The Poseidon Adventure:
Custom Meter Set Workflow with Lucity Water

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lucity Regional User Group Meeting

Introductions

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Dublin San Ramon Services District

Who we are:

- Potable water for 62,000 people
- Recycled water for 250 sites
- Wastewater collection and treatment for 141,000 people
- Edge of suburbia – growing rapidly

Who am I?

+ Database administrator for 30+ applications
+ Web developer / Technical Writer
+ Systems analyst / Project Manager
+ Graduate school adjunct faculty (Info Sys)
+ Programming since the days of IBM minicomputers running RPGII
+ SME: financials, sales & marketing, transportation, manufacturing, telecommunications, analytics, utilities

Who are you?

+ Please provide job role so I can tune the presentation details

+ Tell us how your organization currently handles setting new meters…Paper? Lucity? Other?

Meter set process overview

+ Developer installs meter box
+ Developer contacts agency to set meter
+ Construction inspector begins set meter
+ Engineer checks development fees paid
+ Field operations team sets meter
+ Customer service team initiates billing

Starting point

Initial focus on commercial and irrigation meters

Revenue flow

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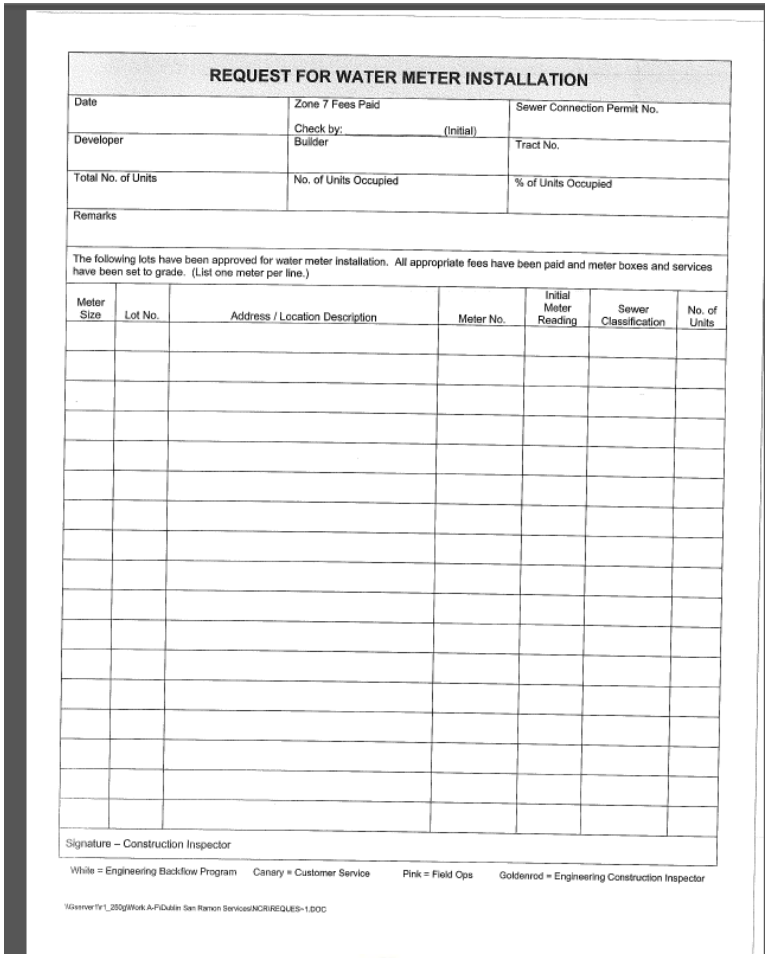
The problem

The problem - parameters

+ Performance
+ Information
+ Economy
+ Control
+ Efficiency
+ Security

How we used to set meters – paper based



REQUEST FOR WATER METER INSTALLATION

Date	Zone 7 Fees Paid Check by: (Initial)	Sewer Connection Permit No.
Developer	Builder	Tract No.
Total No. of Units	No. of Units Occupied	% of Units Occupied
Remarks		

The following lots have been approved for water meter installation. All appropriate fees have been paid and meter boxes and services have been set to grade. (List one meter per line.)

Meter Size	Lot No.	Address / Location Description	Meter No.	Initial Meter Reading	Sewer Classification	No. of Units

Signature – Construction Inspector

White = Engineering Backflow Program Canary = Customer Service Pink = Field Ops Goldenrod = Engineering Construction Inspector

\\Gserver1\r1_280g\Work A-F\Dublin San Ramon Services\NCR\REQUES~1.DOC

Starting point

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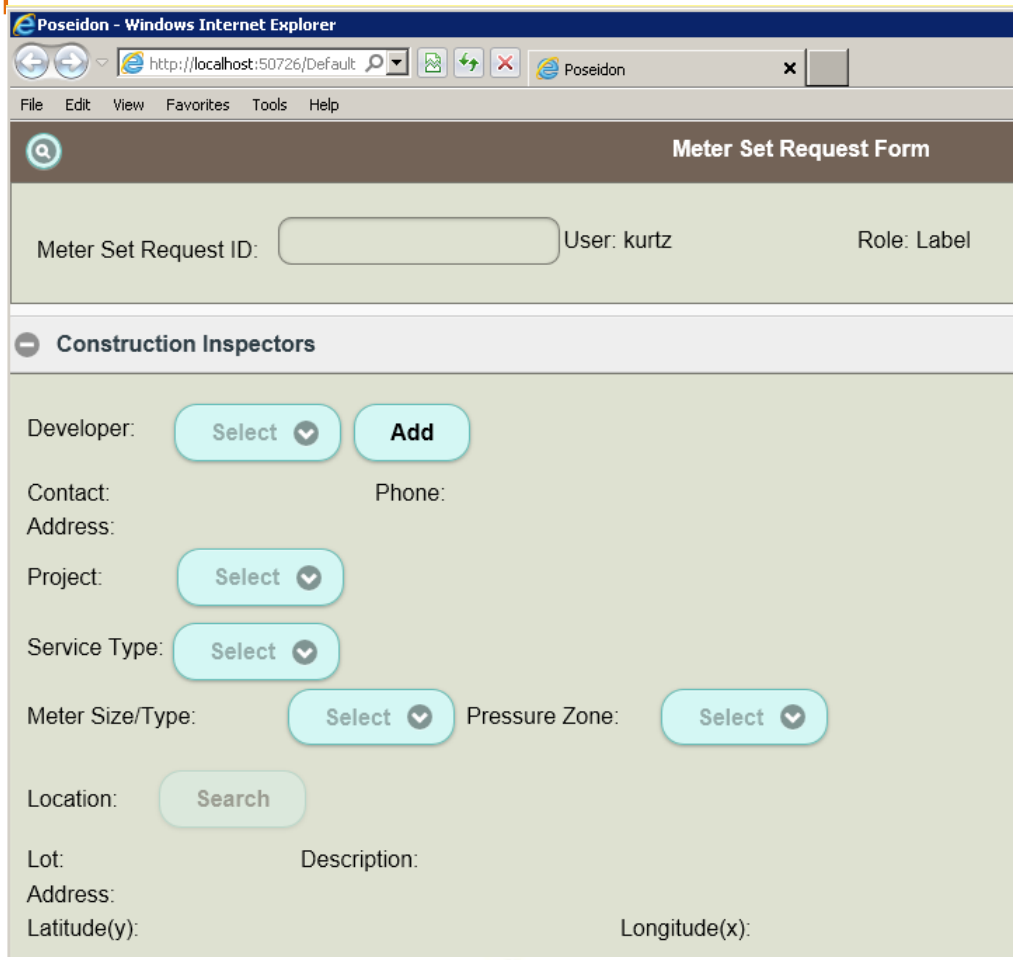
Problems with paper-based systems

+ Slow data transfer
+ Rekeying of form data in computer systems
+ Forms lost during routing
+ Difficult to audit/track meter set thru process
+ Reporting difficult if not impossible
+ Process breakdowns cause finger pointing

Desired end state

Goal: web application with workflow – no paper



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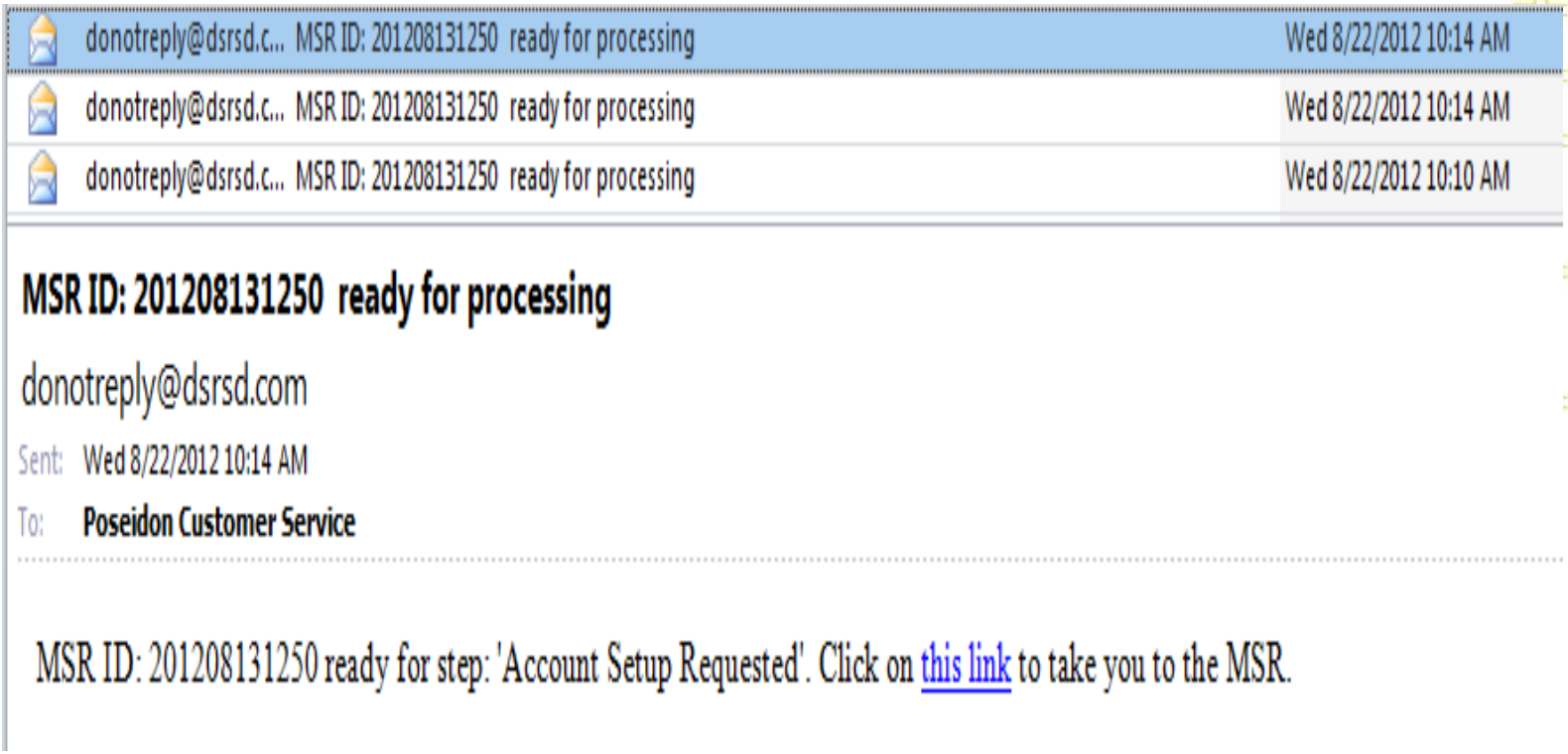
Goal: email routing



