- Interviewing groups
- Observing workers
- Studying business documents

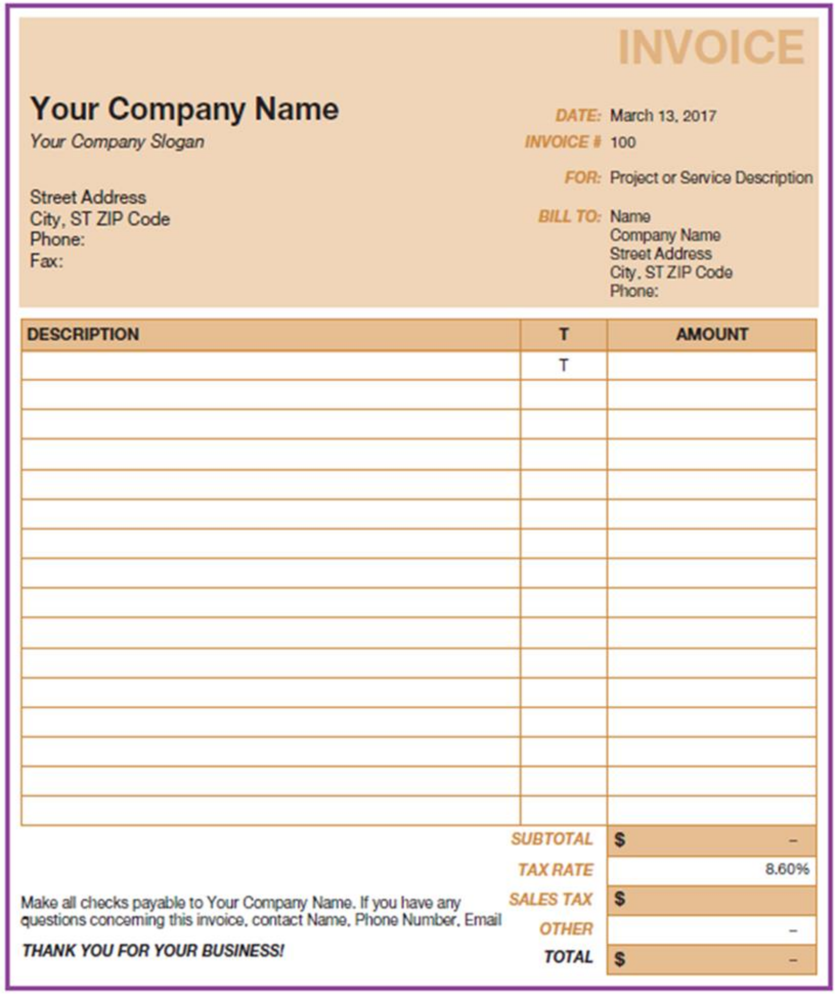
Formal Systems: the official way a system works as described in organizational documentation (i.e. work procedure)

Informal Systems: the way a system actually works (i.e. interviews, observations)

Analyzing Procedures and Documents

Types of information to be discovered:

- Problems with existing system
- Opportunity to meet new need
- Organizational direction
- Names of key individuals
- Values of organization
- Special information processing circumstances
- Reasons for current system design
- Rules for processing data



INVOICE

Your Company Name
Your Company Slogan

Street Address
City, ST ZIP Code
Phone:
Fax:

DATE: March 13, 2017
INVOICE # 100
FOR: Project or Service Description
BILL TO: Name
Company Name
Street Address
City, ST ZIP Code
Phone:

DESCRIPTION	T	AMOUNT
	T	

SUBTOTAL	$ –
TAX RATE	8.60%
SALES TAX	$
OTHER	–
TOTAL	$ –

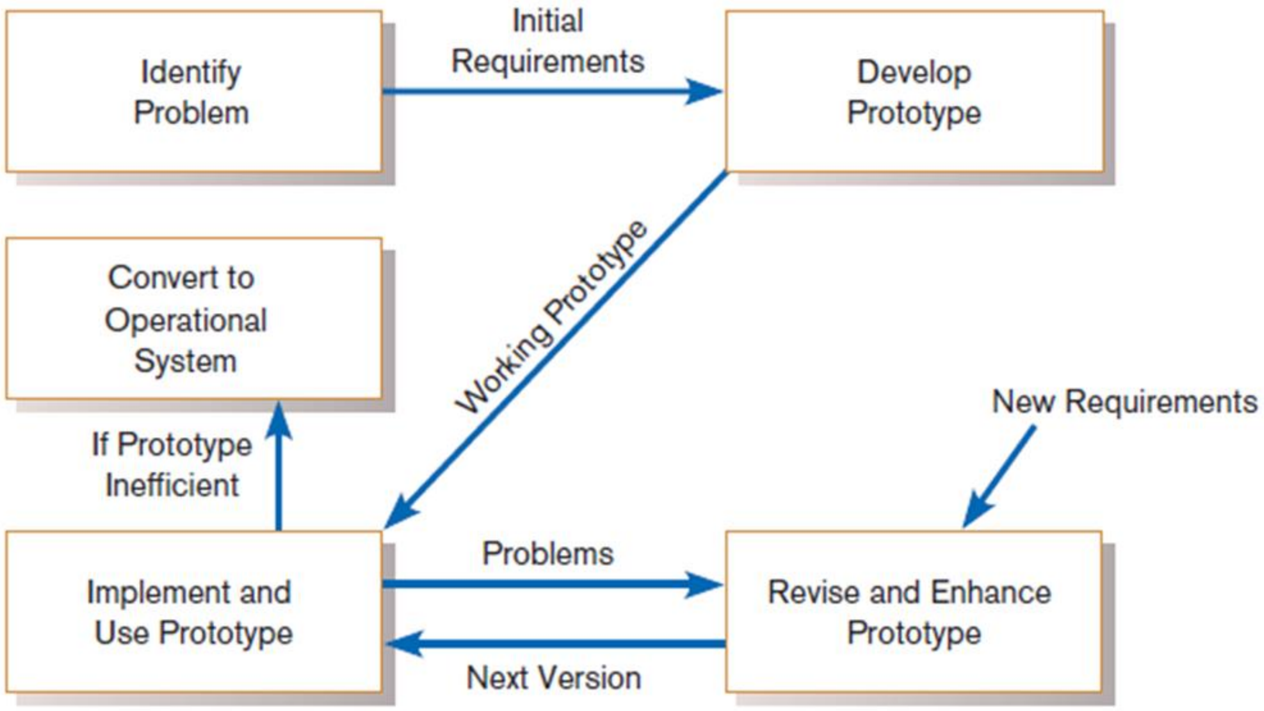
Make all checks payable to Your Company Name. If you have any questions concerning this invoice, contact Name, Phone Number, Email

THANK YOU FOR YOUR BUSINESS!

Other Methods for Determining Requirements

- **Joint Application Design (JAD)**
  - Brings together key users, managers, and systems analysts
  - Purpose: collect system requirements simultaneously from key people
  - Conducted off-site
- **System prototypes (from Spiral, RAD and Agile SDLC methods)**
  - Iterative development process
  - Rudimentary working version of system is built
  - Refine understanding of system requirements in concrete terms

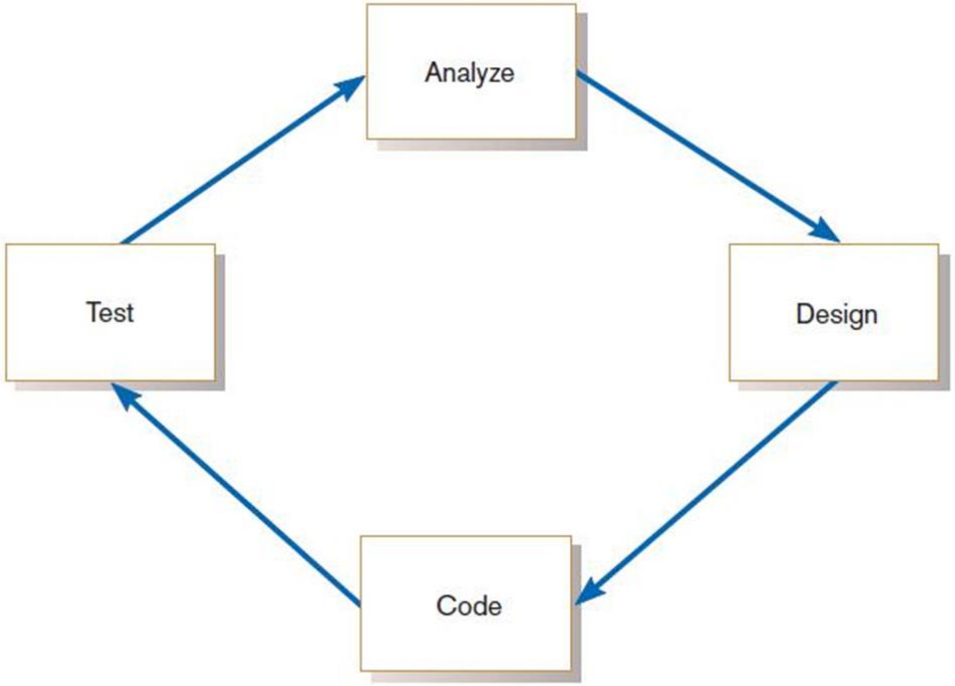
Prototyping for Requirements Determination



- **Throwaway prototyping** – prototype is just a mockup or simple model, discarded after use
- Evolutionary prototyping – prototype becomes the basis of the operational system
  - Addresses functional needs of the production system, includes database processing and coding logic

Problems with Reliance on Prototyping for Requirements Determination

- Tendency to avoid formal documentation
- Difficult to adapt to more general user audience
- Sharing data with other systems is often not considered
- Systems Development Life Cycle (SDLC) checks are often bypassed



***Benefit:** Continual User Involvement throughout iterative analysis–design–code–test cycle*

Requirements Specification

With all projects it is important to understand:

- Requirements of the information system in terms of:
  - Functionality
  - Data
  - Characteristics of the environment

Without a clear definition and specification of requirements, the project is likely experience:

Scope creep

- Situation where project adds more and more functionality beyond the original specification

Problem of scope creep

Resource impact is doom of many projects

- Increased resources and effort needed to accomplish incurs greater expense than allocated to the original project

Security impact

- Requirements added in unplanned / haphazard ways increase the resulting attack surface and inherent vulnerabilities

What are the requirement types?

1. **Functional requirement**
   - Something the system must do
   - Outcome the system must produce as part of its useful operation
2. **Nonfunctional requirement**
   - Quality or constraint for the system
   - Must be maintained as the system operates
3. **Security requirement**
   - As associated protection that must be placed on some part of the system
   - Contingency to normal operations
   - Guarantee of some constraint that would otherwise violate conditions of safe operation

Example

Functional requirements

1. Provide ability to collect user name and address field in a web UI. The customer should be able to submit name and address data before proceeding to the ordering page.

Non-functional System requirements

1.1 Provide ability to enter person’s first name and last name in separate input fields

1.2 Provide ability to enter address, which would have Street number, Street name, city, and zip code in separate input fields

1.2.1 An address must have street name and city

1.2.2 Zip code must be 5 character numbers

1.3 If a user clicks on “submit” button without entering name and address fields, prompt the user with “you must enter your name and address to continue”

1.4 If a user is a returning user, pre-populate the existing user name and address

1.5 Provide ability to store the name and address fields as part of the customer records

1.6 Provide ability to submit the name and address page in less than 1 seconds

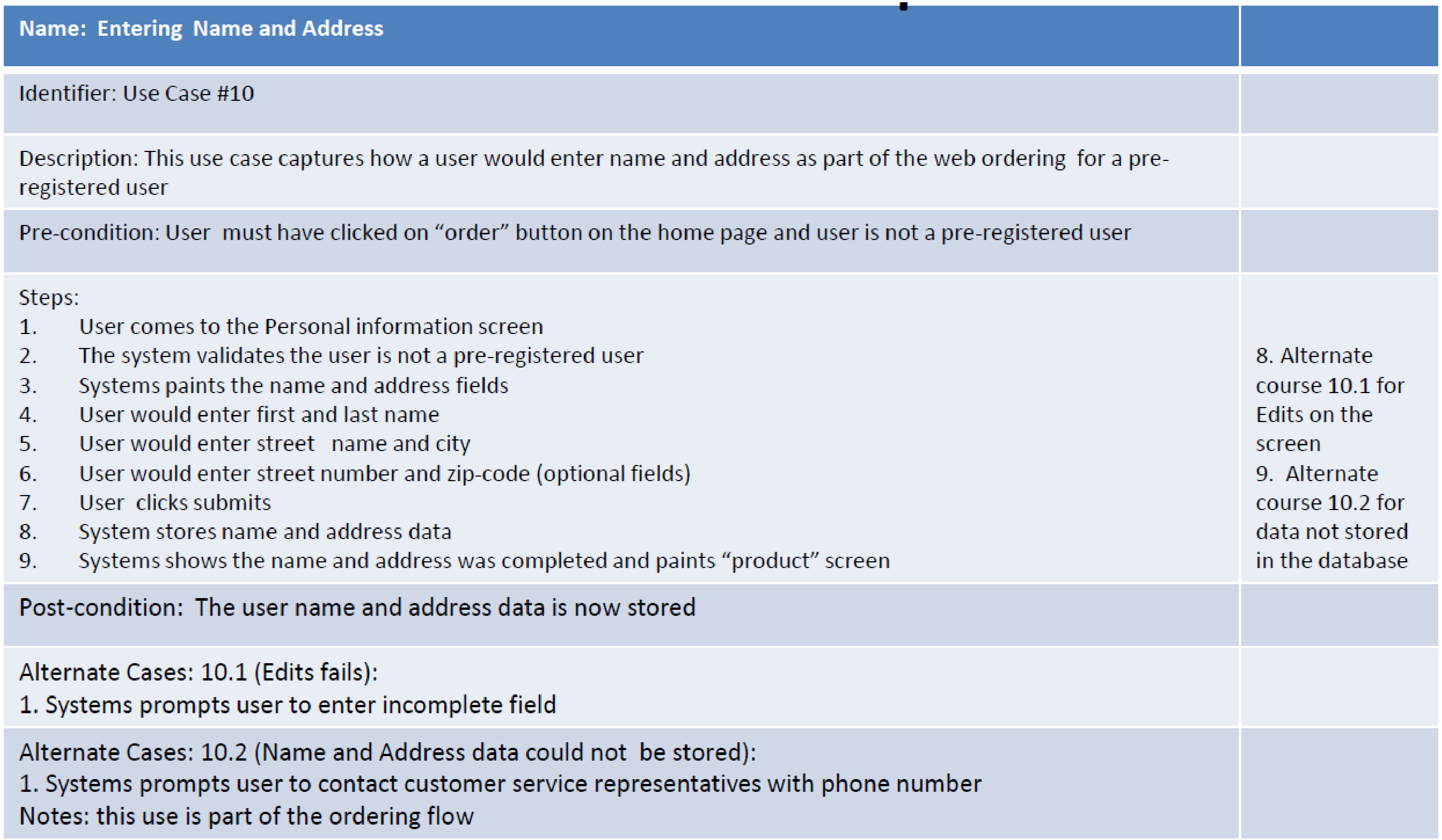
1.7 Provide ability to report on for manual re-entry by Support team, when the customer submits the name and address field and data is not successfully written in customer records

1.8 The systems should be able to handle 1 million concurrent transactions with no degradation in

Requirements Example

No.	Requirement	Type	Priority	Must Have	Notes
1	Provide ability to collect name and address from end users				
1.1	Provide ability to enter person's first name and last name in separate fields	Functional	High	Yes	
1.2	Provide ability to enter address: street number, street name, city, and zip code in separate fields	Functional	High	Yes	
1.2.1	An address must have street name and city	Functional	Medium	Yes	
1.2.2	Zip code must be 5 character numbers	Functional	Low	Yes	
1.3	If use clicks on "submit" button without entering name and address fields, prompt user with "you must enter your name and address to continue"	Functional	Medium	Yes	
1.4	If a user is a returning user, pre-populate the existing user name and address	Functional	Medium	No	
1.5	Provide ability to store the name and address fields as part of the customer records	Functional	High	Yes	
1.6	Provide ability to submit the name and address page in less than 1 seconds	Performance	Medium	No	
1.7	Provide ability to create a ticket for manual re-entry by Support team, if the customer submits the name and address field and data is not successfully written in customer records	Operational	High	Yes	Part of issue reporting
1.8	The system should handle 2 million concurrent transactions with no degradation in performance	Performance	Medium	Yes	At least 1 million

Use Case Example



Name: Entering Name and Address	
Identifier: Use Case #10	
Description: This use case captures how a user would enter name and address as part of the web ordering for a pre-registered user	
Pre-condition: User must have clicked on “order” button on the home page and user is not a pre-registered user	
Steps: 1. User comes to the Personal information screen 2. The system validates the user is not a pre-registered user 3. Systems paints the name and address fields 4. User would enter first and last name 5. User would enter street name and city 6. User would enter street number and zip-code (optional fields) 7. User clicks submits 8. System stores name and address data 9. Systems shows the name and address was completed and paints “product” screen	8. Alternate course 10.1 for Edits on the screen 9. Alternate course 10.2 for data not stored in the database
Post-condition: The user name and address data is now stored	
Alternate Cases: 10.1 (Edits fails): 1. Systems prompts user to enter incomplete field	
Alternate Cases: 10.2 (Name and Address data could not be stored): 1. Systems prompts user to contact customer service representatives with phone number Notes: this use is part of the ordering flow	

Good requirements answer

1. **Who are the stakeholders for this requirement?**
   - Listing of interested parties for this requirement in particular
   - Supports traceability
2. **Why should this be part of the system?**
   - Answer could be obvious or simply part of the project description
   - If no justified answer in the business case or from a stakeholder, it could be unnecessary adding cost and risk
3. **What are the dependencies for this requirement?**
   - Goal is to connect requirements to each other
     - E.g. Successful login could be precursor to executing functionality for a requirement
     - E.g. Completing actions in this requirement could facilitate other requirements
4. **What are the constraints on this requirement?**
   - Answer focuses on controls for the requirement
   - A control can be anything that monitors execution to make sure it is proceeding as expected
   - Absence of an answer may indicate additional refinement of requirement may be needed

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Security Requirements

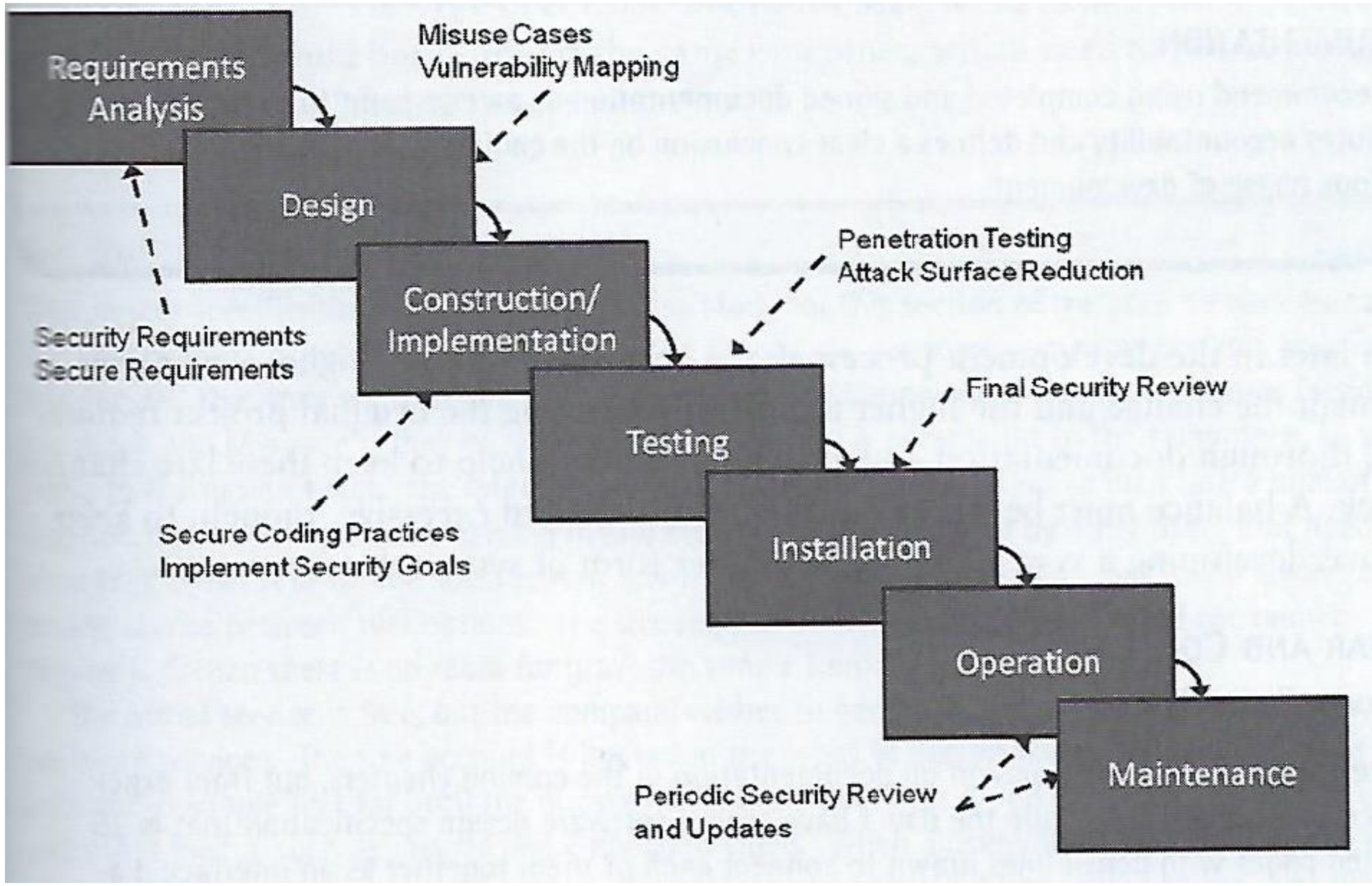
The earlier security is considered, the more likely it is to be implemented well

Baseline of security considerations are:

- Confidentiality
- Integrity
- Availability

Security requirements may also include:

- Data privacy
- Strict authentication and access control
- Uptime and reliability
- Failing safely
- Nonrepudiation



Richardson, T. and Thies, C. (2013) Secure Software Design

Secure requirements VERSUS Security requirements

Secure requirements are standard requirements that have security built into them to determine the necessary constraints to protect the system as a whole

- Facilitate security across the entire system
- Systematic

Security requirements are separate entities that support an overall security objective

- Often contributed by security personnel and specialists
- Assert what is needed within the system to support overall business security objectives
- Emphasize security in particular places

Richardson, T. and Thies, C. (2013) Secure Software Design

Requirements can be improved by answering additional information security questions

- **What are the exceptions to the normal situation for this requirement?**
  - The normal requirement is generally well thought out and planned
  - **Exception cases** to the normal operation are usually not considered or not adequately planned
    - Candidates for security vulnerabilities
- **What sensitive information is included in this requirement?**
  - Use an computation of sensitive information needs to be documented as a risk to be managed
- **What are the consequences if the conditions to this requirement are violated?**
  - Errors need to be handled to fail safely without compromise
  - Focus for security controls
- **What happens if this requirement is intentionally violated?**
  - What potential is there for attack on the system via the specific requirement
  - E.g. What would happen if a malicious string of code were entered for a username to try to break the system?

Good requirements also include operational security considerations, such as:

5. ***Fail case:* What will happen if the requirement is not fulfilled during operation?**
   - This is situation where constraint is violated by exceeding boundaries or computation is not completed or completed incorrectly
6. ***Consequence of failure:* What is the result of the fail case?**
   - Example of failure would be an incomplete computation and later functional requirements that rely on this requirement will fail
7. ***Associated risks:* What sensitive information could be revealed or compromised?**
   - Ripping impacts can result in failure of dependent requirements, or vioulation of system specifications or laws/regulations

Example requirement with security elements

System: A survey system product for collecting and tallying users’ input on questions

Requirement: Users will vote only once per question

Fail case: A user is allowed to vote twice for the same question

Consequence of failure: The tote tally will be incorrect; confidence in the system will be lost

Associated risk: Violation of product purpose; users may stop using product

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Requirements Process Modeling

Graphically represent the processes that capture, manipulate, store, and distribute data

- Between a system and its environment
- Among the system's components

Examples of process modeling diagrams

- Data flow diagrams
- Use case diagrams
- Activity and business process modeling ("swim lane") diagrams
- Sequence diagrams

Common elements

- Useful for depicting logical information flows
- Structured decomposition of system functions
  - Stepwise process of decomposing a system into its component part
  - Continues until it no longer makes sense to break subprocesses any further down
  - Results in “modular design” of software components making up an information system

  - **Context diagram** = Overview of an information system, showing:
    - System boundaries
    - External entities
    - Information flows between the entities and the systems
  - **Level-0 diagram** = Represents systems’ major processes, data flows, and data stores
  - **Level-n diagram** = Result of n nested decompositions from a process on a Level-0 diagram

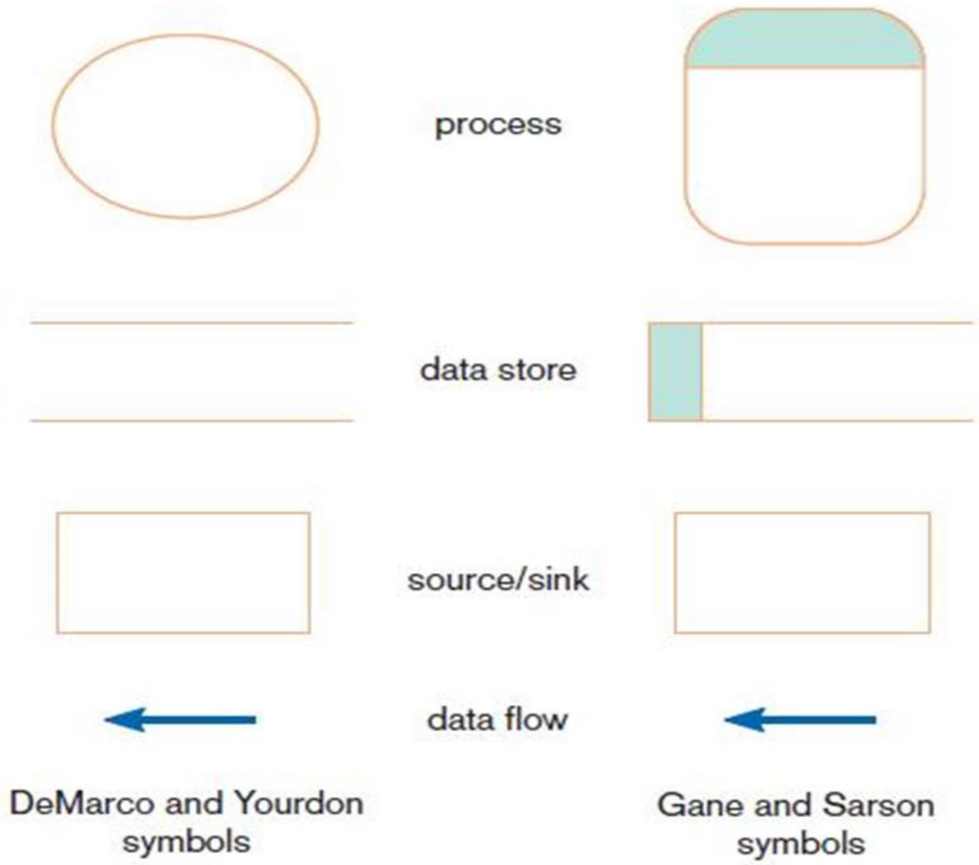
Data Flow Diagrams

Context diagram = Overview of an information system, showing:

- System boundaries
- External entities
- Information flows between the entities and the systems

Level-0 diagram = Represents systems’ major processes, data flows, and data stores
Level-n diagram = Result of n nested decompositions from a process on a Level-0 diagram

Data Flow Diagrams – basic elements



- **Process**: work or actions performed on data (inside the system)
- **Data store**: data at rest (inside the system)
- **Source/sink**: external entity that is the origin or destination of data (outside the system)
- **Data flow**: arrows depicting movement of data

Assignment Problem 7.32

2 diagrams are needed:

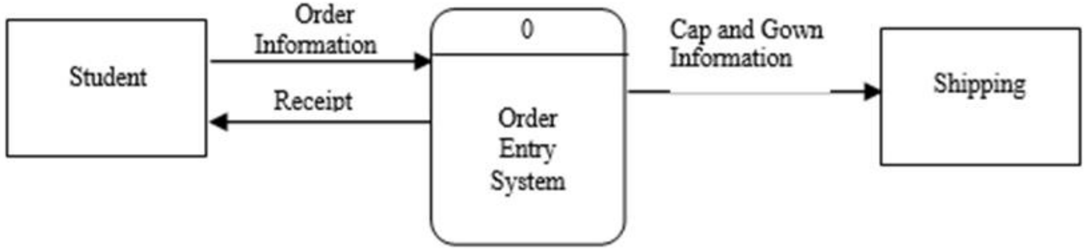
1. Develop a high-level data flow diagram (DFD) i.e. context diagram for a transaction (e.g. ordering cap & gown for graduation)
2. Decompose this to a level-0

Need to differentiate between 3 types of objects:

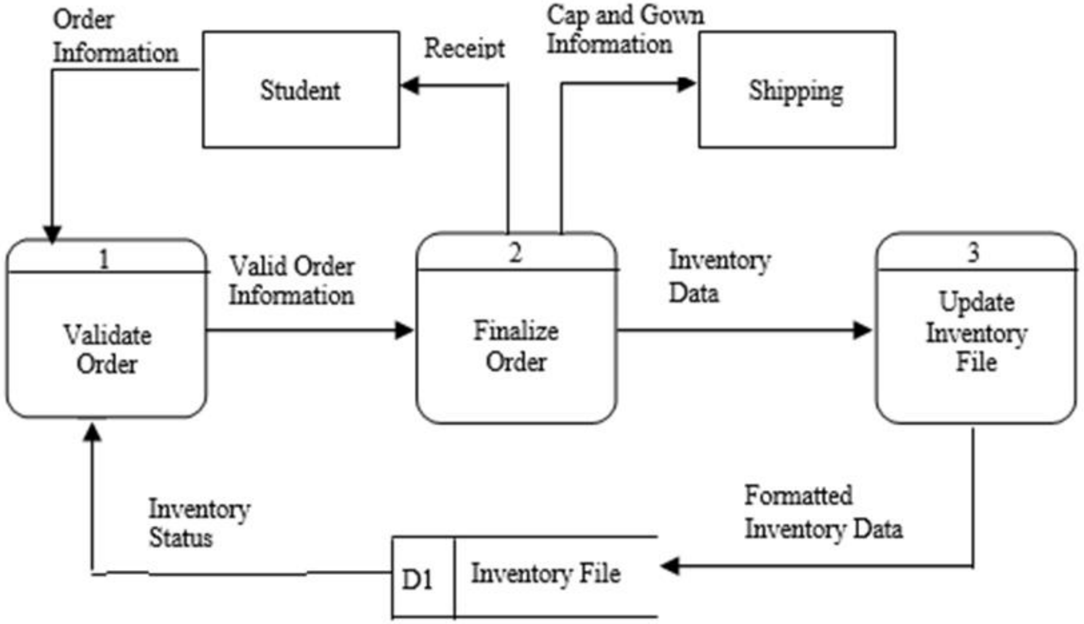
1. Process
2. Data store
3. Source/sink

And show data flow

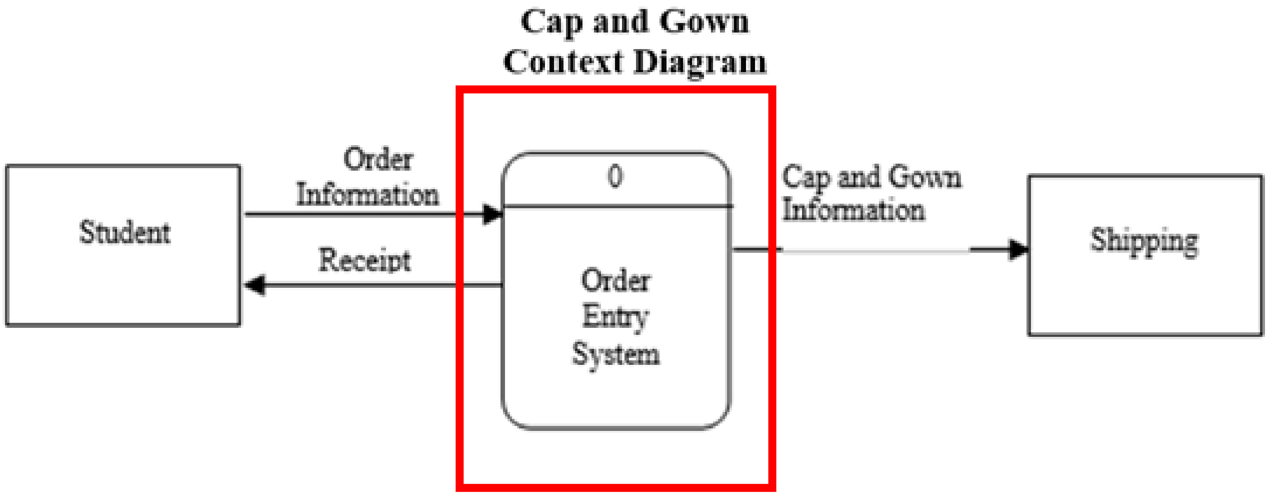
Cap and Gown Context Diagram



Cap and Gown Level-0 Diagram



Where is the system boundary in the context diagram?



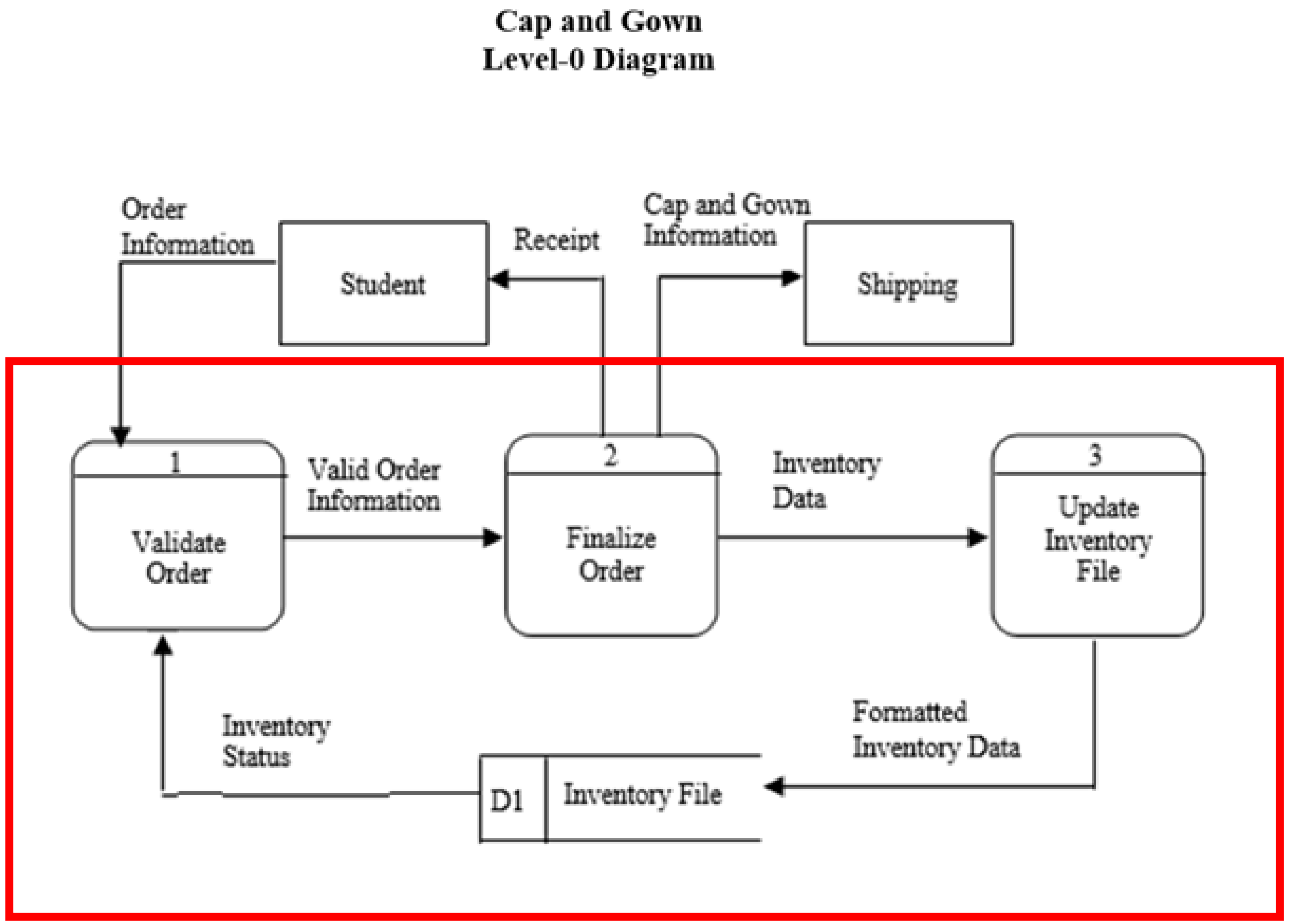
Why would the IT Auditor care about the system boundary?