Goal: field hardware support

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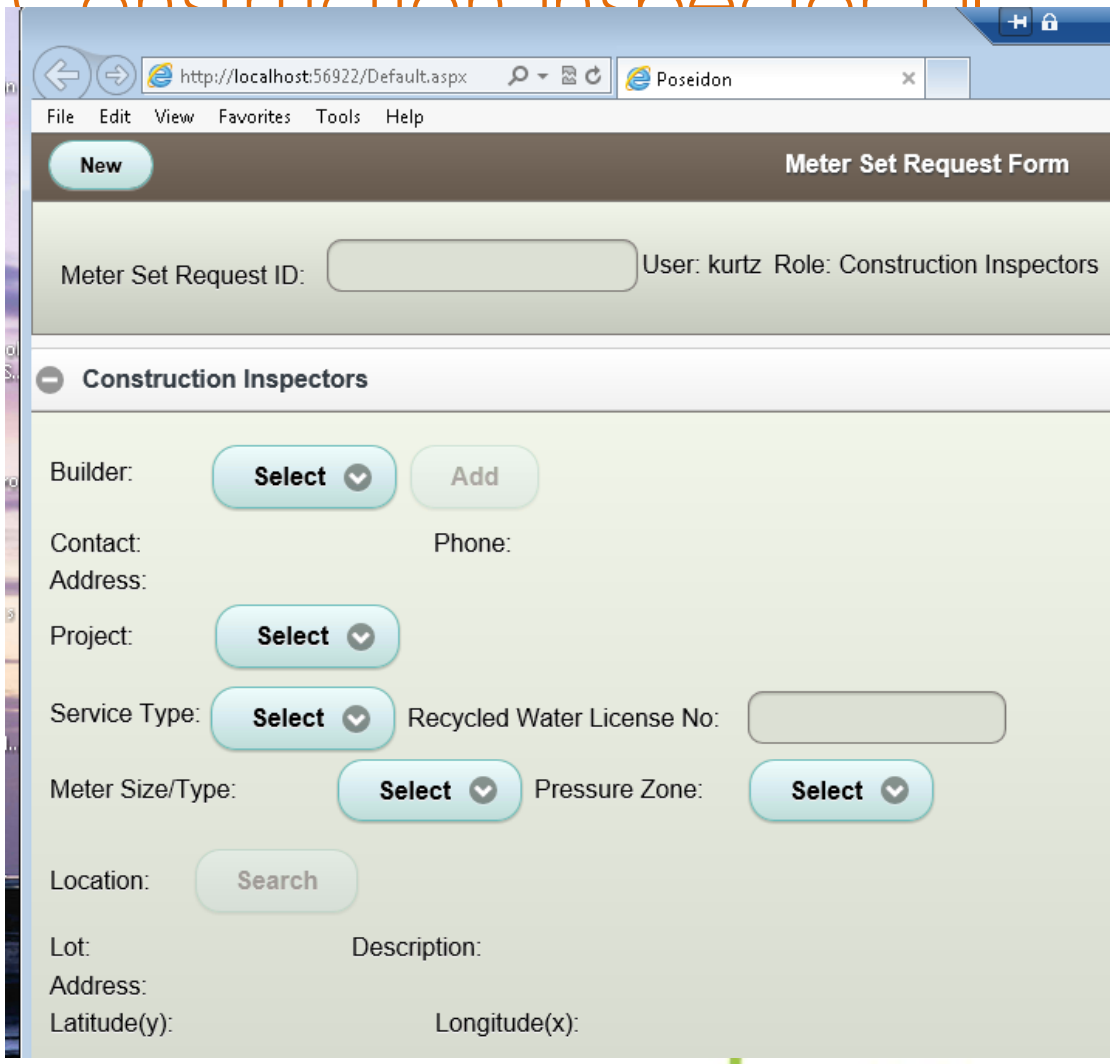
Poseidon

DEMO UI

Construction inspector II



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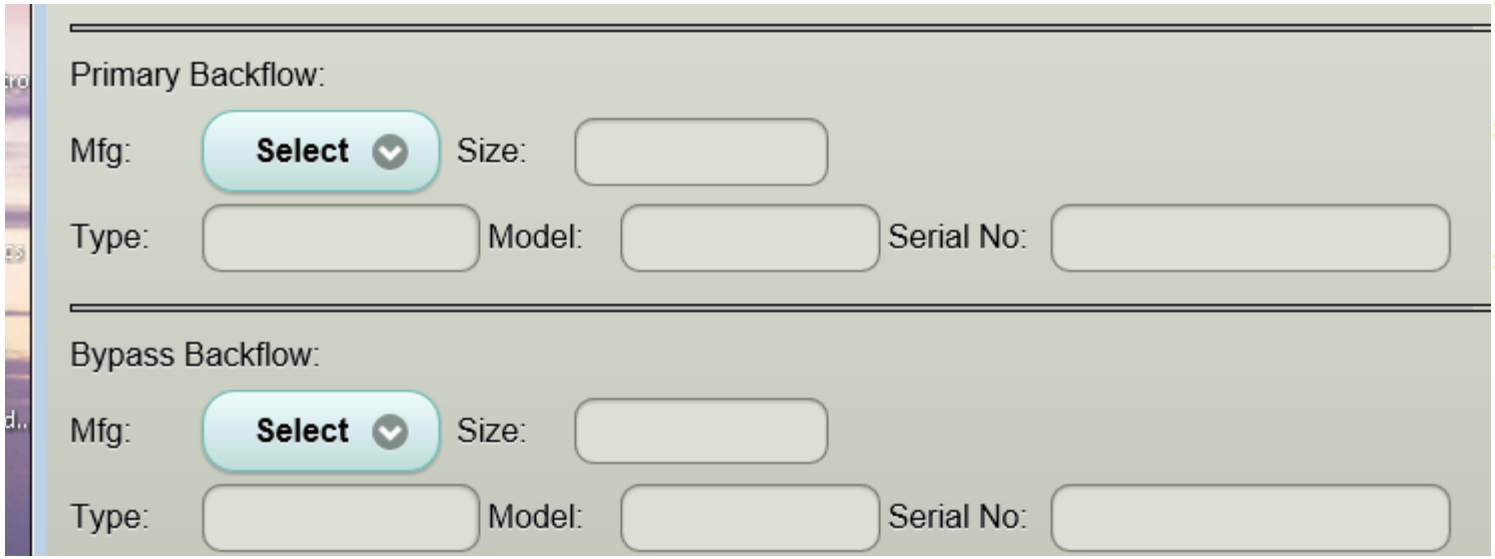
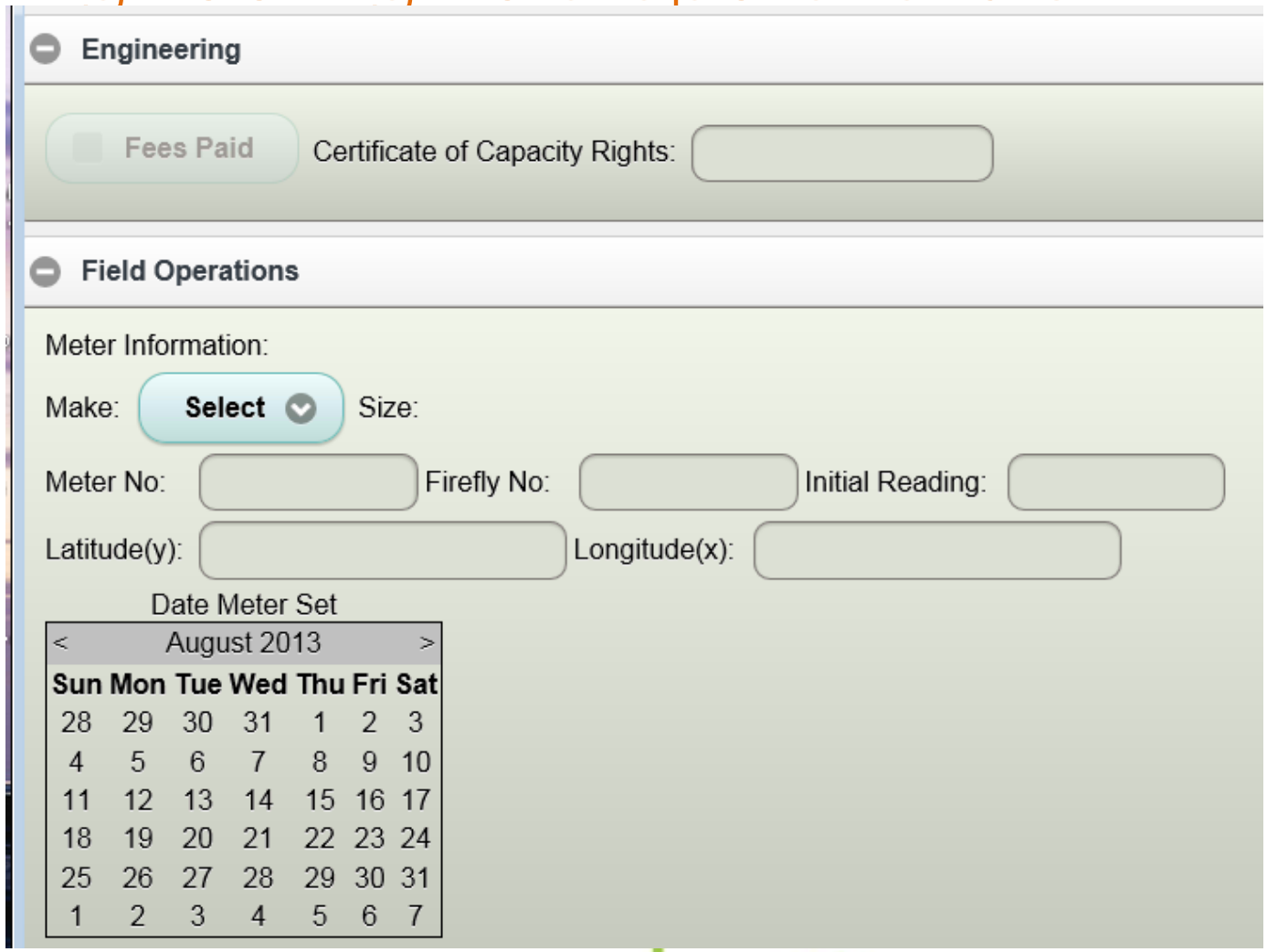
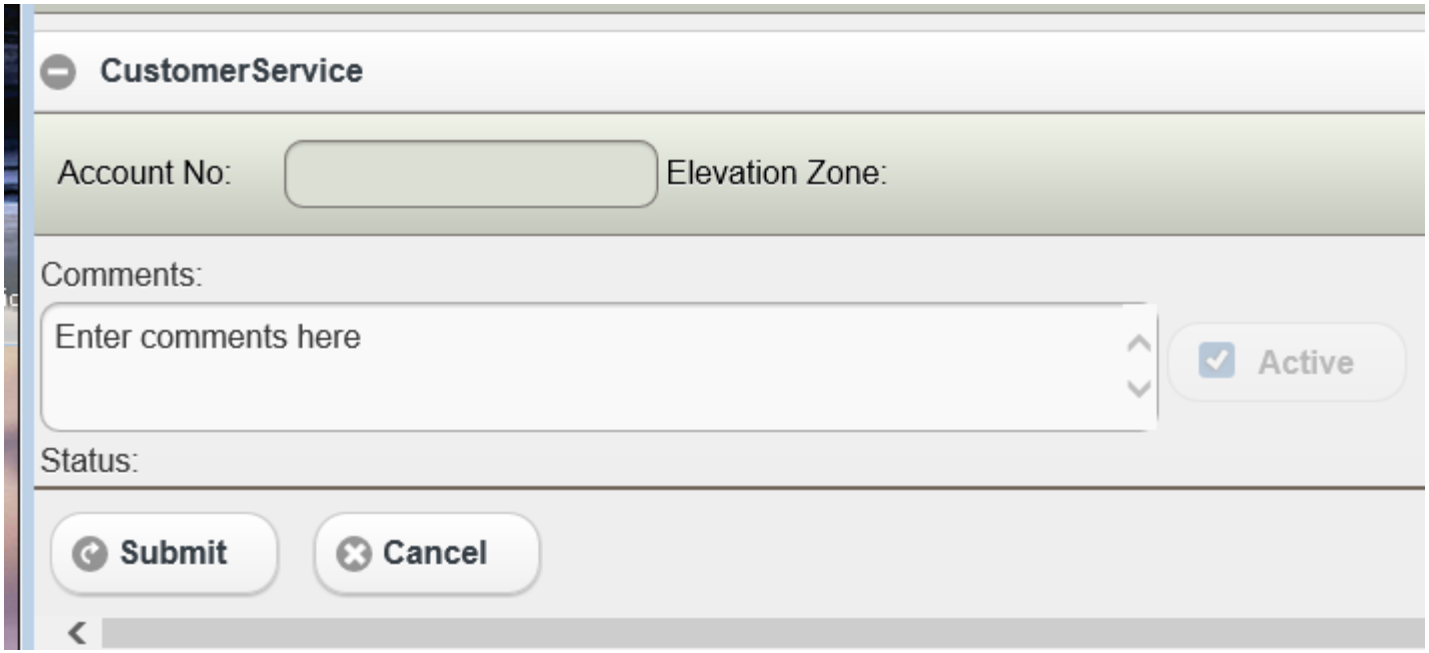
Construction inspector UI