Where is the system boundary in the level 0 diagram?

What kinds of threats can cross the system boundary?

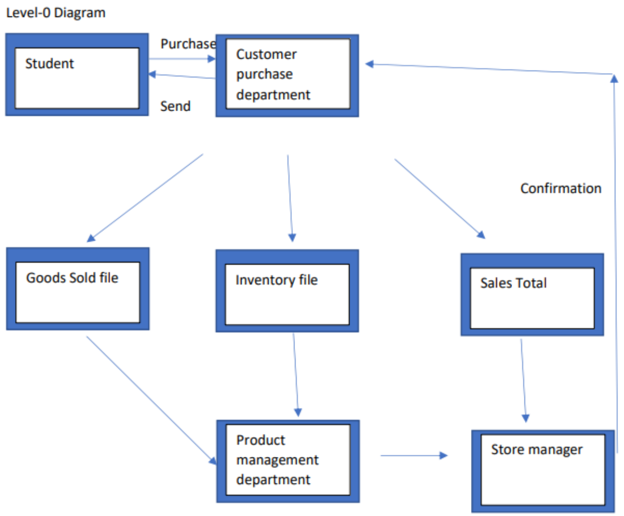
What could they target?

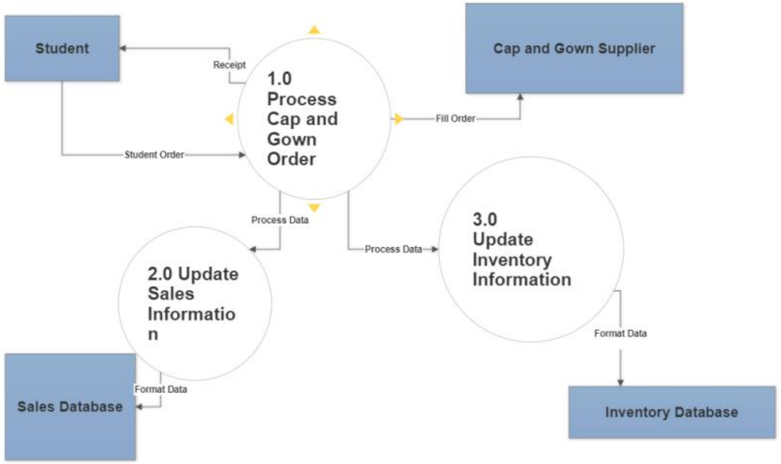
What kinds of impacts can they have?

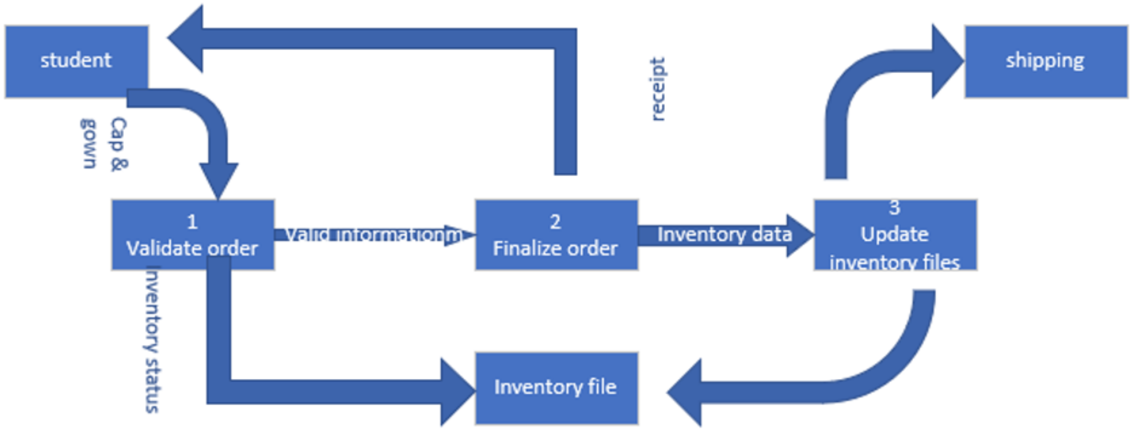


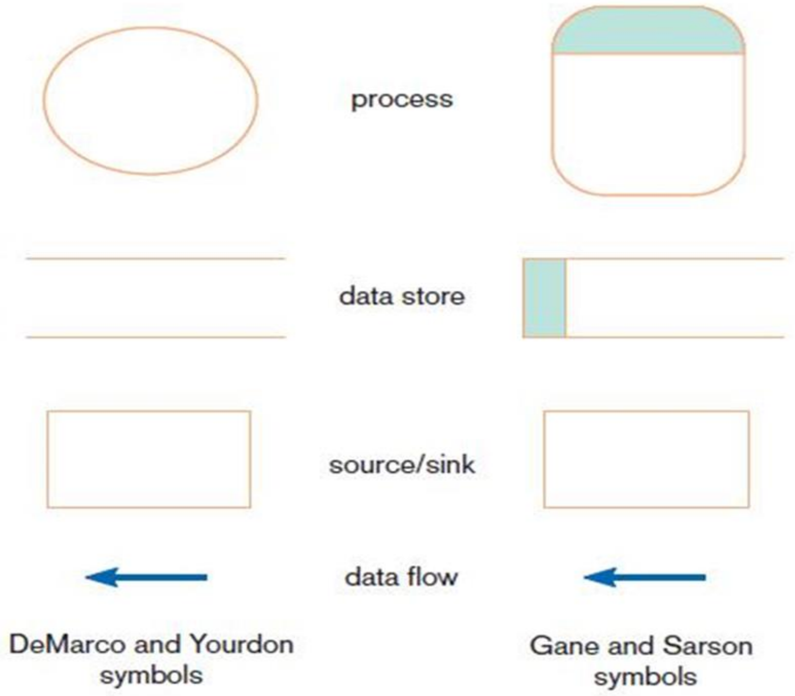
Why is it important to have valid functional requirements diagrams in the requirements specification of a system?

What is wrong with these Data Flow diagram requirements specifications?...









Assignment Problem 7.32

Identify and explain potential violations of rules and guidelines on these diagrams

(1) Different names and numbers are used for apparently the same data store on the two diagrams;

(2) In the level-0 diagram, the data store, Class Roster, does not have the data flow, Scheduled Classes, flowing into it, rather this data flow connects processes 2 and 3, thus these DFDs are not balanced

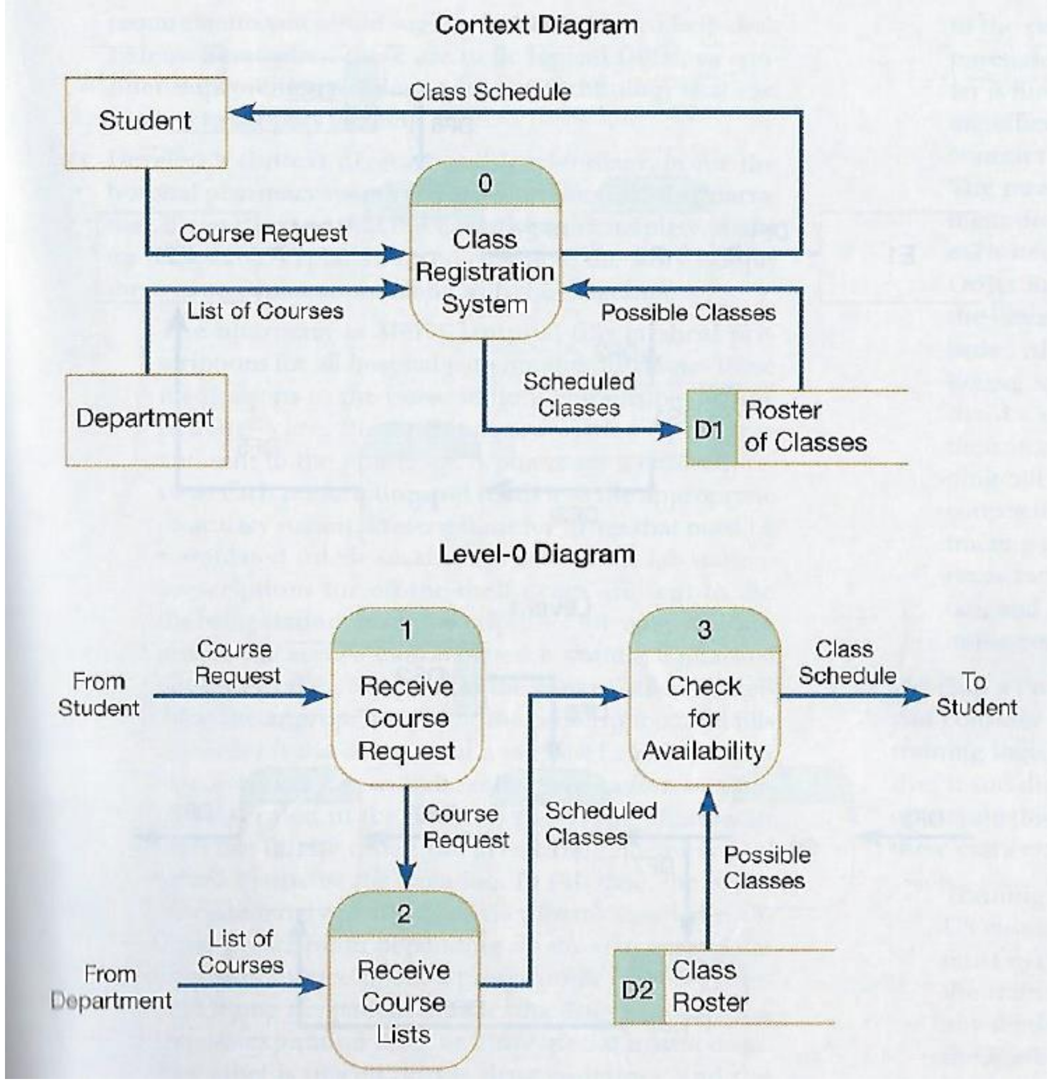
(3) Process 1 appears to accomplish nothing because its inflow and outflow are identical; such processes are uninteresting and probably unnecessary

  i. It is possible that this process will become interesting when it is decomposed, where validation and error handling processes might appear

(4) Process 2 does not appear to need Course Request as input in order to perform its function, as implied by its name

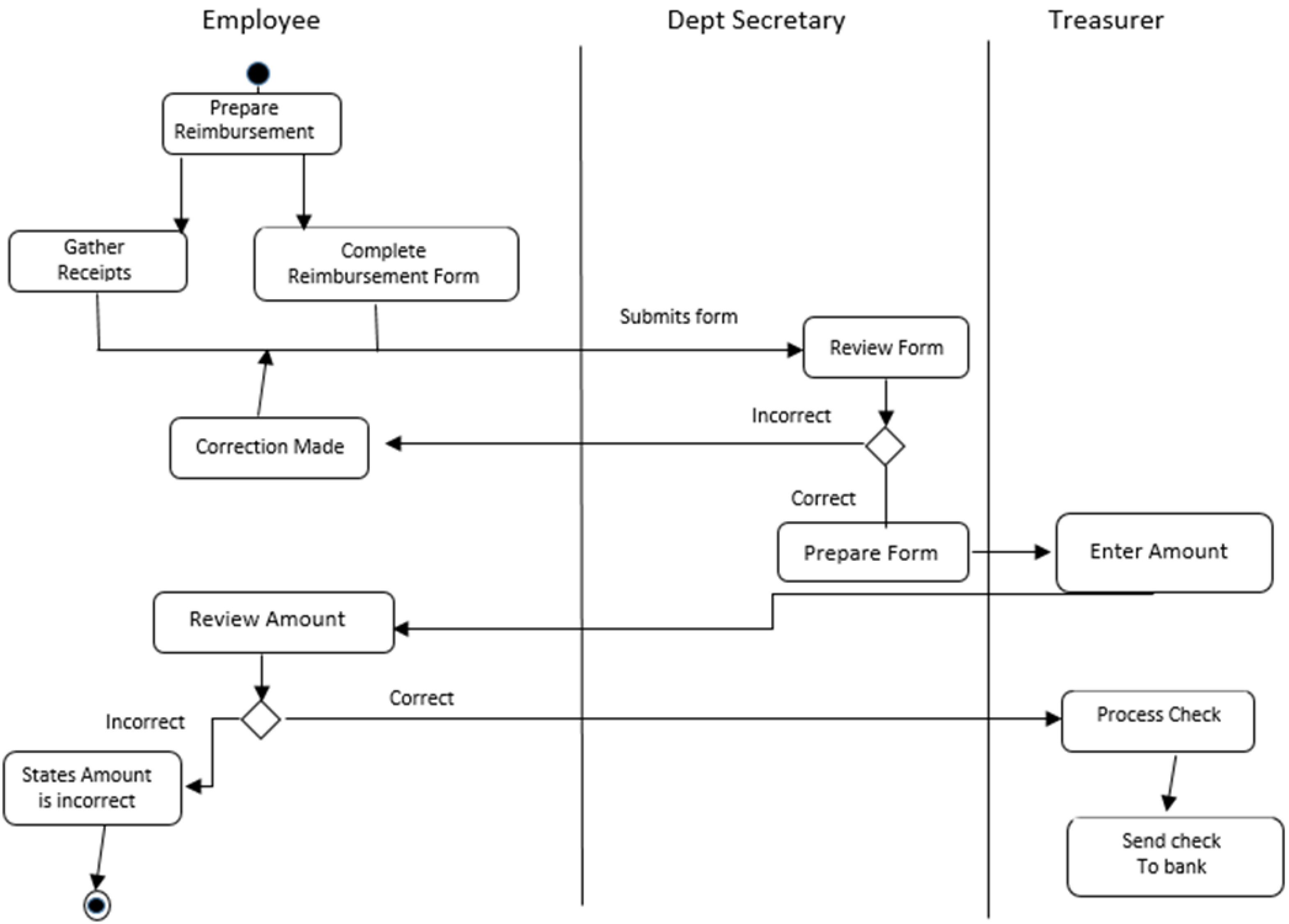
(5) Does Process 3 have sufficient input sufficient to produce its output

  i. For example, where are prior class registrations kept so that Process 3 can determine when a course is full?



Problem 7A.2

Activity diagram for Reimbursement process involving three swim lanes



Activity/Swim-Lane diagrams are useful for specifying functional requirements for workflow management systems

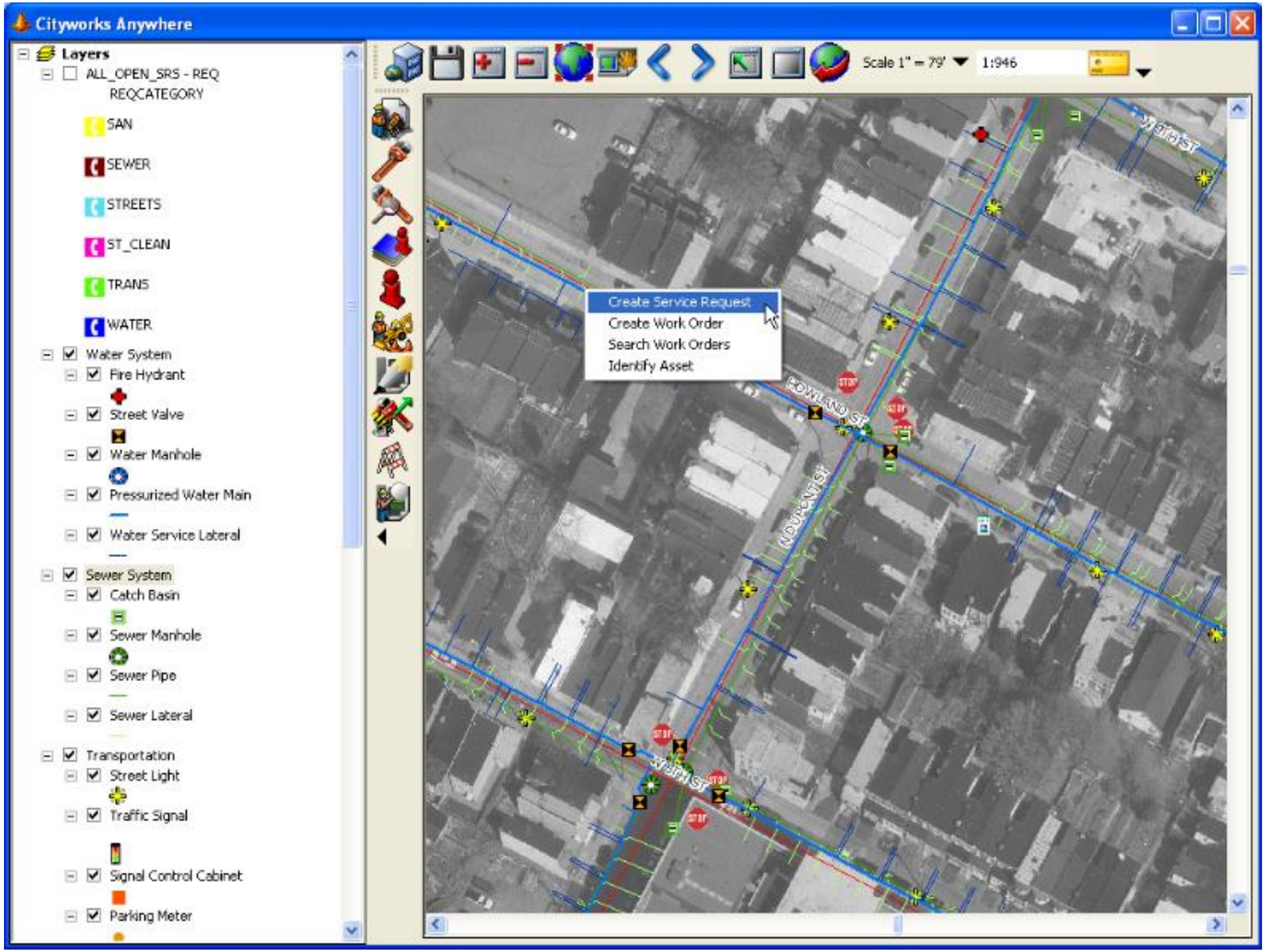
Example:

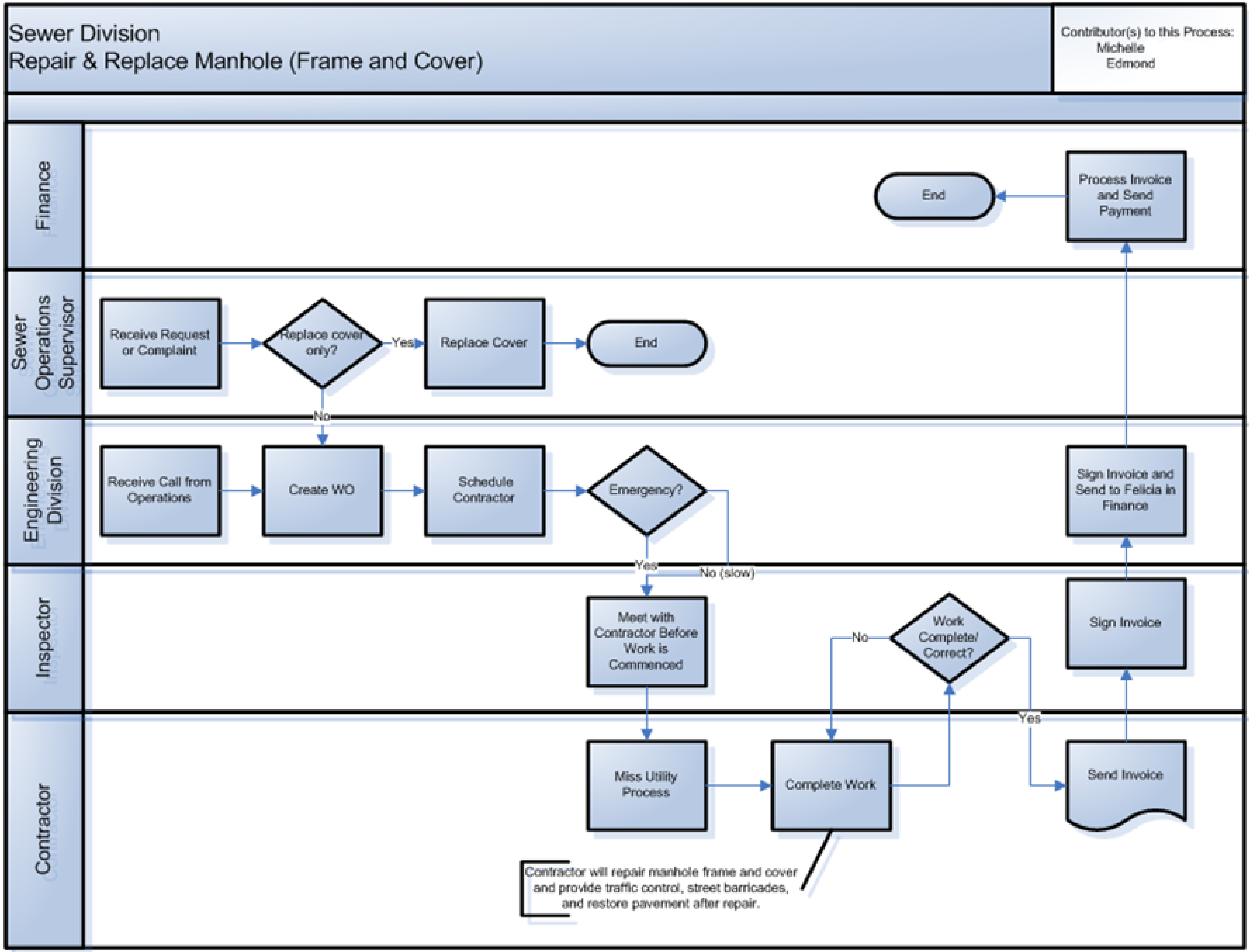
Functional requirements for a service request and utility maintenance management work order information system

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

Service Request / Work Order System

“Computerized Maintenance Management System (CMMS)”

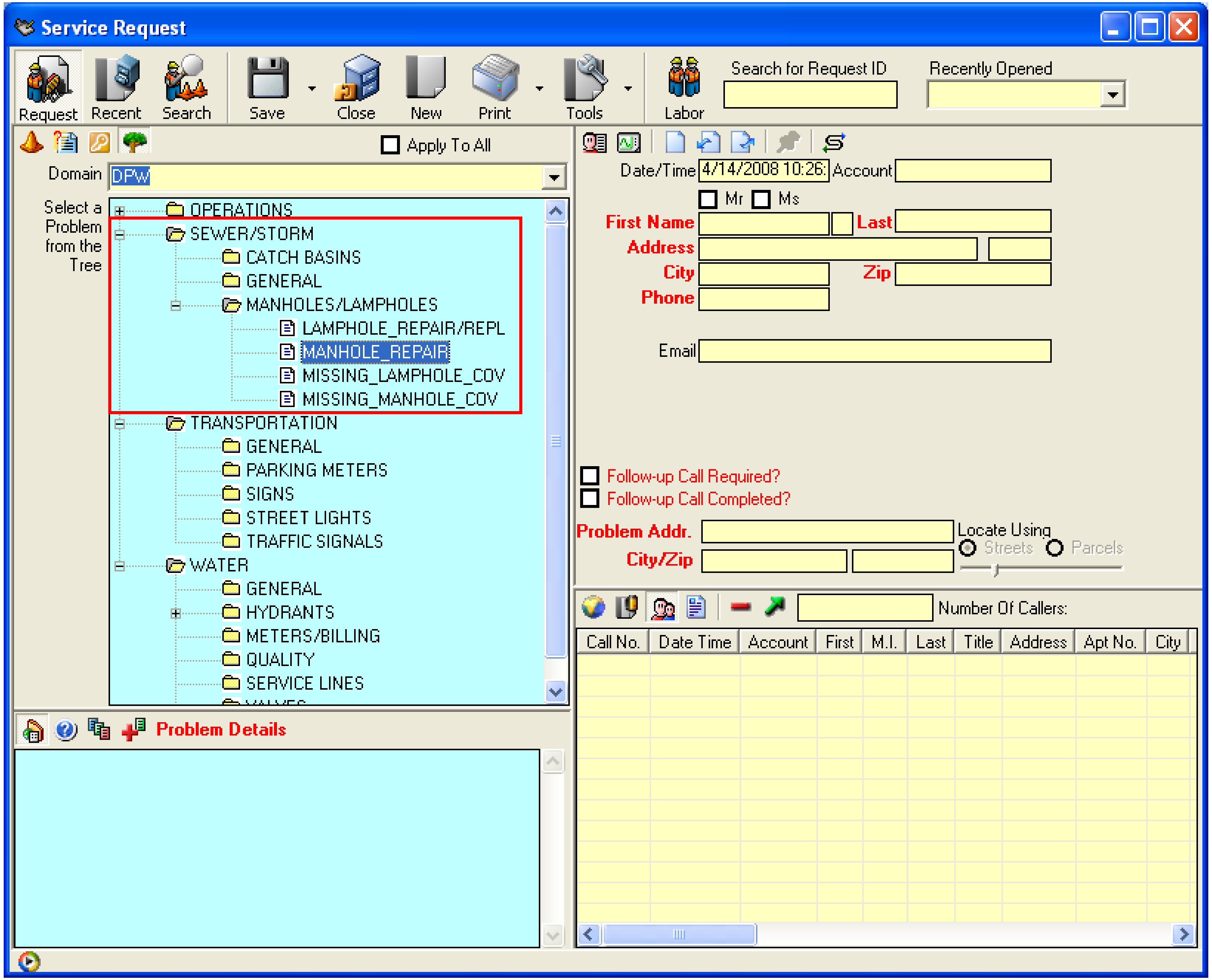




Sewer Division
Repair & Replace Manhole (Frame and Cover)