Engineering/field operations UI



Customer service UI

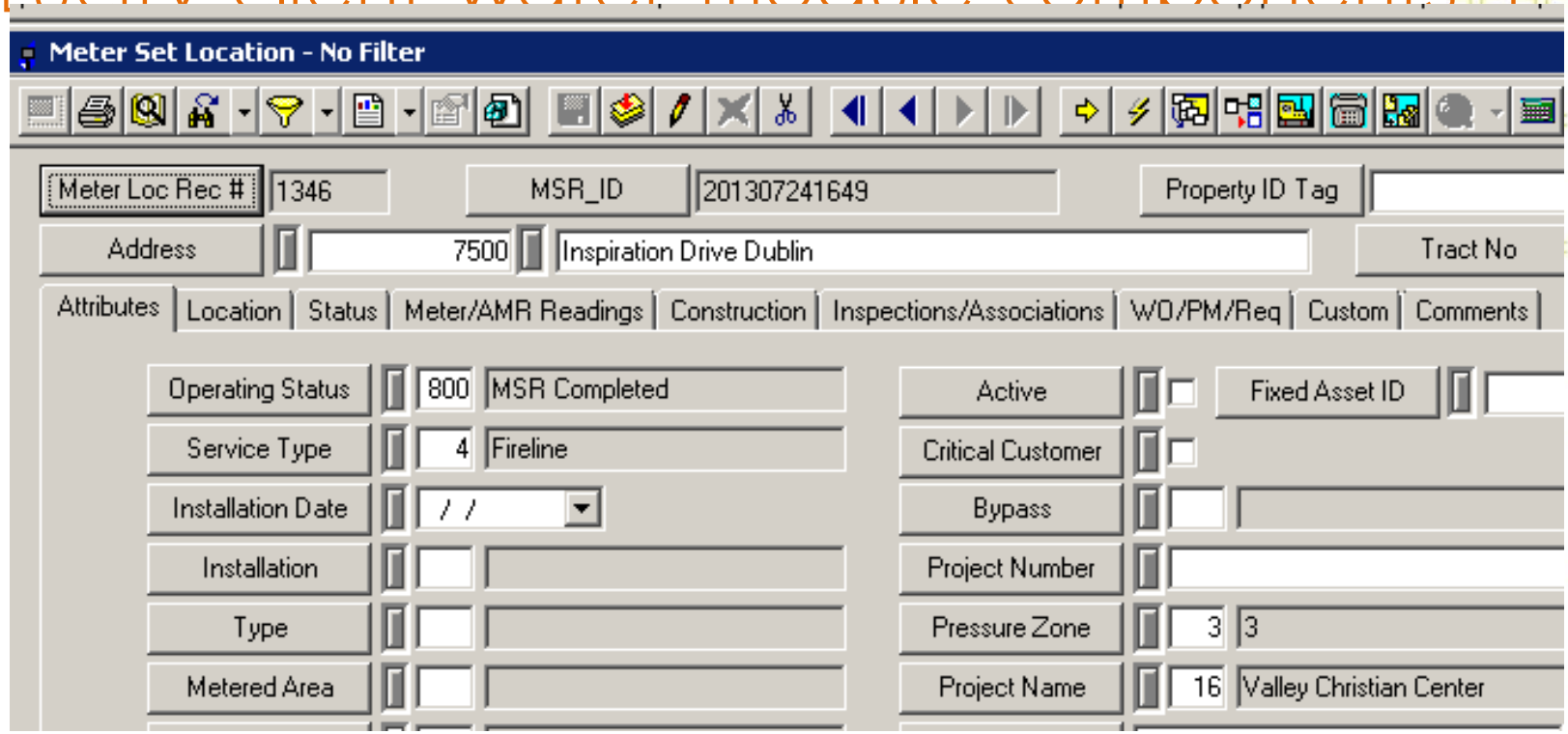


Lucity client water module data overview

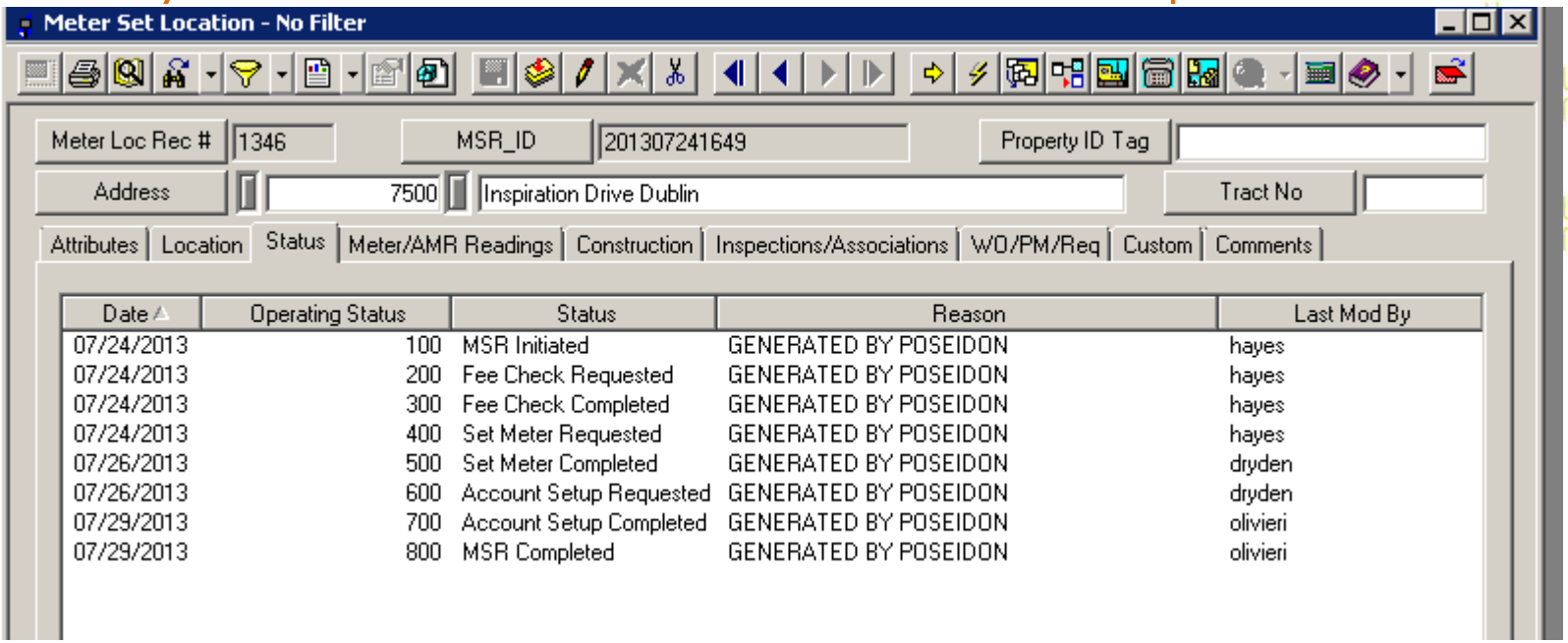
NO EDITS IN POSEIDON – APPLICATION MOVE FORWARD ONLY

USE LUCITY CLIENT TO FIX UPSTREAM DATA ERRORS

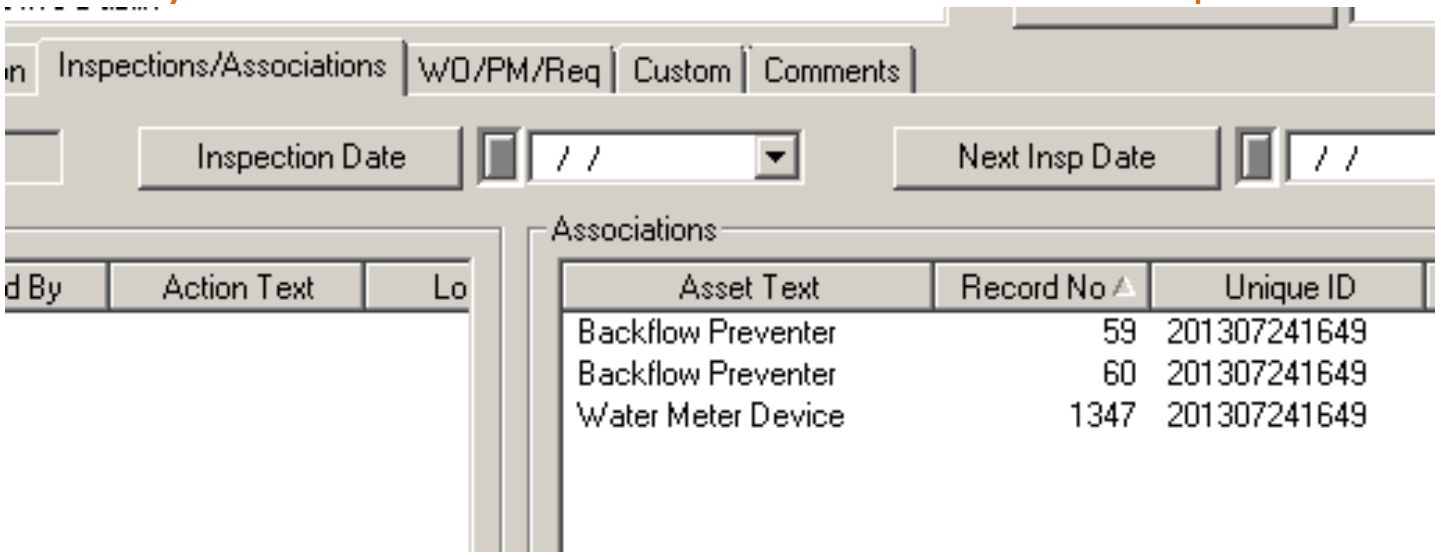
Lucity client water module components 1



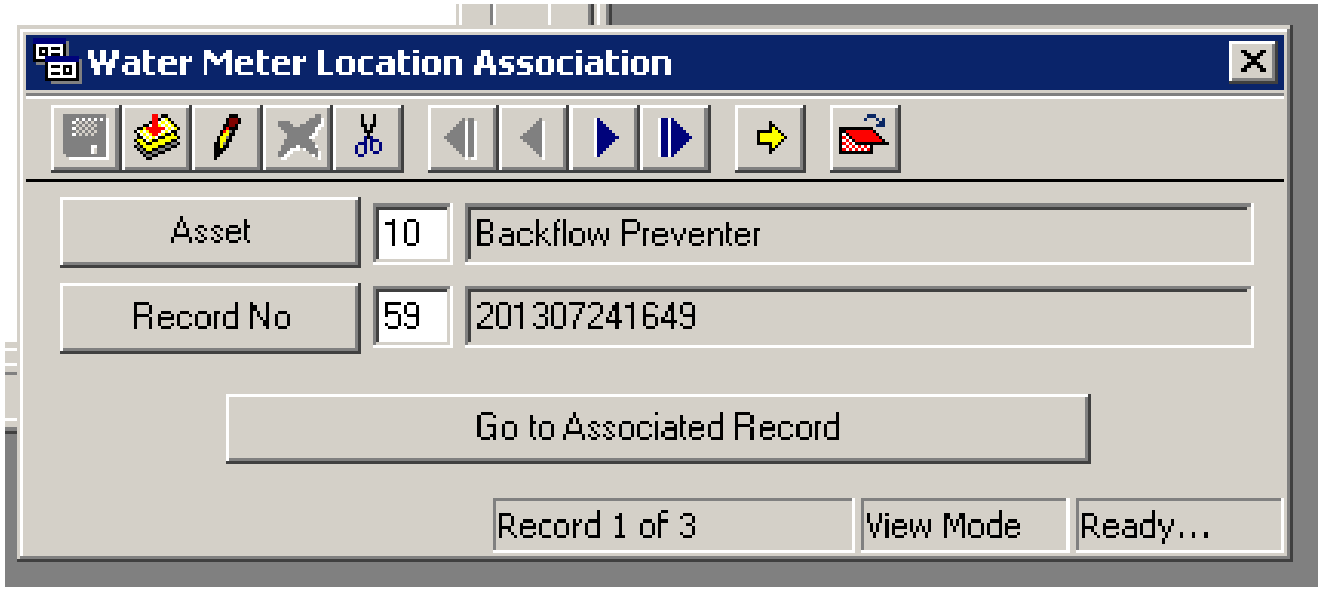
Lucity client water module components 2



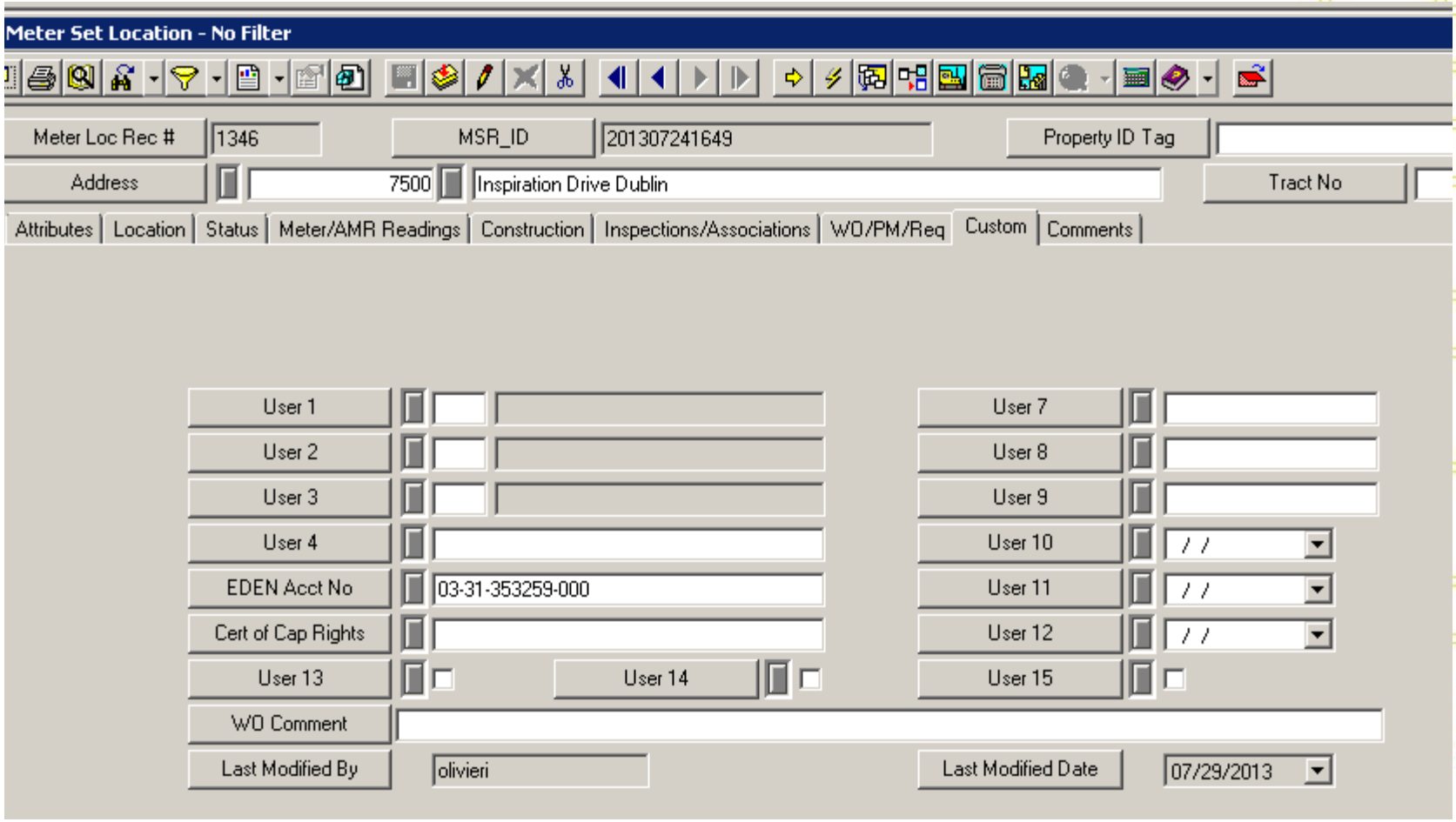