Contributor(s) to this Process:
Michelle
Edmond

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

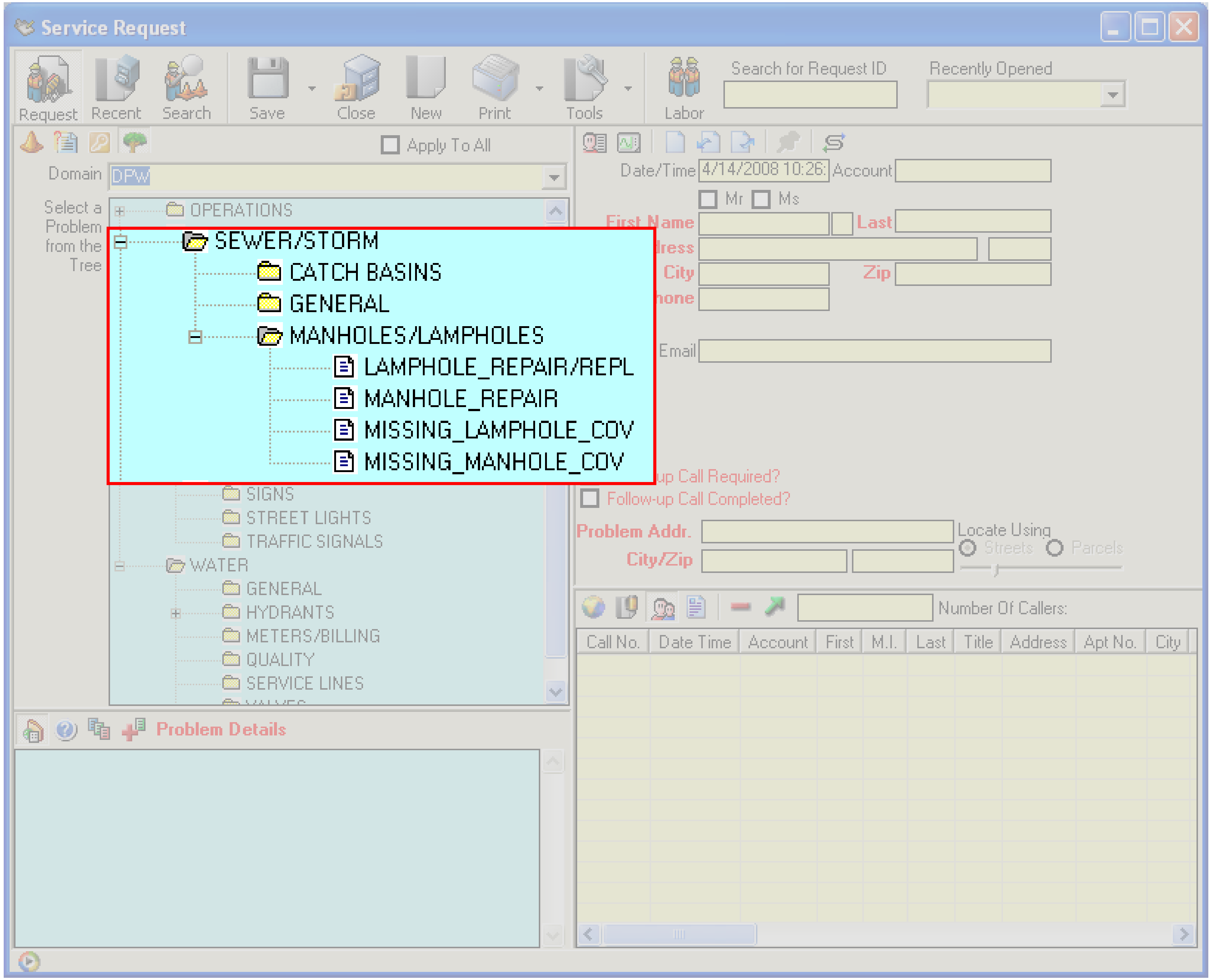


Domain: DPW

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

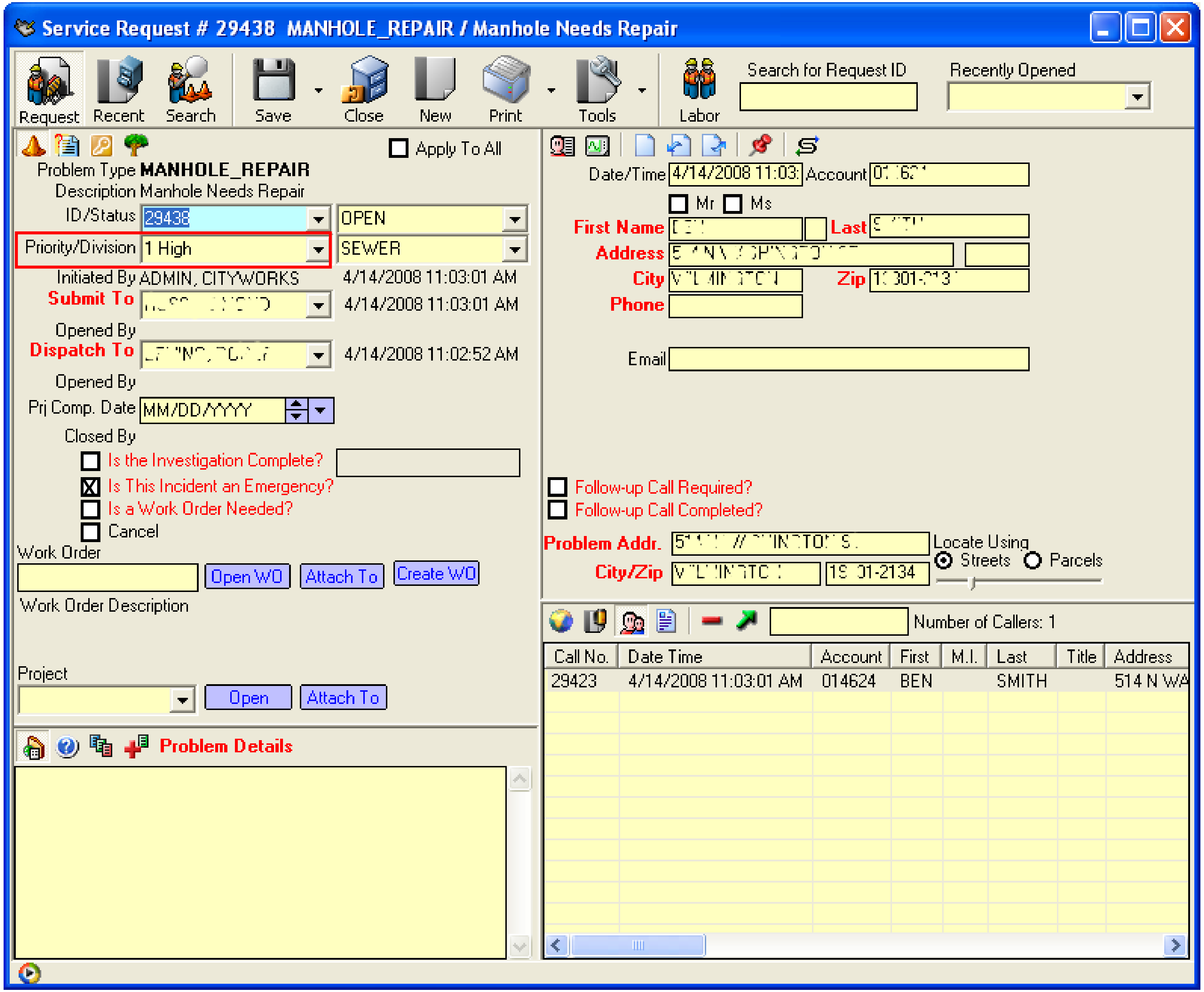
```
⊞ OPERATIONS
⊟ SEWER/STORM
    CATCH BASINS
    GENERAL
  ⊟ MANHOLES/LAMPHOLES
      LAMPHOLE_REPAIR/REPL
      MANHOLE_REPAIR
      MISSING_LAMPHOLE_COV
      MISSING_MANHOLE_COV
⊟ TRANSPORTATION
    GENERAL
    PARKING METERS
    SIGNS
    STREET LIGHTS
    TRAFFIC SIGNALS
⊟ WATER
    GENERAL
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

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



Domain: DPW

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



□ 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 [redacted] 4/14/2008 11:03:01 AM

Opened By

Dispatch To [redacted] 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

Problem Details

Date/Time 4/14/2008 11:03: Account [redacted]

□ Mr □ Ms

First Name [redacted] Last [redacted]

Address [redacted]

City [redacted] Zip [redacted]

Phone

Email

□ Follow-up Call Required?

□ Follow-up Call Completed?

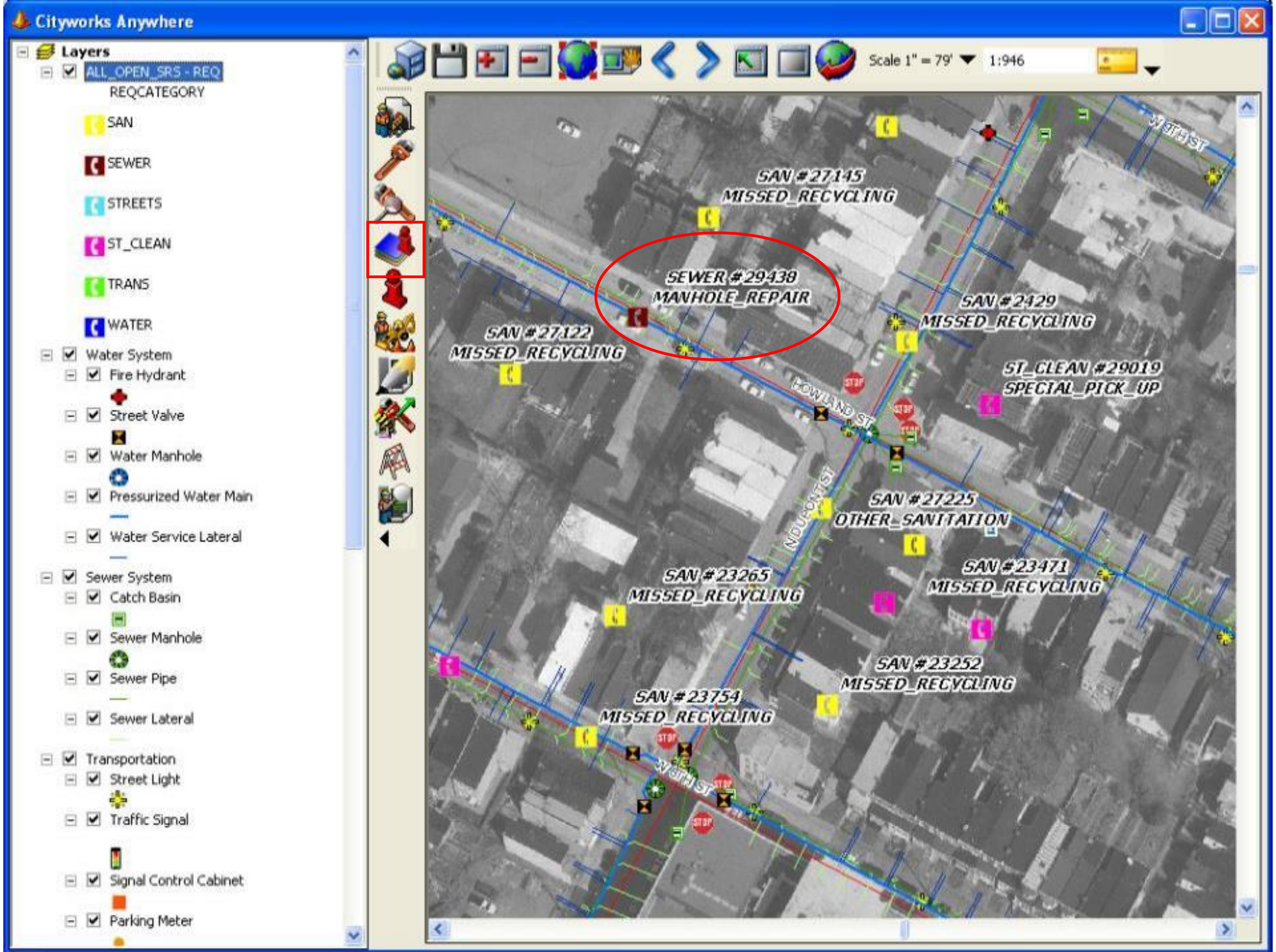
Problem Addr. [redacted]

City/Zip [redacted] [redacted]

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



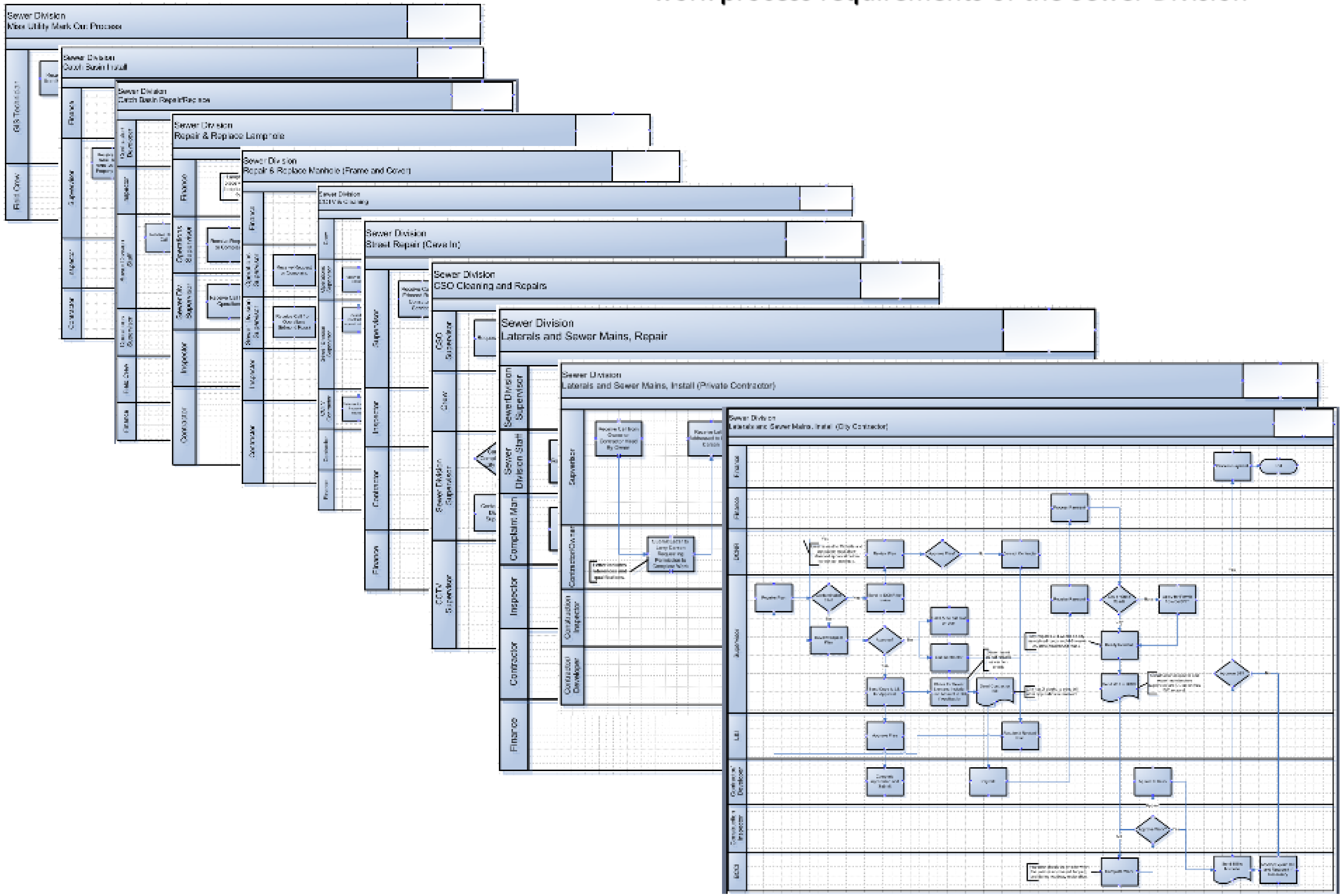
Cityworks Anywhere

Layers

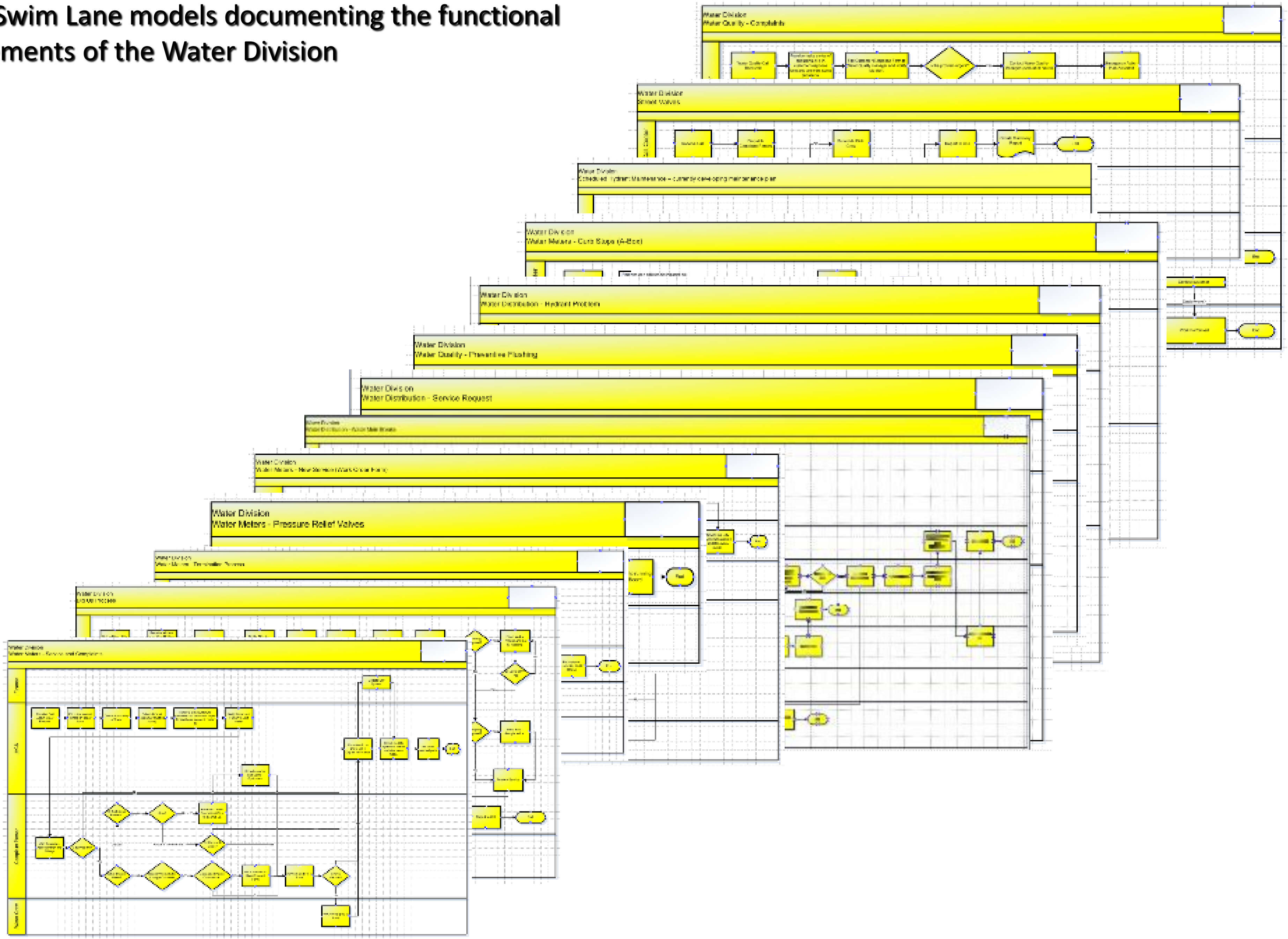
- ☑ ALL_OPEN_SRS - REQ
  - REQCATEGORY
  - SAN
  - SEWER
  - STREETS
  - ST_CLEAN
  - TRANS
  - WATER
- ☑ Water System
  - ☑ Fire Hydrant
  - ☑ Street Valve
  - ☑ Water Manhole
  - ☑ Pressurized Water Main
  - ☑ Water Service Lateral
- ☑ Sewer System
  - ☑ Catch Basin
  - ☑ Sewer Manhole
  - ☑ Sewer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

Scale 1" = 79'   1:946

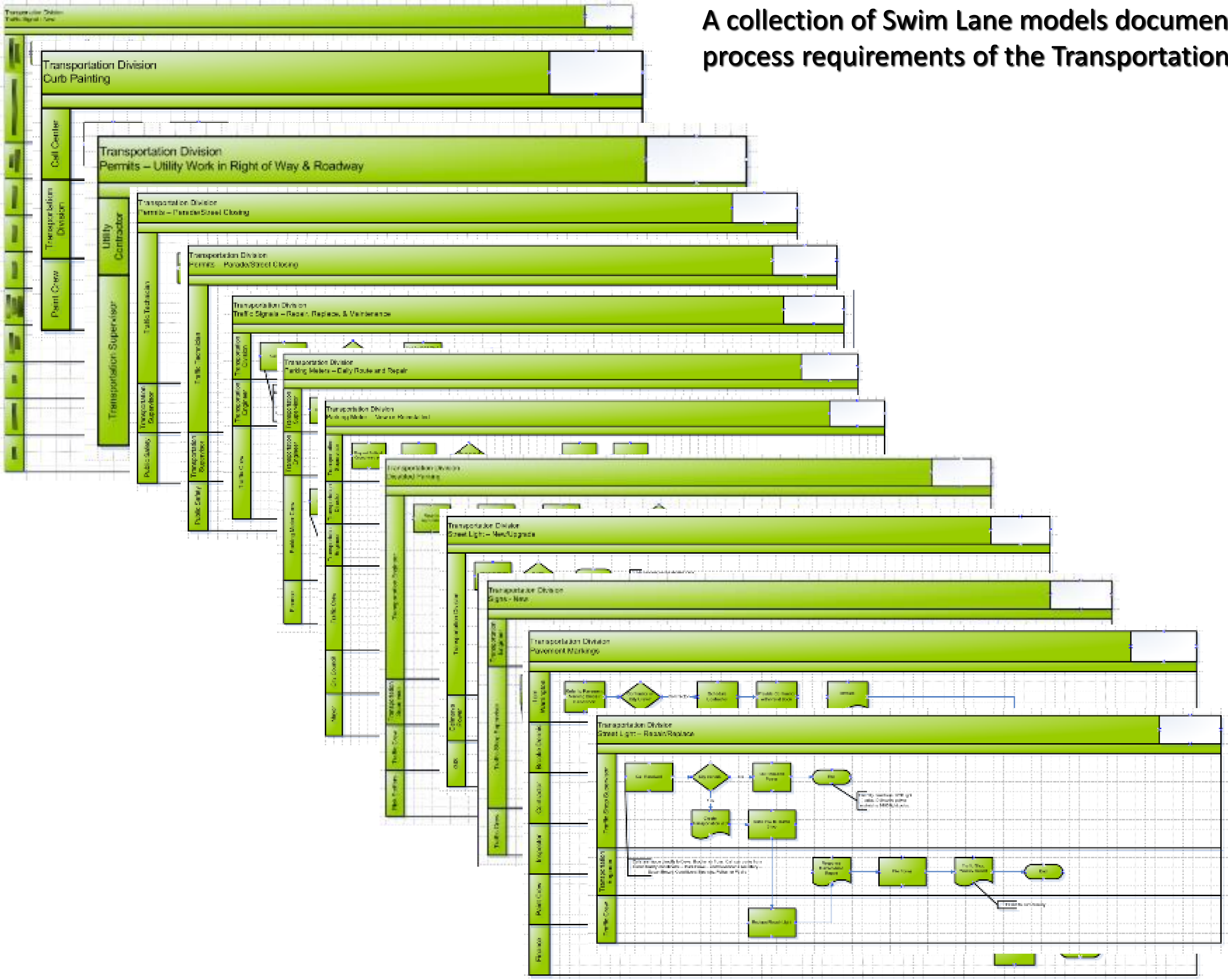
A collection of Swim Lane models documenting the functional work process requirements of the Sewer Division

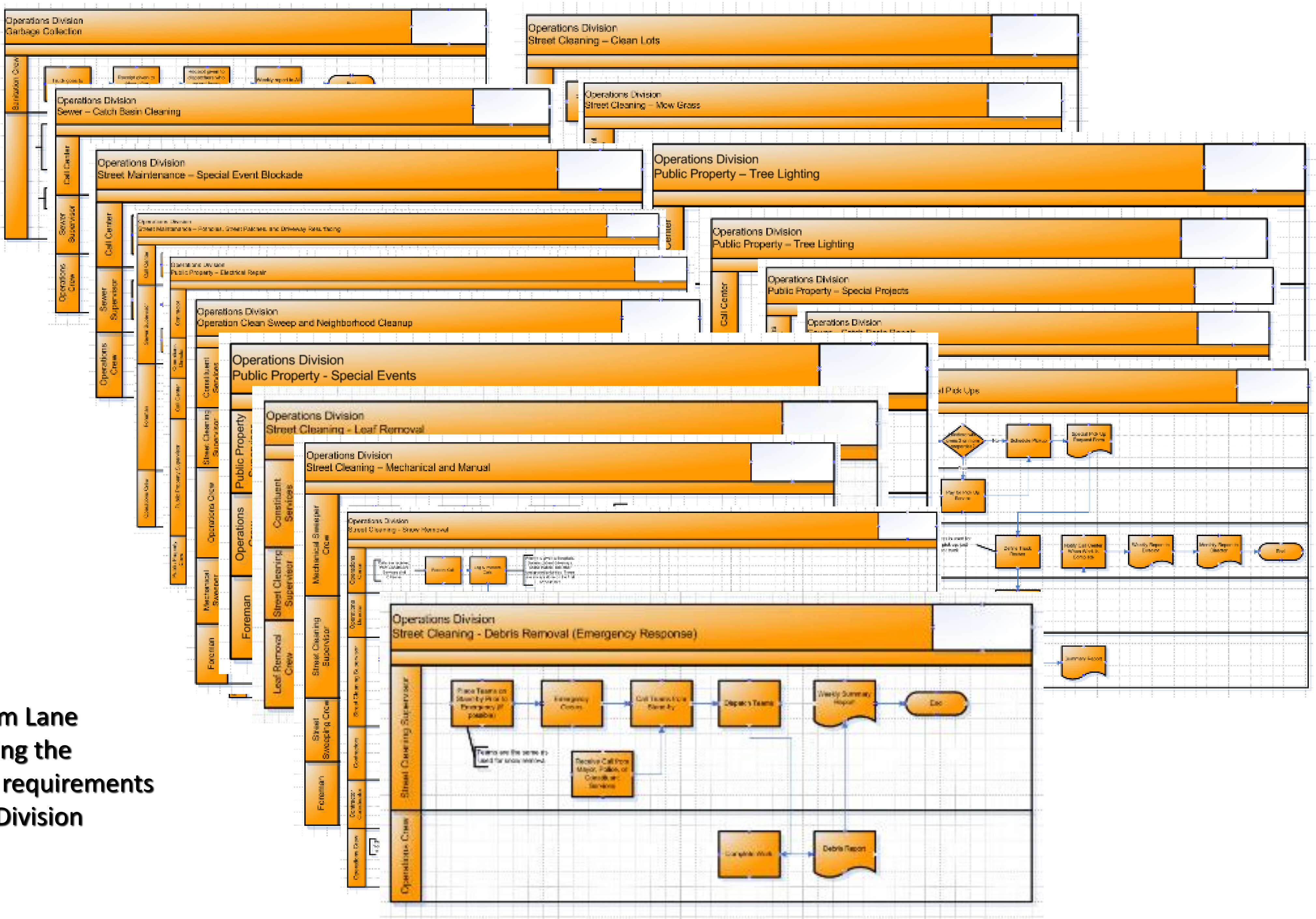


A collection of Swim Lane models documenting the functional process requirements of the Water Division


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 Problem
Water Division
Water Quality - Preventive Flushing
Water Division
Water Distribution - Service Request
Water Division
Water Distribution - Water Main Breaks
Water Division
Water Meters - New Service Work Order Form
Water Division
Water Meters - Pressure Relief Valves
Water Division
Water Meters - Termination Process
Water Division
Water Division
Water Meters - Service and Complaints
End

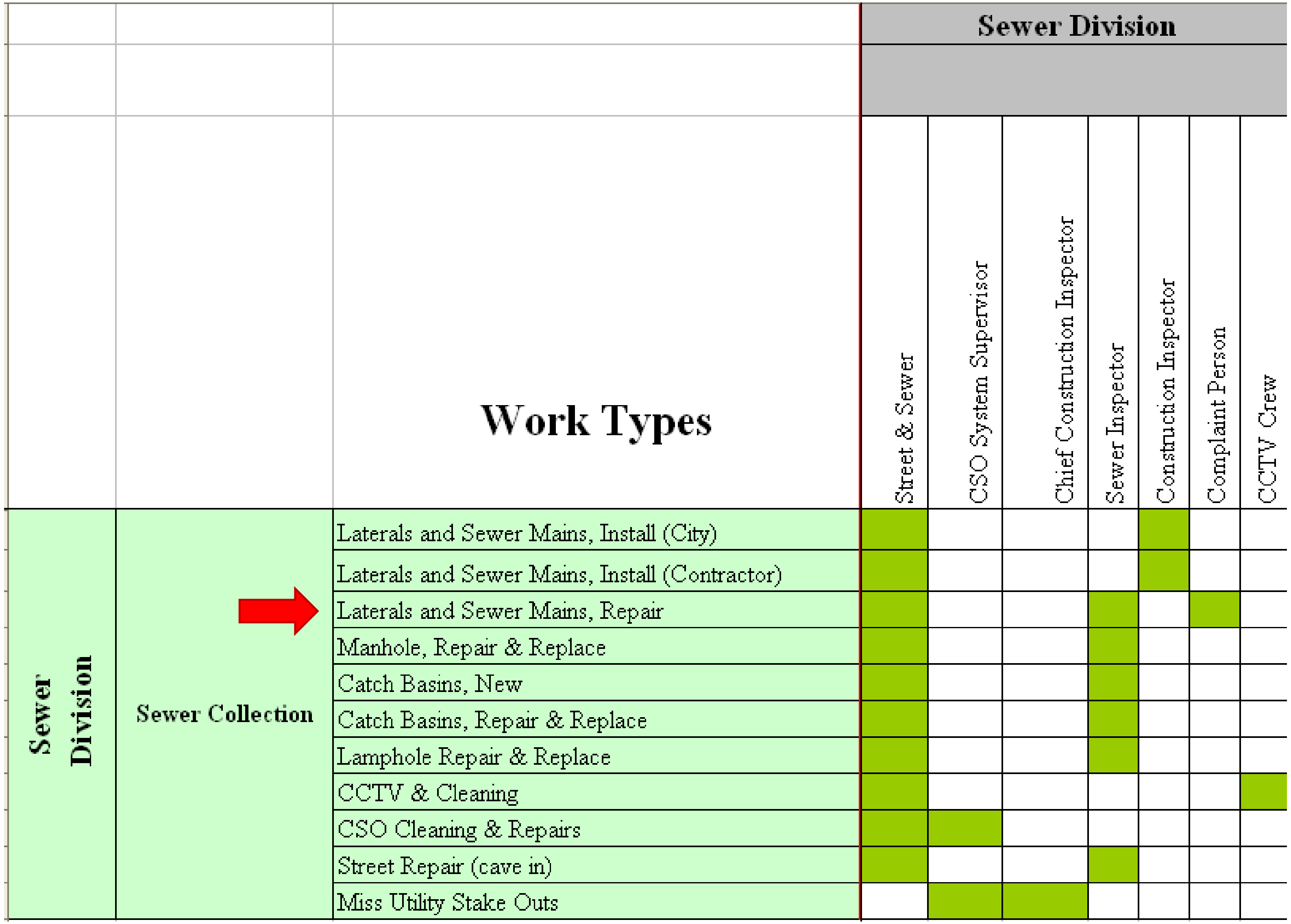
A collection of Swim Lane models documenting the functional process requirements of the Transportation Division




Operations Division
Garbage Collection
Operations Division
Street Cleaning – Clean Lots
Operations Division
Sewer – Catch Basin Cleaning
Operations Division
Street Cleaning – Mow Grass
Operations Division
Street Maintenance – Special Event Blockade
Operations Division
Public Property – Tree Lighting
Operations Division
Street Maintenance – Potholes, Street Patches, and Driveway Resurfacing
Operations Division
Public Property – Tree Lighting
Operations Division
Public Property – Electrical Repair
Operations Division
Public Property – Special Projects
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)
Sanitation Crew
Call Center
Sewer Supervisor
Operations Crew
Constituent Services
Street Cleaning Supervisor
Mechanical Sweeper
Foreman
Public Property Supervisor
Leaf Removal Crew
Mechanical Sweeper Crew
Street Sweeping Crew
Street Cleaning Supervisor
Operations Crew
Place Teams on Stand-by Prior to Emergency (if possible)
Emergency Occurs
Call Teams from Stand-by
Dispatch Teams
Weekly Summary Report
End
Teams are the same as used for snow removal
Receive Call from Mayor, Police, or Constituent Services
Complete Work
Debris Report
Schedule Pickup
Special Pick Up Request Form
Weekly Report to Director
Summary Report

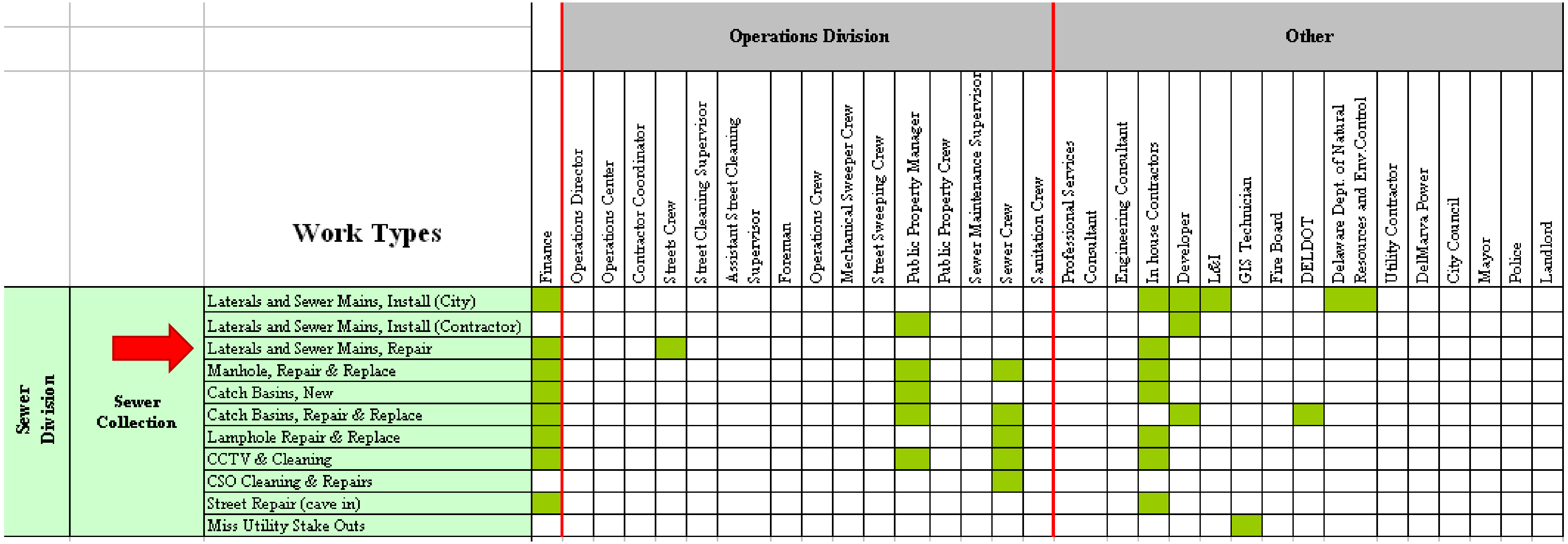
A collection of Swim Lane models documenting the functional process requirements of the Operations Division

Do the requirements identify the work process types and organizational dependencies on them?



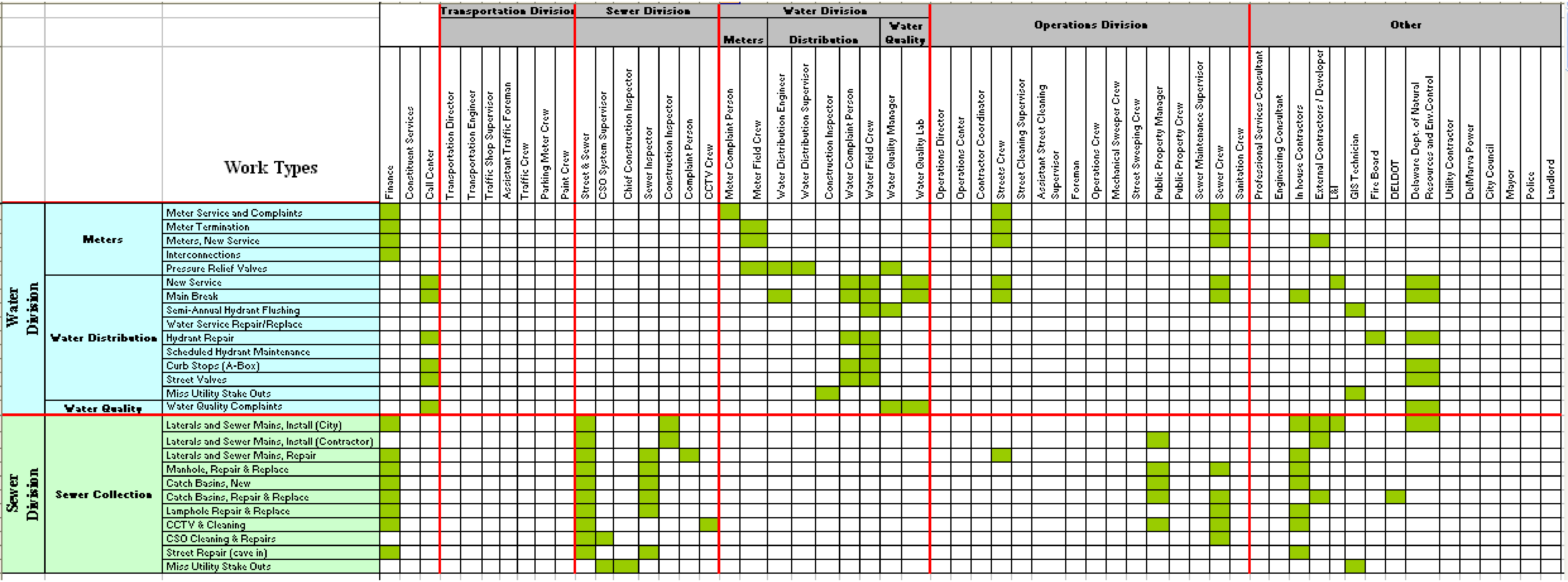
			Sewer Division						
		Work Types	Street & Sewer	CSO System Supervisor	Chief Construction Inspector	Sewer Inspector	Construction Inspector	Complaint Person	CCTV Crew
Sewer Division	Sewer Collection	Laterals and Sewer Mains, Install (City)	🟩				🟩		
		Laterals and Sewer Mains, Install (Contractor)	🟩				🟩		