Lucity client water module components 3



Lucity client water module components 4



Lucity client water module components 5



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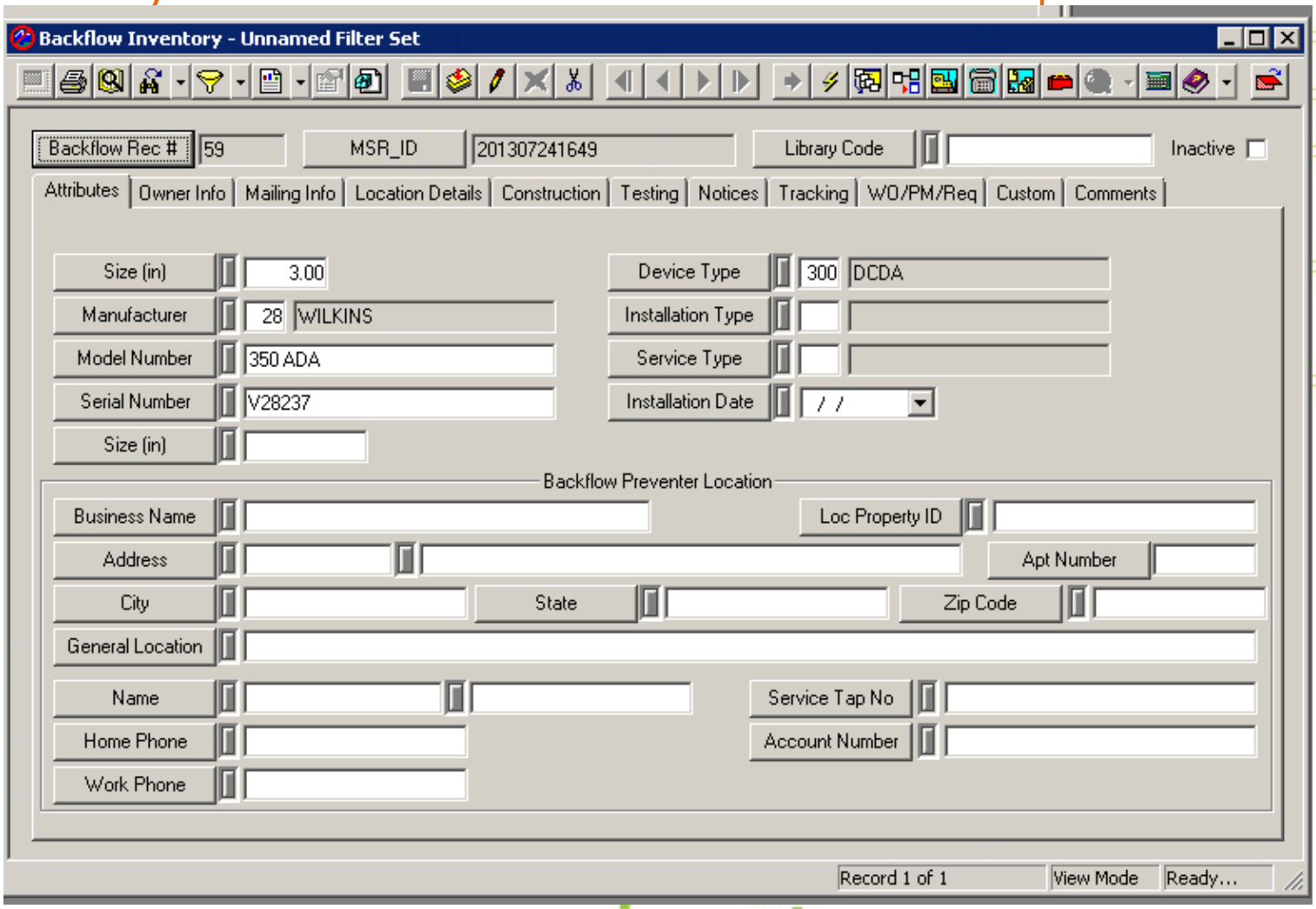
Lucity client water module components 6



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Project fly over

3 Types of Feasibility

+ Organizational
+ Economic
+ Technical

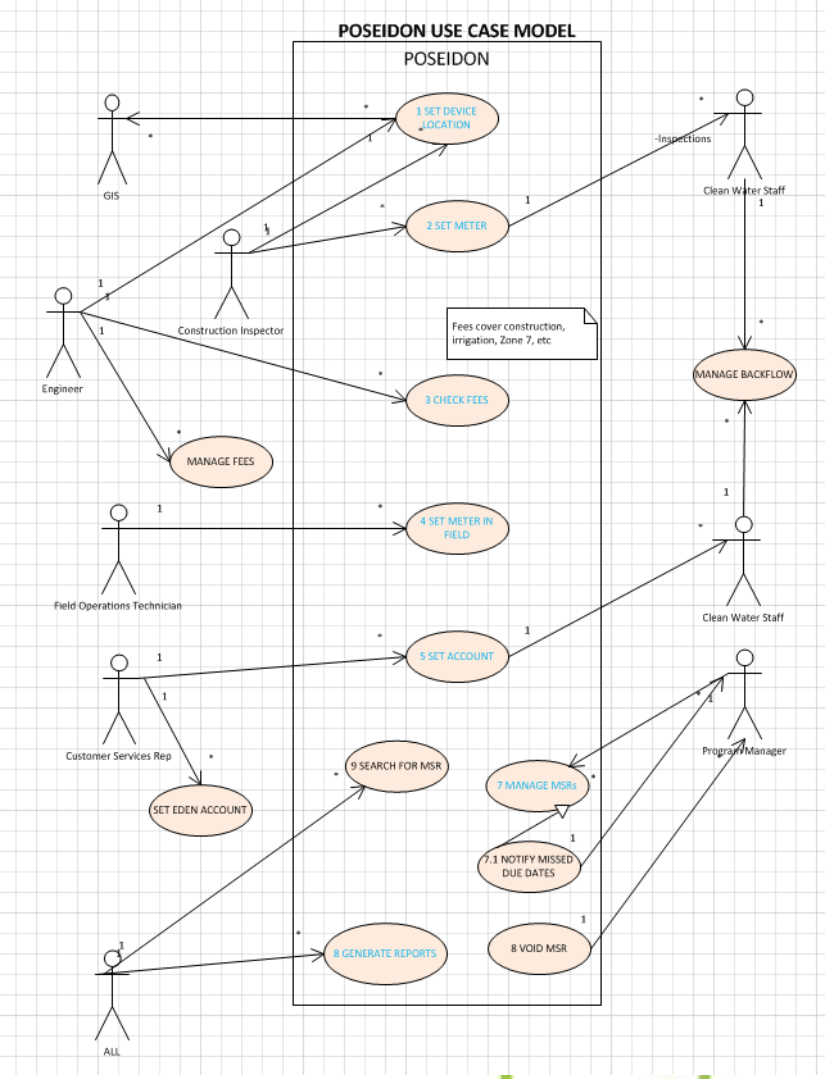
Iterative development

+ Quick turnaround requirements to code
+ Stay close to the customer
+ Create models that are just good enough

Development techniques

- How do you analyze current business processes?
- Look at “what” not “how”
- Make the back end complex so the UI can be simple

Analyze business processes 1



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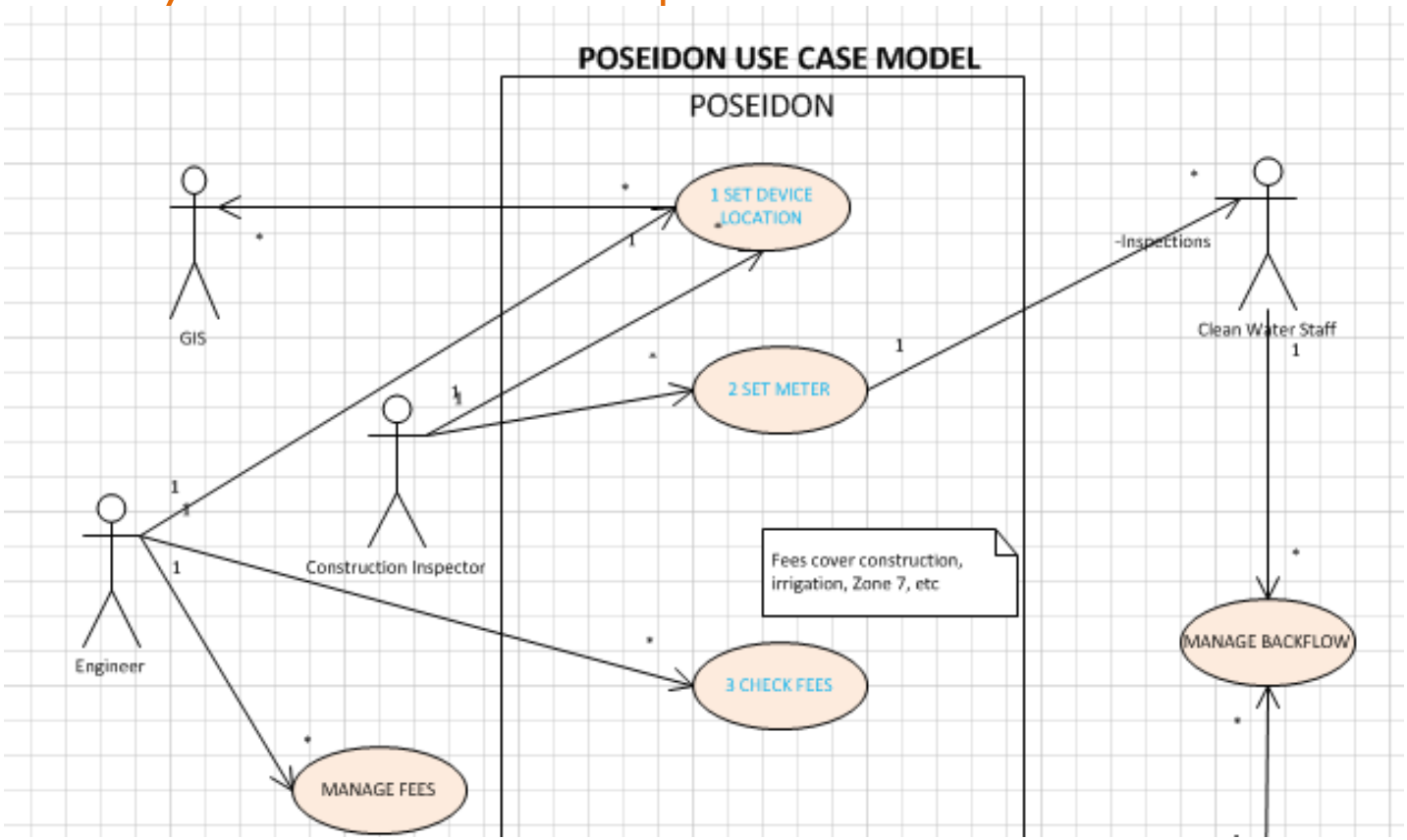
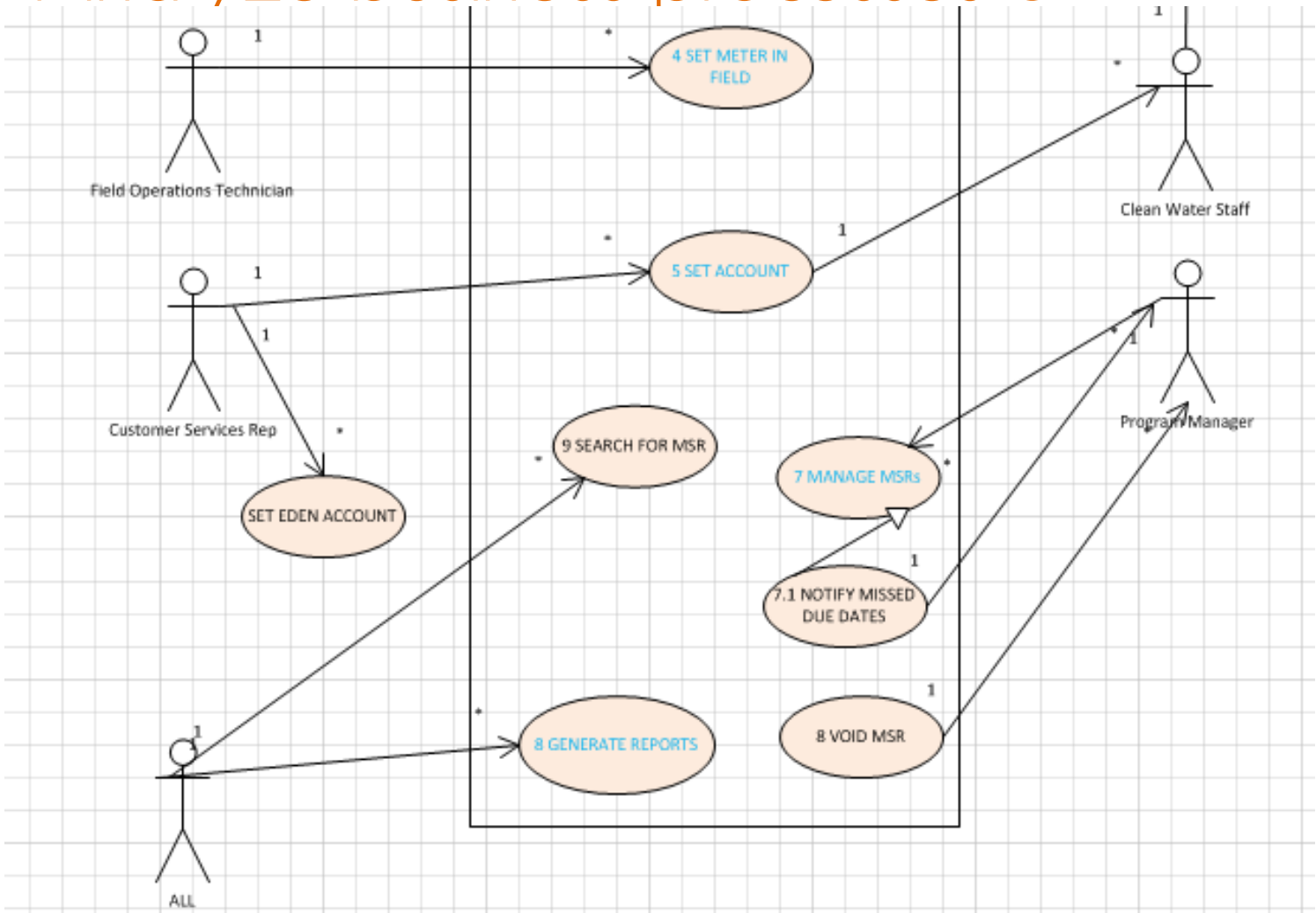
Analyze business processes 2