		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		🟩	🟩				

Do the functional specification indicate the cross organizational workflows supported by each work process?



				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																						🟩									

Do the requirements identify the work process types and organizational dependencies on them?



						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			🟩																				🟩	🟩		🟩				🟩									🟩						🟩				🟩						
		Main Break			🟩																	🟩			🟩	🟩		🟩				🟩									🟩				🟩						🟩						
		Semi-Annual Hydrant Flushing																								🟩	🟩																							🟩									
		Water Service Repair/Replace																																																							
		Hydrant Repair			🟩																				🟩	🟩																									🟩		🟩						
		Scheduled Hydrant Maintenance																								🟩																															
		Curb Stops (A-Box)			🟩																				🟩	🟩																											🟩						
		Street Valves			🟩																				🟩	🟩																											🟩						
		Miss Utility Stake Outs																						🟩																										🟩									
	Water Quality	Water Quality Complaints			🟩																						🟩	🟩																									🟩						
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												🟩	🟩																																		🟩									

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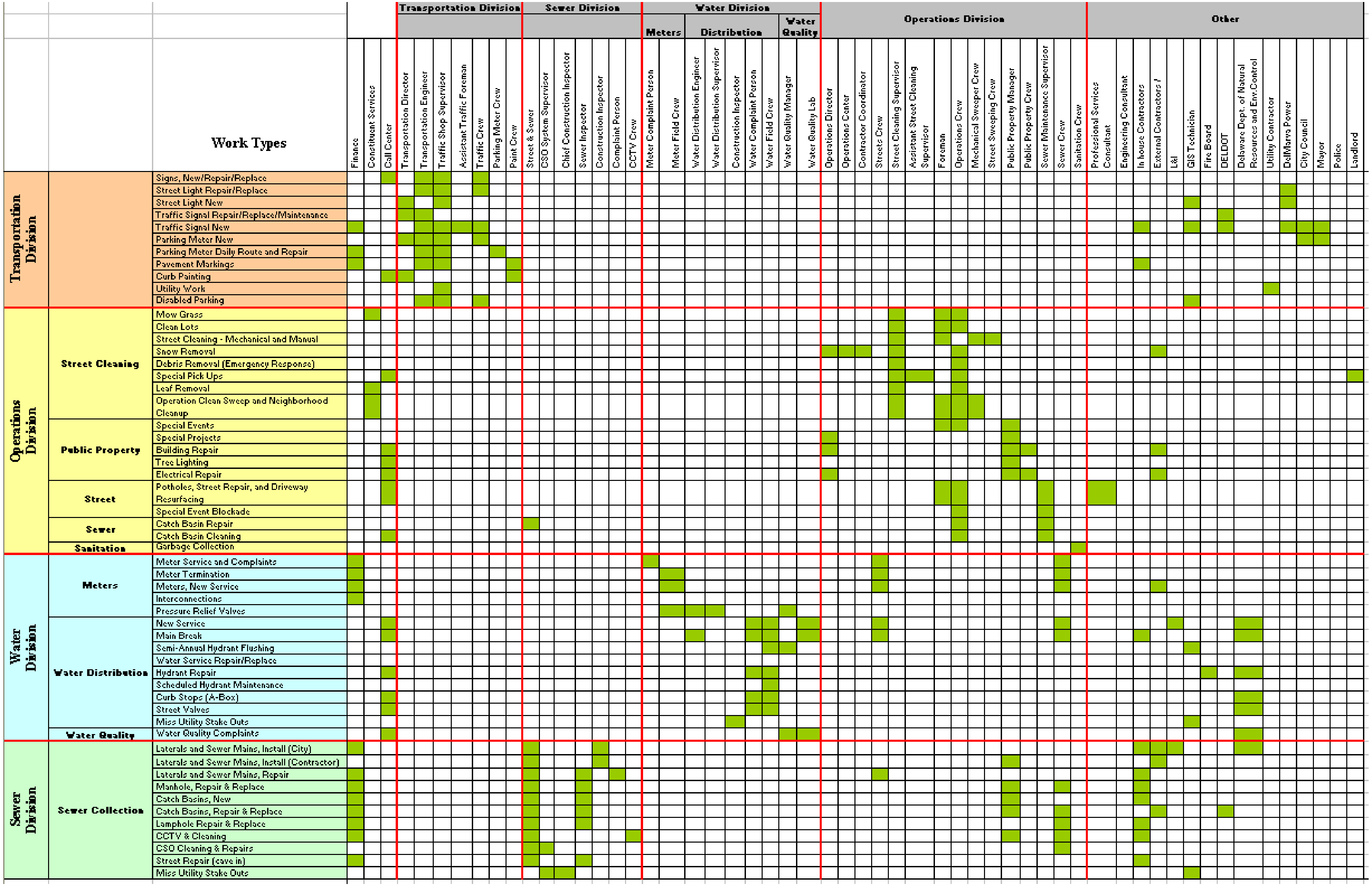

						Transportation Division							Sewer Division							Water Division									Operations Division															Other														
																				Meters		Distribution					Water Quality																															
		Work Types	Finance	Constituent Services	Call Center	Transportation Director	Transportation 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 /	L&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			🟩		🟩	🟩		🟩																																																
		Street Light Repair/Replace					🟩	🟩		🟩																																												🟩				
		Street Light New				🟩		🟩																																									🟩					🟩				
		Traffic Signal Repair/Replace/Maintenance				🟩	🟩																																													🟩							
		Traffic Signal New	🟩				🟩	🟩	🟩	🟩																																				🟩			🟩		🟩			🟩	🟩	🟩		
		Parking Meter New				🟩	🟩	🟩		🟩																																													🟩	🟩		
		Parking Meter Daily Route and Repair	🟩				🟩	🟩			🟩																																															
		Pavement Markings	🟩				🟩	🟩				🟩																																		🟩												
		Curb Painting			🟩	🟩						🟩																																														
		Utility Work						🟩																																												🟩					
		Disabled Parking					🟩	🟩		🟩																																							🟩									
Operations Division	Street Cleaning	Mow Grass		🟩																													🟩		🟩	🟩																							
		Clean Lots																															🟩		🟩	🟩																							
		Street Cleaning - Mechanical and Manual																															🟩		🟩		🟩	🟩																					
		Snow Removal																											🟩	🟩	🟩		🟩			🟩												🟩											
		Debris Removal (Emergency Response)																															🟩			🟩																							
		Special Pick Ups			🟩																												🟩	🟩		🟩																							🟩
		Leaf Removal		🟩																													🟩			🟩																							
		Operation Clean Sweep and Neighborhood Cleanup		🟩																													🟩		🟩	🟩	🟩																						
	Public Property	Special Events																																	🟩	🟩			🟩																				
		Special Projects																											🟩										🟩																				
		Building Repair			🟩																								🟩										🟩	🟩							🟩											
		Tree Lighting			🟩																																		🟩																				
		Electrical Repair			🟩																								🟩										🟩	🟩							🟩											
	Street	Potholes, Street Repair, and Driveway Resurfacing			🟩																														🟩	🟩					🟩			🟩														
		Special Event Blockade																																		🟩					🟩																	
	Sewer	Catch Basin Repair											🟩																							🟩					🟩																	
		Catch Basin Cleaning			🟩																															🟩					🟩																	
	Sanitation	Garbage Collection																																									🟩															
Water Division	Meters	Meter Service and Complaints	🟩																	🟩												🟩										🟩																