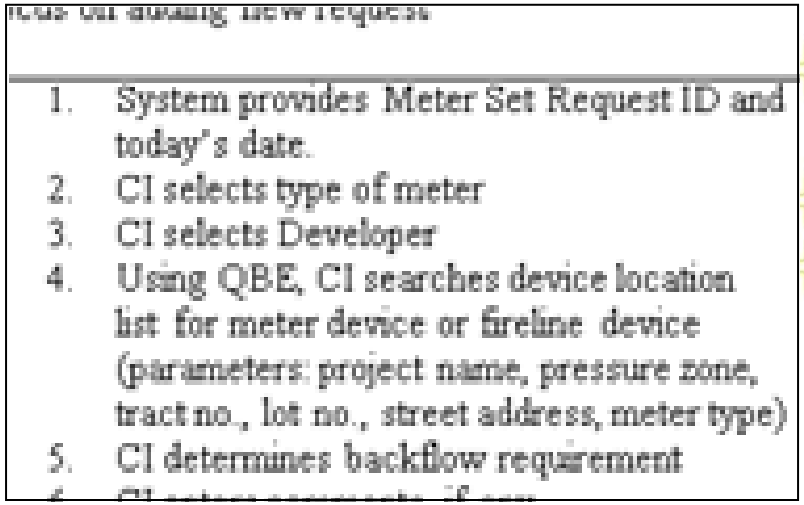


Analyze business processes 3

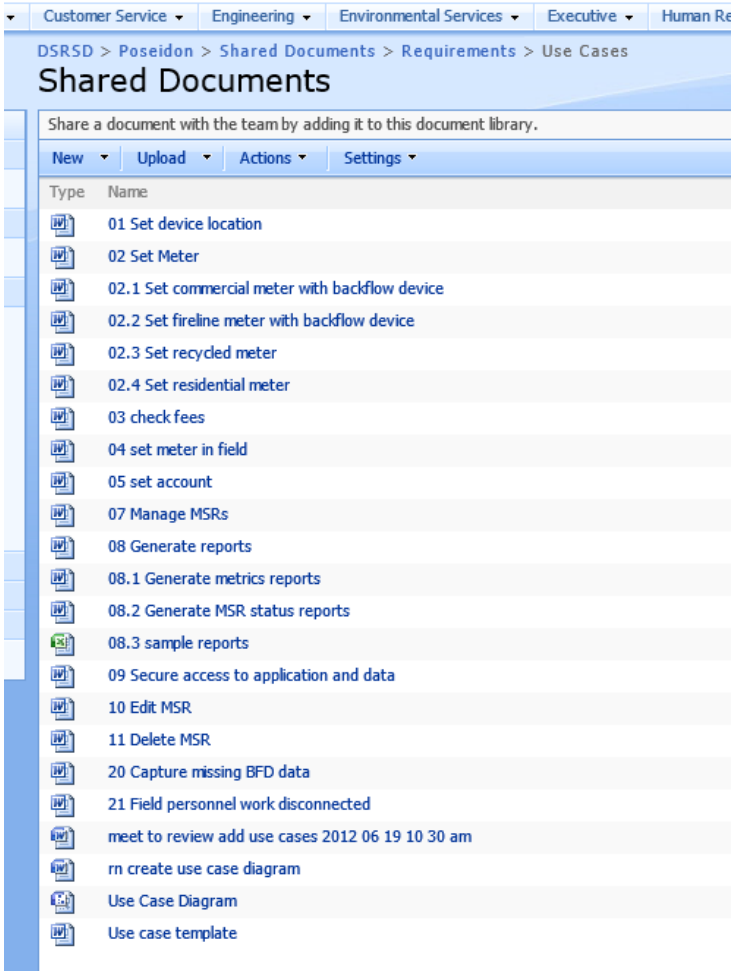


Sample Use Case

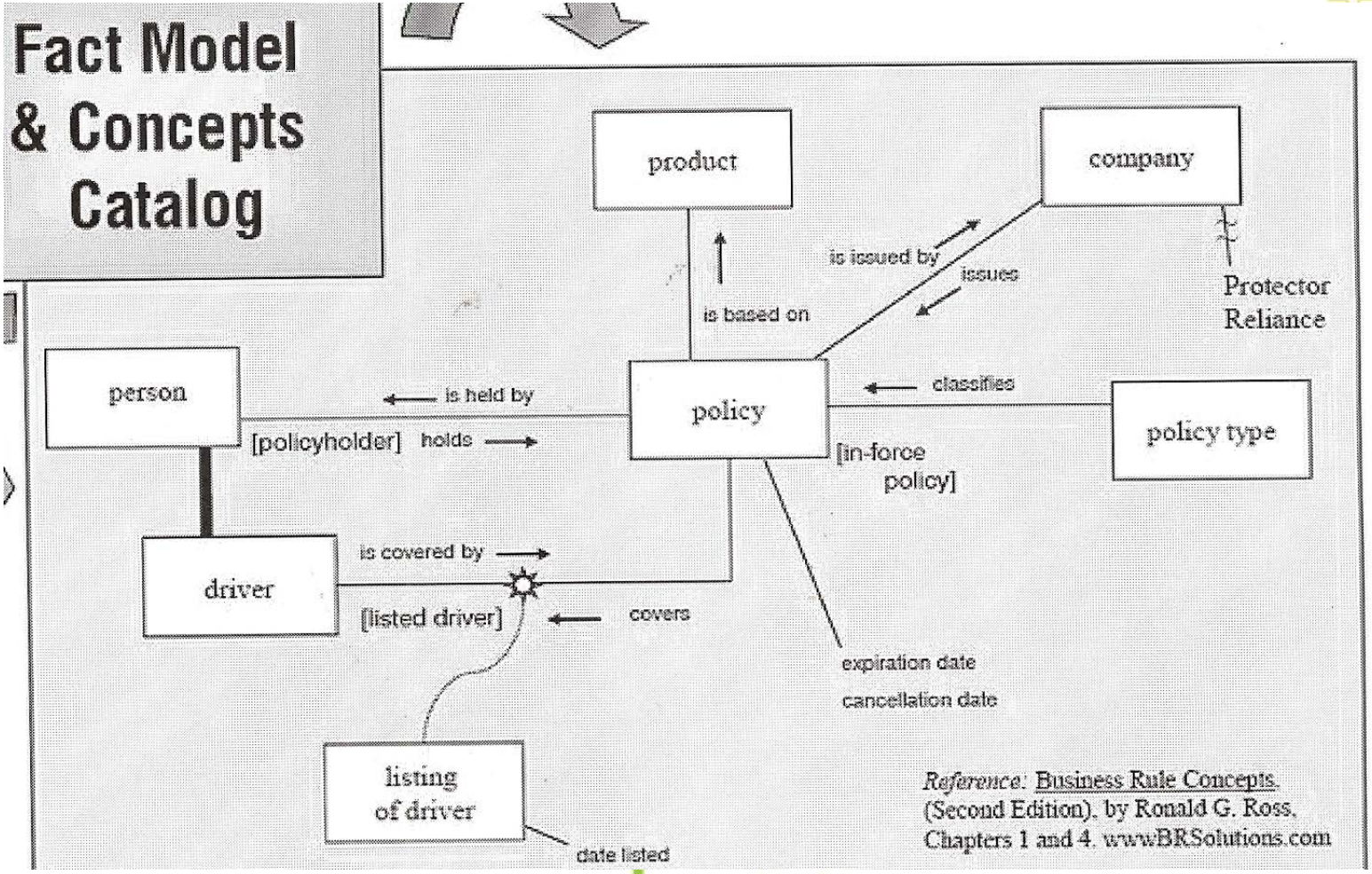
Use Case	**02 Set Meter**
Description	Before actual meters can be installed, Construction Inspector has to set the meter and backflow properties for each of the 4 types of meters covered: 02.1 Commercial 02.2 Fireline 02.3 Recycled 02.4 Residential
Actors	Construction Inspector (CI) - primary Engineer (EN) - secondary
Assumptions	Customer has contacted CI to begin meter set process and customer has paid all requisite fees. High level steps. Focus on adding new request
Steps	1. System provides Meter Set Request ID and today's date. 2. CI selects type of meter 3. CI selects Developer 4. Using QBE, CI searches device location list for meter device or fireline device (parameters: project name, pressure zone, tract no., lot no., street address, meter type) 5. CI determines backflow requirement 6. CI enters comments, if any 7. CI clicks Check Fees button 8. System sends email notification to Planning/Permitting and Clean Water.
Variations	4A. EN may have updated data that CI was not aware of, therefore, EN may override any of CI entries. 6A. Depending on type of meter, backflow requirement differs. Each variation has a separate Use Case. 7A. For Fireline meter: there's no Zone 7 fee and inspection fees are assumed to have been with Permit issuance. Developer installs fireline meter when the backflow device is installed. However, Jackie/Jojo should still do the steps in Check Fees regardless, as this will also force them to enter permit number for the record.


1. System provides Meter Set Request ID and today's date.
2. CI selects type of meter
3. CI selects Developer
4. Using QBE, CI searches device location list for meter device or fireline device (parameters: project name, pressure zone, tract no., lot no., street address, meter type)
5. CI determines backflow requirement

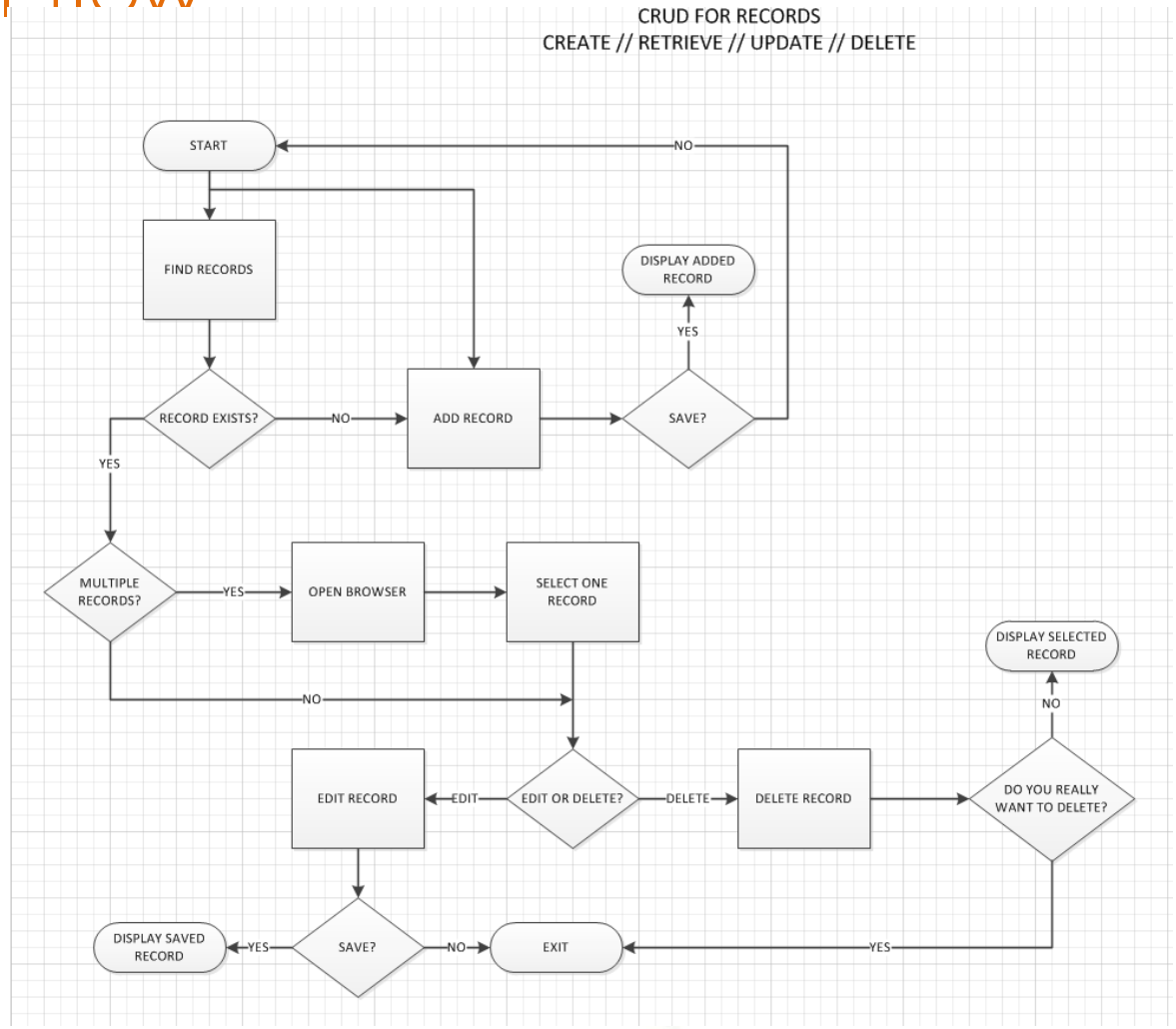
Extensive use of Sharepoint doc libs/lists



Sample fact model / business rules



UI flow



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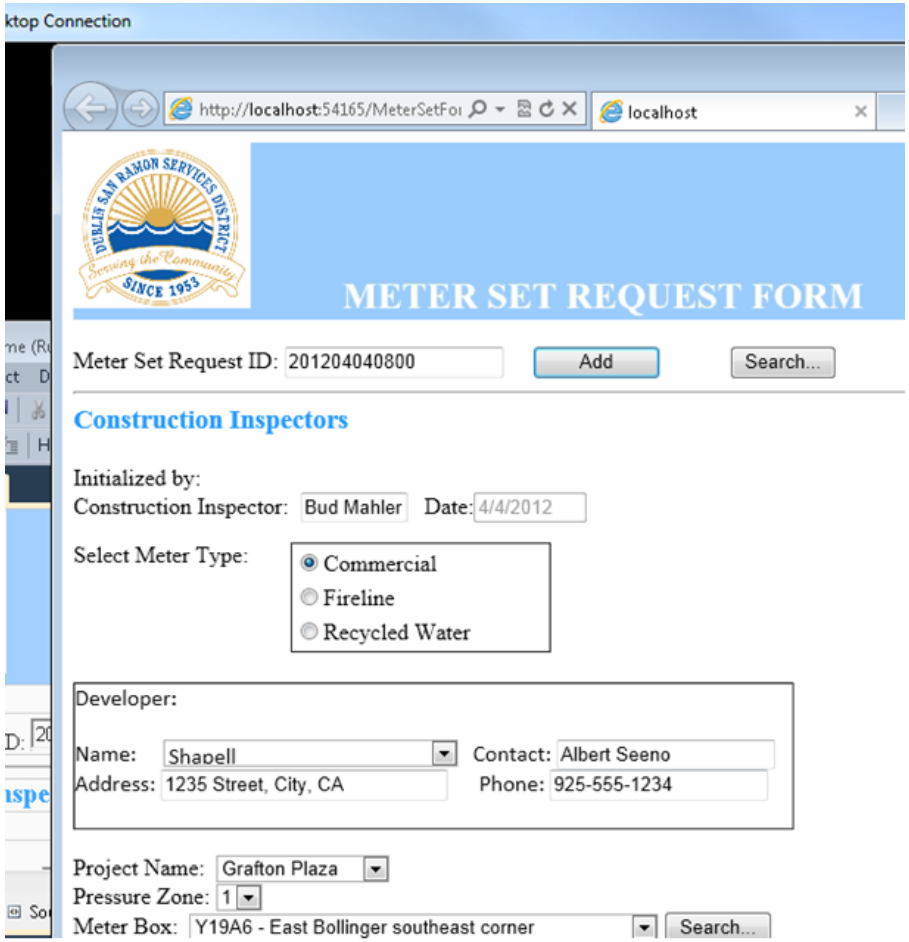
Buy or build?

Lucity Client/Web UI and Lucity Database

- Understanding requirements aids in discussions with contractor/in-house dev
- Conferred with Lucity Implementation Consultant with Use Cases as basis for discussions
- Decided to use core Lucity databases with custom UI
- Decided to use Outlook as workflow engine rather than Lucity work order engine

Proof of concept prototype- UI only - no data



Development resources

DataFunctionary Sharepoint list 1

form	ui seq	Title	screen label	lucity ui label	db table source	db data source
Main	1	add button	plus sign icon		n/a	
Main	2	search msr button	spyglass icon		n/a	
Main	3	msr_id	Meter Set Request ID		n/a	javascript datatime functions
Main	4	logged on user	user		n/a	Request.ServerVariables ["LOGON_USER"]
Main	5	role	role		poseidon.groupauth	vwGetRoleForLogin
Main	6	developername	developer		gbacomm.cmcontact	DSRSD_vwAllDevelopers
Main	7	add developer button	add	multiple screens	gbacomm.cmcontact	
Main	8	ct_name2	contact		gbacomm.cmcontact	DSRSD_vwDeveloperDetails
Main	9	ct_hm_phn	phone		gbacomm.cmcontact	DSRSD_vwDeveloperDetails
Main	10	adr	address		gbacomm.cmcontact	DSRSD_vwDeveloperDetails
Main	11	project	project	project name	gbawater.wtfieldsdesc	DSRSD_vwGetAllProjects
Main	12	servicetype	service type	service type	gbawater.wtfieldsdesc	DSRSD_vwGetAllMeterTypes
Main	13	metersize	meter size	meter size	poseidon.infolist	vwGetAllmetersizes
Main	14	pressurezone	pressure zone	pressure zone	gbawater.wtmeter	DSRSD_vwGetAllElevationZones
Main	15	location search	search		gbawater.wtmeter	DSRSD_vwOpenMeterSet
Main	16	lot	lot	lot no	gbawater.wtmeter	mt_lid_des
Main	17	locdesc	description	general location	gbawater.wtmeter	mt_locate

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DataFunctionary Sharepoint list 2

db table target	db data target	Required	Validation	notes with unit test cases	comments
gbacomm.cmcontact		Yes			
gbacomm.cmcontact		Yes			
gbacomm.cmcontact		Yes			
gbacomm.cmaddr		Yes			
gbacomm.cmaddr		Yes			
gbacomm.cmaddr		Yes			
gbacomm.cmaddr		Yes			
		Yes			
		Yes			
		No		add mode	only shows for Construction Inspector role
		No		link	
poseidon.meterset	msr_id	Yes		msr id	
gbacomm.cmcontact		Yes	25 max len	logged in user	
n/a		Yes		link	
poseidon.meterset	contact_id	Yes			
gbacomm.cmcontact		Yes		link	writing to cmaddr, streetlist, cmcontact
n/a		Yes			only contact_id is stored
n/a		Yes			only contact_id is stored
n/a		Yes			only contact_id is stored