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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	🟩										🟩			🟩																							🟩							🟩												
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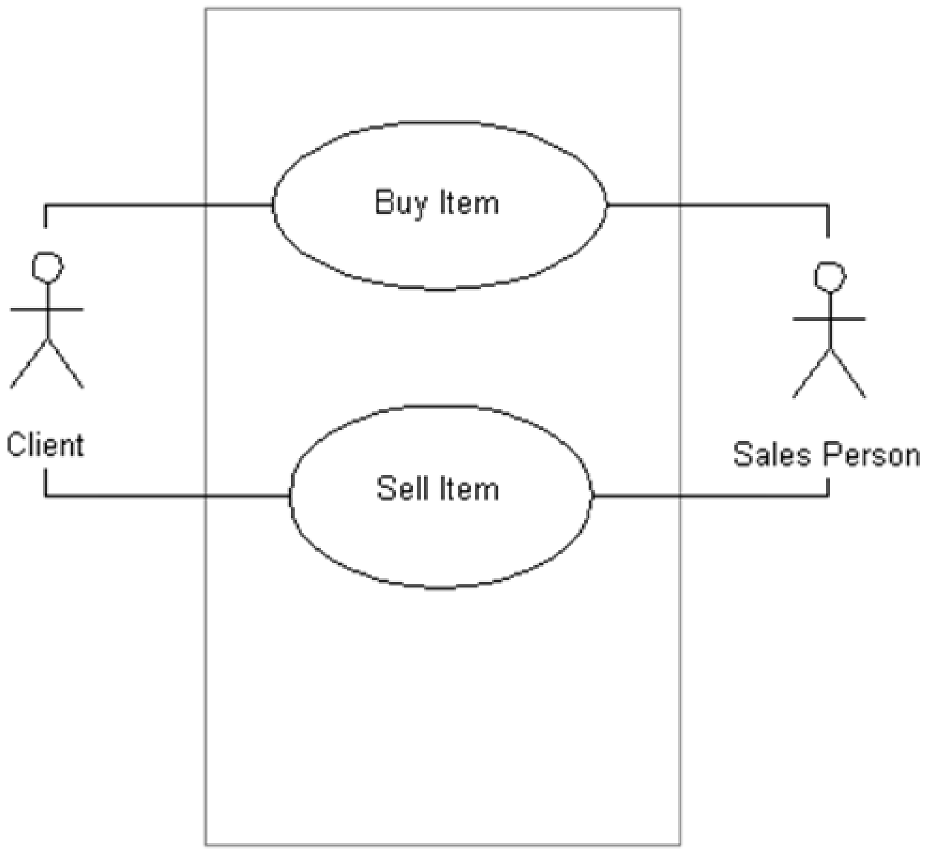
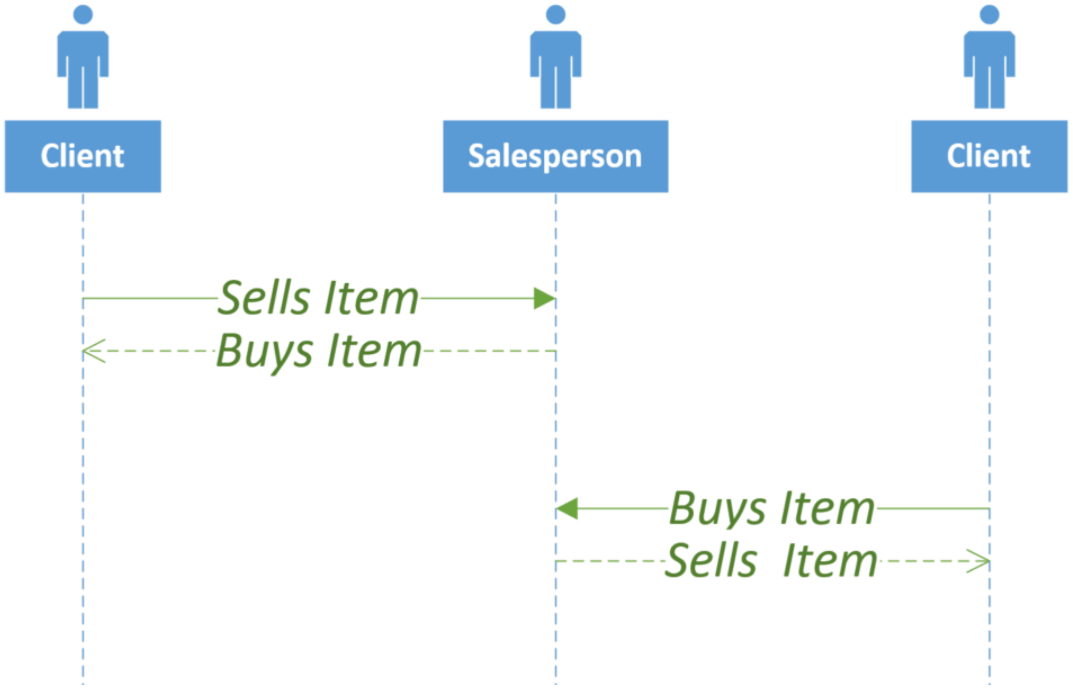
		CSO Cleaning & Repairs											🟩	🟩																												🟩																
		Street Repair (cave in)	🟩										🟩			🟩																														🟩												
		Miss Utility Stake Outs												🟩	🟩																																		🟩									

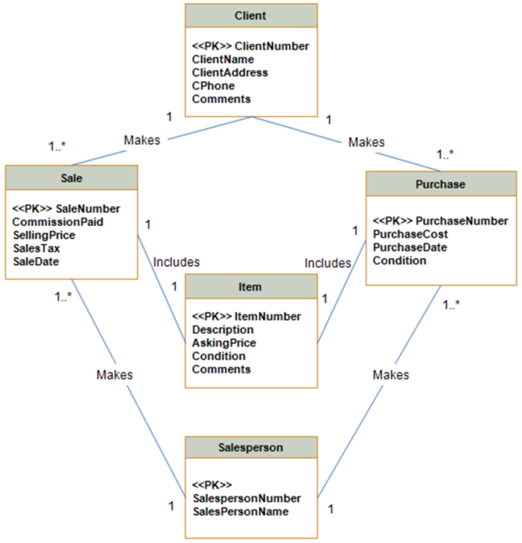
Problem 7C.9



Use Case Diagram

This is a Sequence Diagram

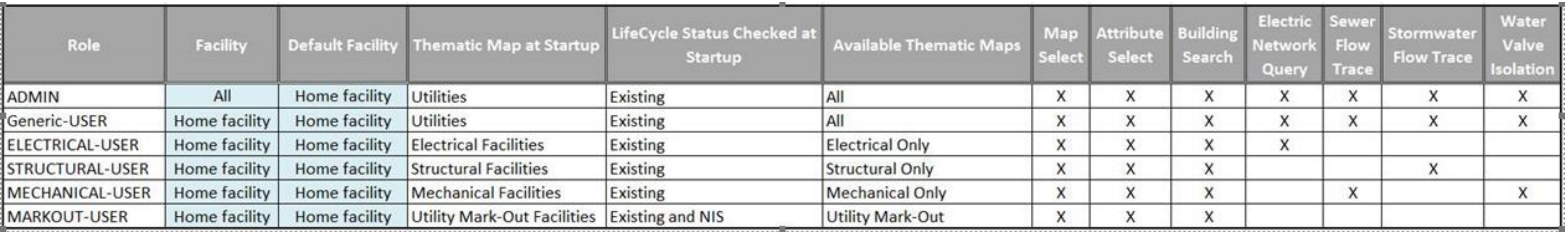




This is not a Sequence Diagram, …it is a UML object class diagram

Modeling Functional Logic with Decision Tables

Functional Requirements



Role	Facility	Default Facility	Thematic Map at Startup	LifeCycle Status Checked at Startup	Available Thematic Maps	Map Select	Attribute Select	Building Search	Electric Network Query	Sewer Flow Trace	Stormwater Flow Trace	Water Valve Isolation
ADMIN	All	Home facility	Utilities	Existing	All	X	X	X	X	X	X	X
Generic-USER	Home facility	Home facility	Utilities	Existing	All	X	X	X	X	X	X	X
ELECTRICAL-USER	Home facility	Home facility	Electrical Facilities	Existing	Electrical Only	X	X	X	X			
STRUCTURAL-USER	Home facility	Home facility	Structural Facilities	Existing	Structural Only	X	X	X			X	
MECHANICAL-USER	Home facility	Home facility	Mechanical Facilities	Existing	Mechanical Only	X	X	X		X		X
MARKOUT-USER	Home facility	Home facility	Utility Mark-Out Facilities	Existing and NIS	Utility Mark-Out	X	X	X				

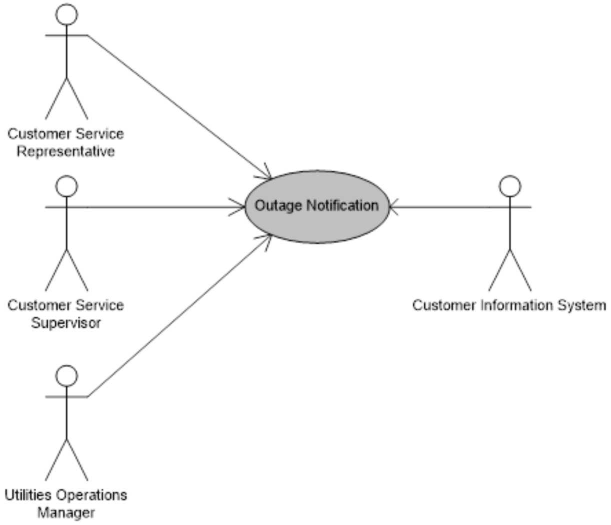
Example requirements specification for of role-based user access to system functionality

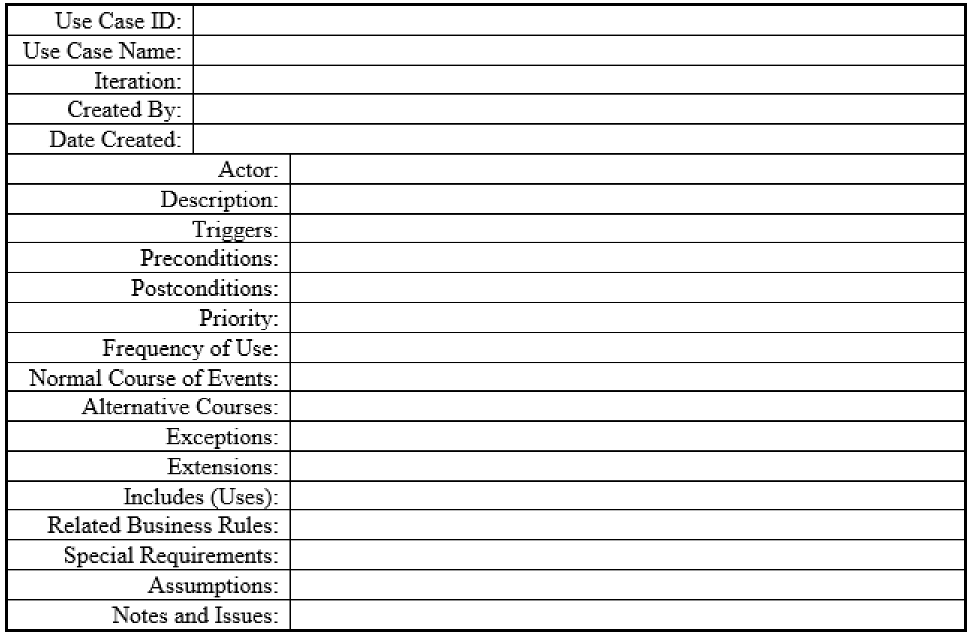
Agenda

- ✓IT Auditor's responsibility during SDLC – Requirements
- ✓Requirements and requirements analysis
- ✓Security requirements – brief introduction
- ✓Requirements process modeling
- Use case modeling with security
- Quiz

Use Case – Functional Requirements Modeling

- The first step in moving from a listing of system requirements to an actual deployed system
- Translates functional requirements into a visual map of activity
- Details the steps of arriving at a measurable system outcome


Customer Service Representative
Outage Notification
Customer Service Supervisor
Customer Information System
Utilities Operations Manager

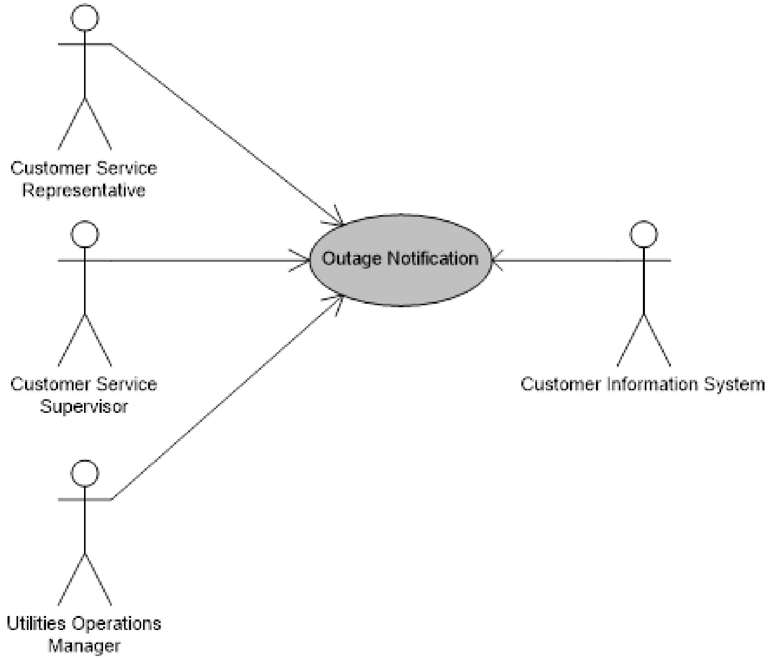


Use Case ID:	
Use Case Name:	
Iteration:	
Created By:	
Date Created:	
Actor:	
Description:	
Triggers:	
Preconditions:	
Postconditions:	
Priority:	
Frequency of Use:	
Normal Course of Events:	
Alternative Courses:	
Exceptions:	
Extensions:	
Includes (Uses):	
Related Business Rules:	
Special Requirements:	
Assumptions:	
Notes and Issues:	

Use Case – Functional Requirements Modeling

Involves 3 primary components:

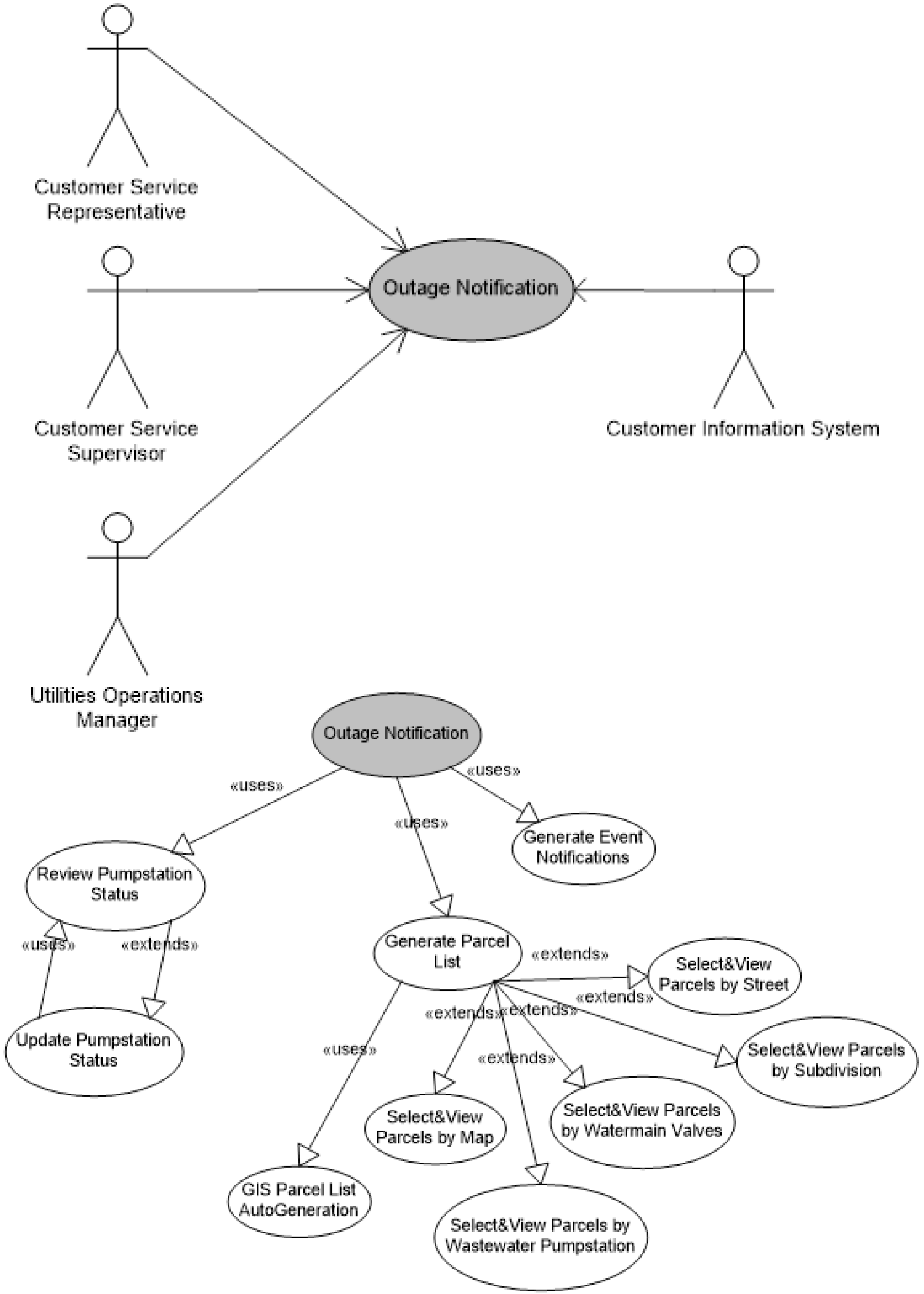
1. **Actor**(s) – a person, external system, or entity that plays a role in the performance of the functional task described in the use case – depicted with a stick figure
2. **Procedure**(s) – a single step performed to achieve the outcome of the system specified by the functional requirement – depicted with an oval
3. **Association**(s) – a relationship between an actor and a procedure – represented by a directional arrow specifying the next step in the process of a system (not directional communication)


Customer Service Representative
Outage Notification
Customer Service Supervisor
Customer Information System
Utilities Operations Manager

Use-Case Exercise

Review the Sewer Outage Management System's Functional Requirements Specification

1. How would you add security requirements to the functional requirements specification


Customer Service Representative
Outage Notification
Customer Service Supervisor
Customer Information System
Utilities Operations Manager
Outage Notification
«uses»
«uses»
«uses»
Generate Event Notifications
Review Pumpstation Status
«uses»
«extends»
Update Pumpstation Status
Generate Parcel List
«extends»
Select&View Parcels by Street
«extends»
«extends»
«extends»
Select&View Parcels by Subdivision
«uses»
«extends»
Select&View Parcels by Map
Select&View Parcels by Watermain Valves
GIS Parcel List AutoGeneration
Select&View Parcels by Wastewater Pumpstation

Use Case Extension for modeling functional security requirements

Additional notation for adding communication into and out of the system as part of the use case diagram to specify that information is passing across the association lines:

[E]

placed on any association between actor and procedure or procedure and procedure that crosses over the external boundary of the system

[I]

placed on any association between actor and procedure or procedure and procedure that indicates communication is internal to the system boundary but does communicate externally beyond a single host machine

[C]

placed on any association to indicate the transmission of sensitive data such as a password or mission critical data

[A]

location of a potential attack

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Can you order the following by priority for protection?

I

C

E

I/C

E/C

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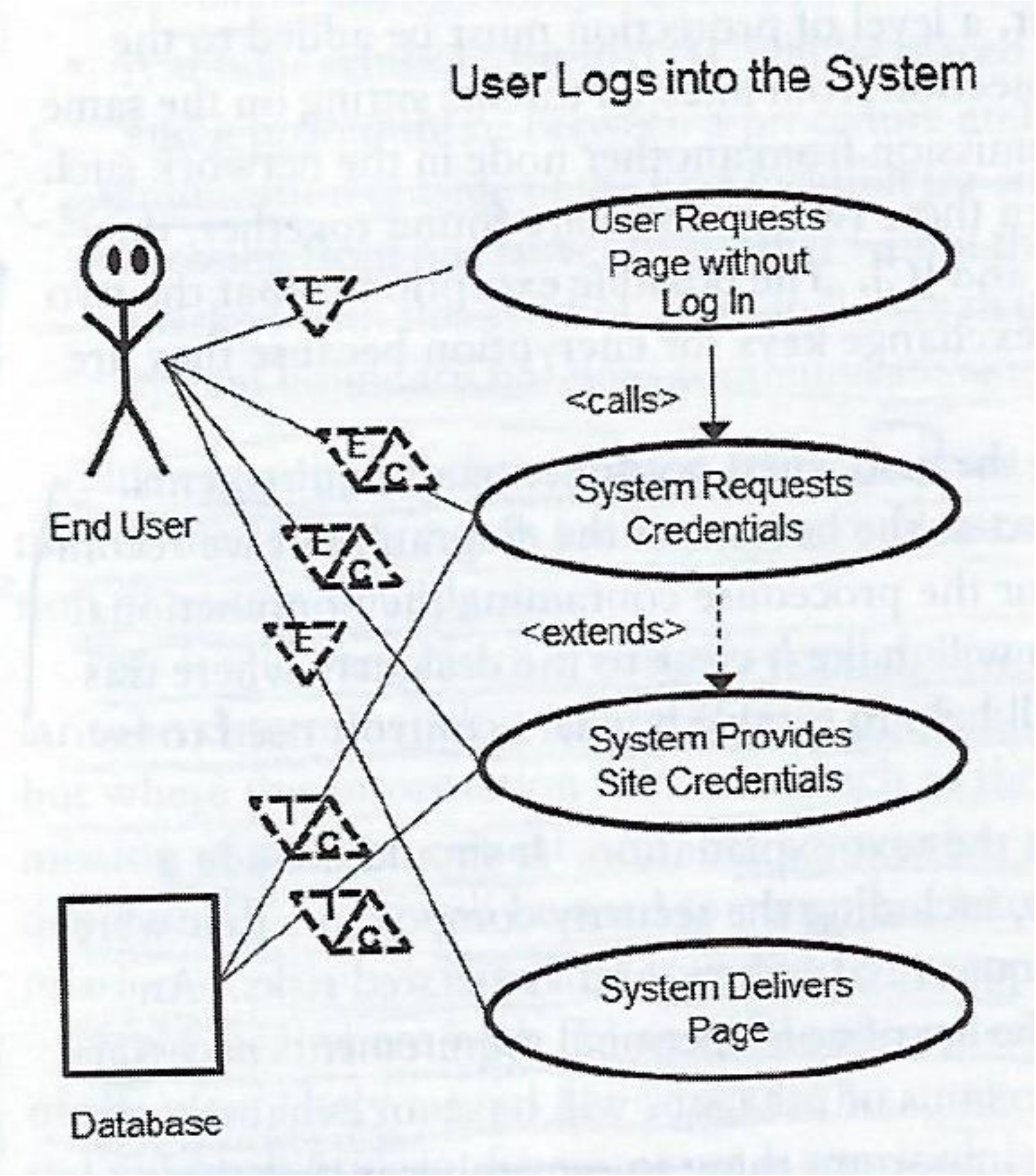
Can you describe what is going here?

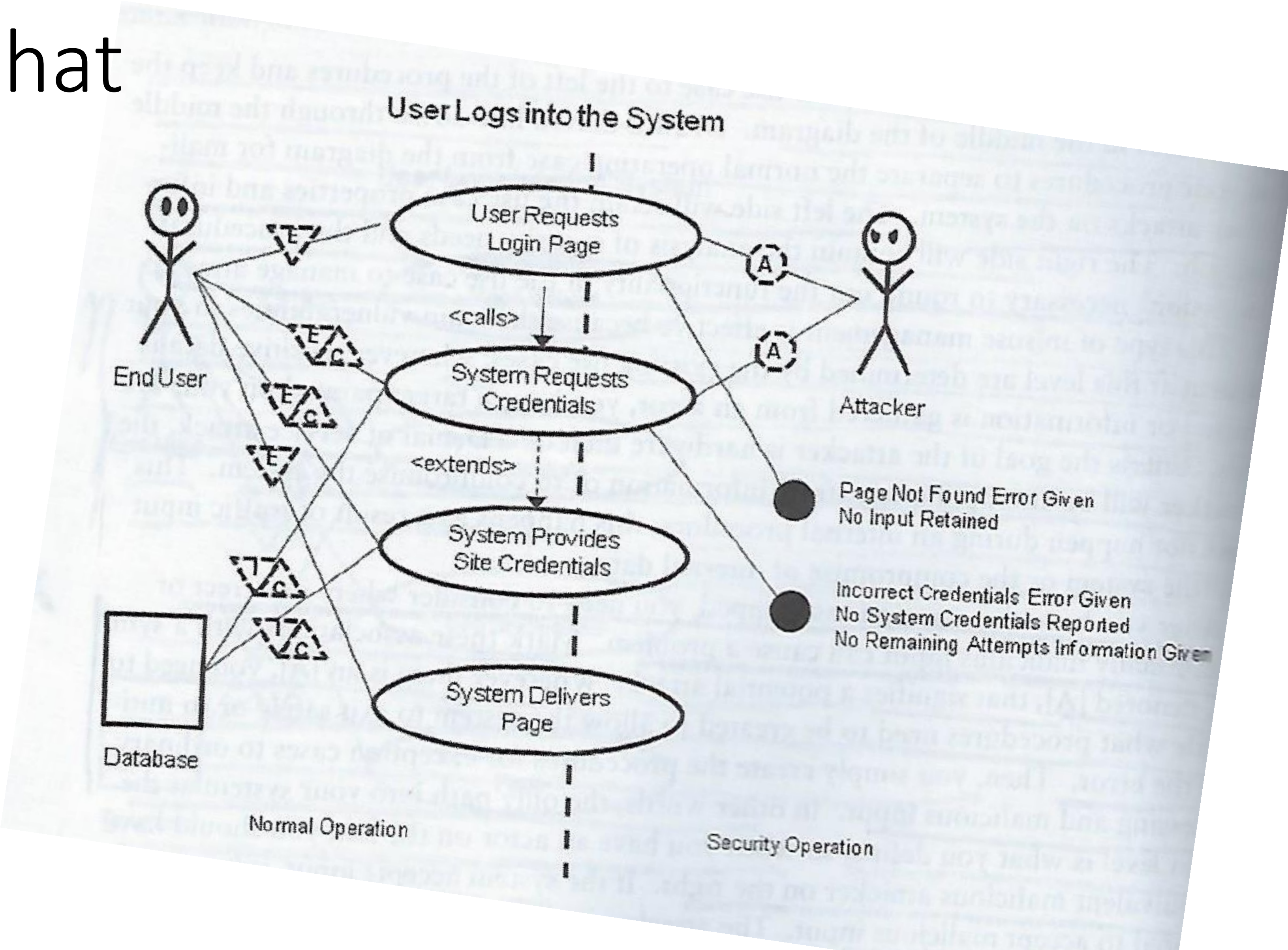
An example use case with notations for communication and transfer of sensitive information across system boundaries


User Logs into the System
End User
Database
User Requests Page without Log In
<calls>
System Requests Credentials
<extends>
System Provides Site Credentials
System Delivers Page
E
E C
E C
E
I C
I C

Richardson, T. and Thies, C. (2013) Secure Software Design

Can you describe what is going here?

An example of the Misuse Management Method identifying possible attack points for each activity, and the fail case exist state for each


User Logs into the System
End User
User Requests Login Page
<calls>
System Requests Credentials
<extends>
System Provides Site Credentials
System Delivers Page
Database
Attacker
E
C
A
Page Not Found Error Given
No Input Retained
Incorrect Credentials Error Given
No System Credentials Reported
No Remaining Attempts Information Given
Normal Operation
Security Operation

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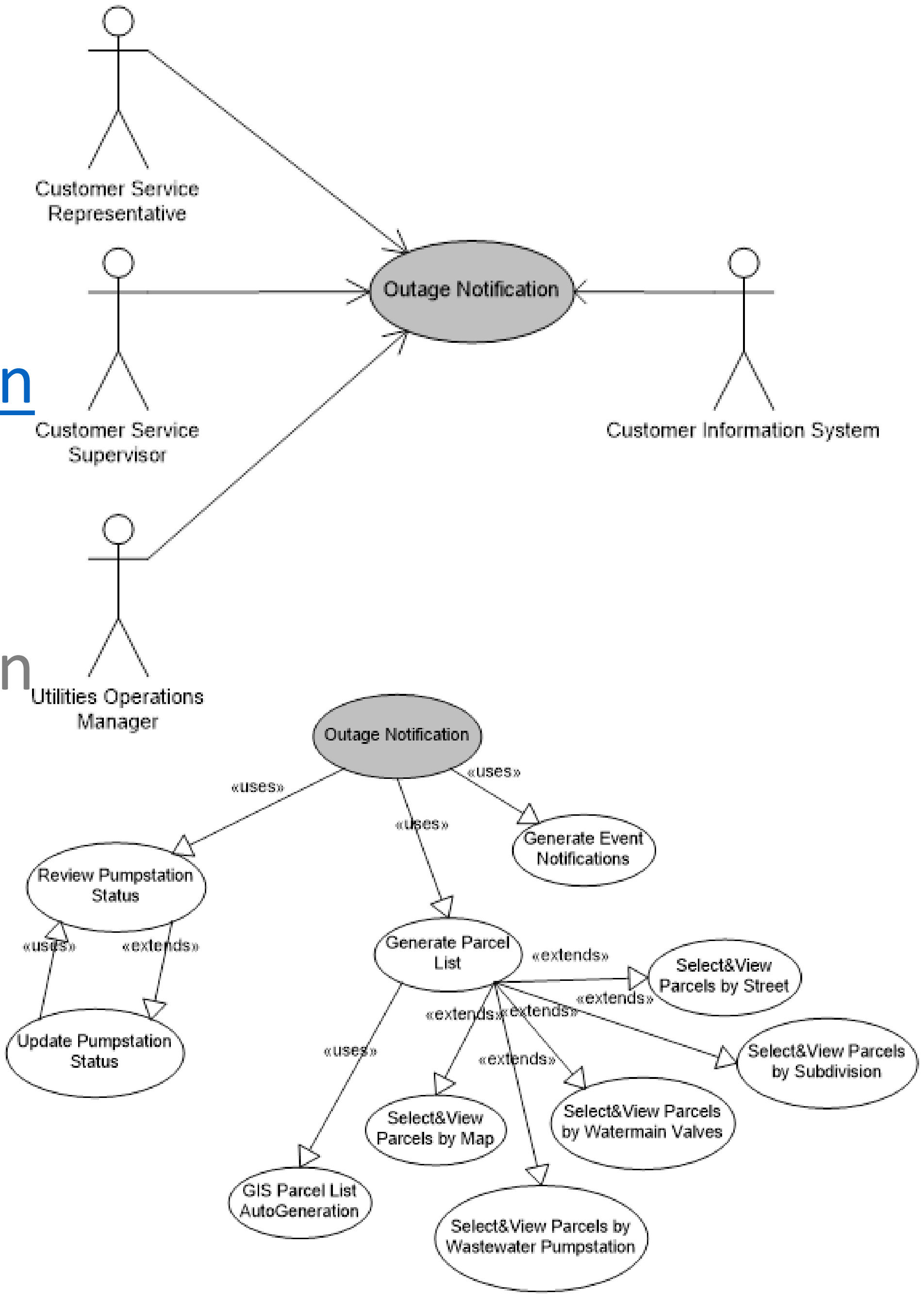
Use-Case Exercise

Review the Sewer Outage Management System's Functional Requirements Specification

1. How would you add security requirements to the functional requirements specification
2. Add security requirements to 1 use case



Customer Service Representative
Customer Service Supervisor
Utilities Operations Manager
Outage Notification
Customer Information System
Outage Notification
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«uses»
«uses»
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Review Pumpstation Status
«uses»
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Update Pumpstation Status
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Select&View Parcels by Street
«extends»
«extends»
«extends»
Select&View Parcels by Subdivision
«uses»
«extends»
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Select&View Parcels by Watermain Valves
GIS Parcel List AutoGeneration
Select&View Parcels by Wastewater Pumpstation

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- Quiz

Quiz

Requirements can be gathered by all except the following

a) Developing a mock system or prototype

b) Interviewing users, business, and IT teams

c) Speaking to vendors to understand which software is selling well in last two years

d) Getting an understanding on what other companies did in a similar situation

Every implementation of the System Development Life Cycle (SDLC) is the same

a) True

b) False

Quiz

Which of the following options best describes scope creep?

a) It is the process by which requirements are gathered directly from stakeholders

b) It is the case in which stakeholders are interviewed a second time to verify and validate the system that is being developed

c) It is the case where requirements are added after the system has a complete project specification

d) It is the process by which the system evolves into a developed state

Quiz

Which of the following options is NOT a security consideration for requirements?

a) Consequence of failure
b) Associated risks
c) Known vulnerabilities
d) Fail case

Quiz

A trust boundary should be placed between the system and any input that comes from outside the internal network.

a) True

b) False

Information leakage within a system represents a threat because it allows an attacker to gain knowledge of the internal workings of the system.

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Agenda

- ✓IT Auditor’s responsibility during SDLC – Requirements
- ✓Requirements and requirements analysis
- ✓Security requirements – brief introduction
- ✓Requirements process modeling
- ✓Use case modeling with security
- ✓Quiz