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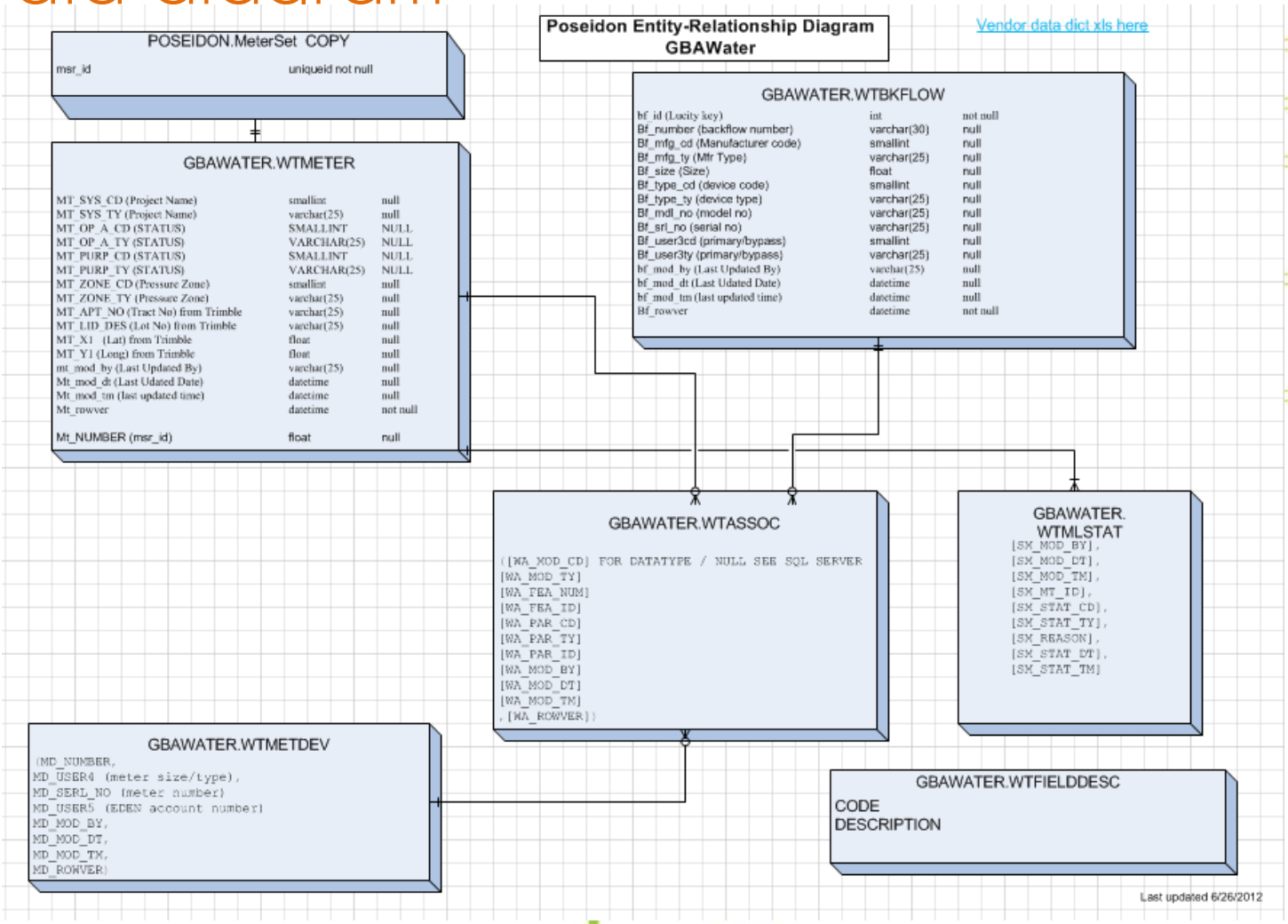
Data diaaram



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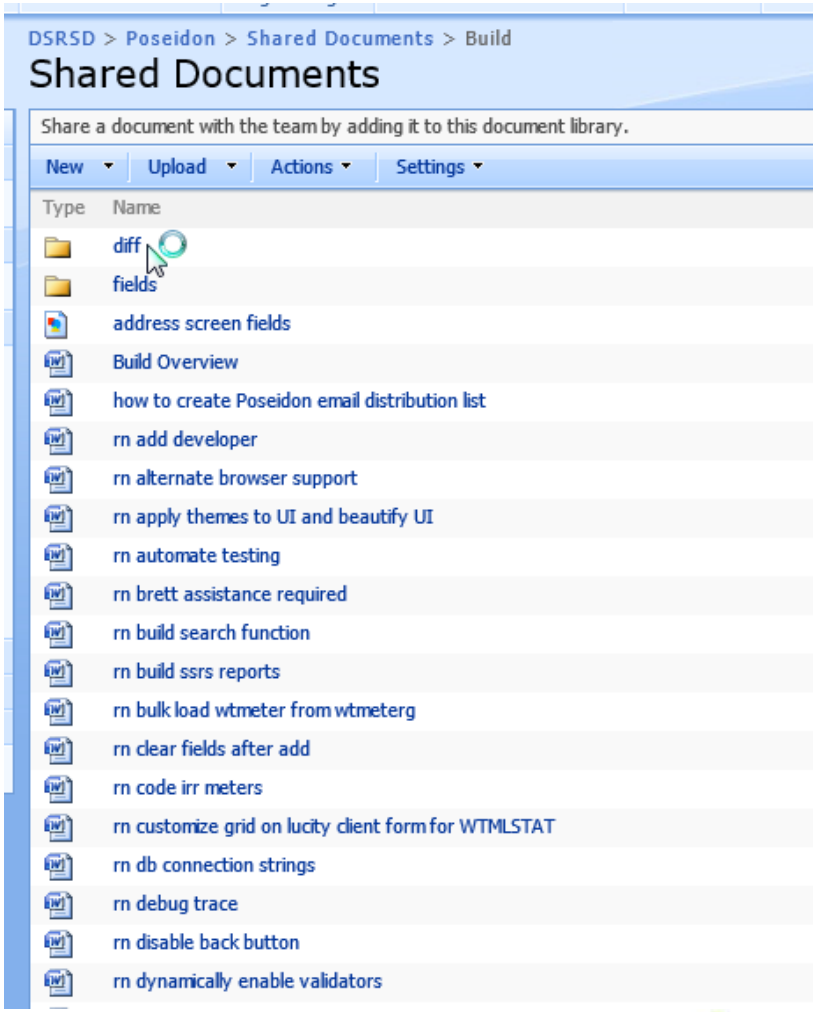
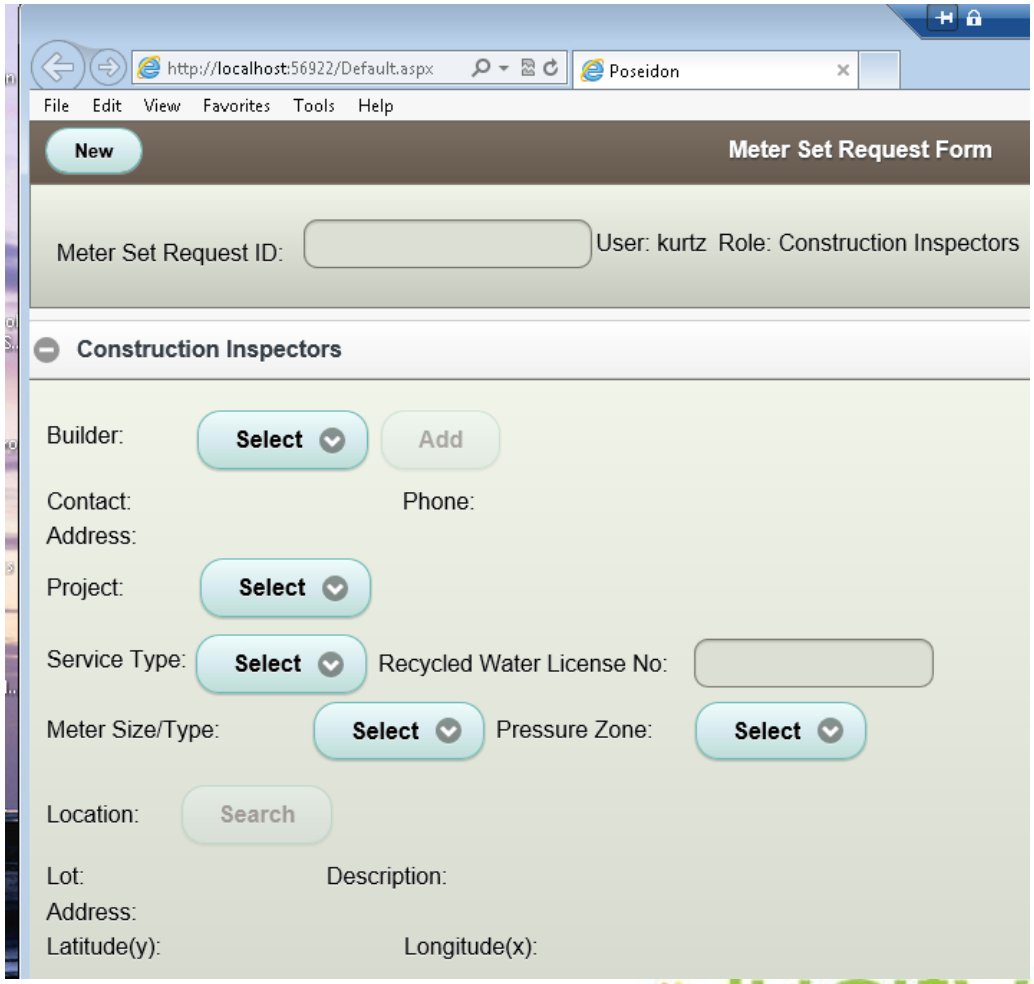
Each field/function has design document



In-house graphic designer chose font, colors, layout



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How does it work?

Back to front – database to UI 1

How do you move data from the database to the screen?

```
+   CREATE VIEW [dbo].[DSRSD_vwGetAllBackflowManufacturers]
+   AS
+   --SELECT info_key, description FROM INFOLIST I WHERE I.INFO_TYPE = 'pn'
+   SELECT Code, Description FROM  WTFIELDSDESC WHERE id = 3298
```

Results | Messages

	Code	Description
1	0	AMES
2	1	Apollo/Conbraco
3	2	ARI
4	3	Arrowhead Brass
5	4	BADGER METER
6	5	BISSEL
7	6	BRAUKMANN
8	7	BUCKNER
9	8	C.M.B.
10	9	Champion Brass
11	10	CLA-VAL

Back to front – database to UI 2

```
<td>
  <asp:SqlDataSource ID="dsbypbfdmfg" runat="server"
    ConnectionString="<%$
ConnectionStrings:connGBAWaterproject %>"
    SelectCommand="SELECT [Description] FROM
[DSRSD_vwGetAllBackflowManufacturers]
ORDER BY [Description]">
  </asp:SqlDataSource>
</td>

<td>
  <asp:DropDownList ID="bypbfdmfg" runat="server"
DataSourceID="dsbypbfdmfg"
    DataTextField="Description" DataValueField="Description"
    AppendDataBoundItems="True" AutoPostBack="True"

onselectedindexchanged="bypbfdmfg_SelectedIndexChanged">
    <asp:ListItem Value="0" Text="Select"></asp:ListItem>
    <asp:ListItem Value="1" Text="New"></asp:ListItem>
  </asp:DropDownList>
</td>
```

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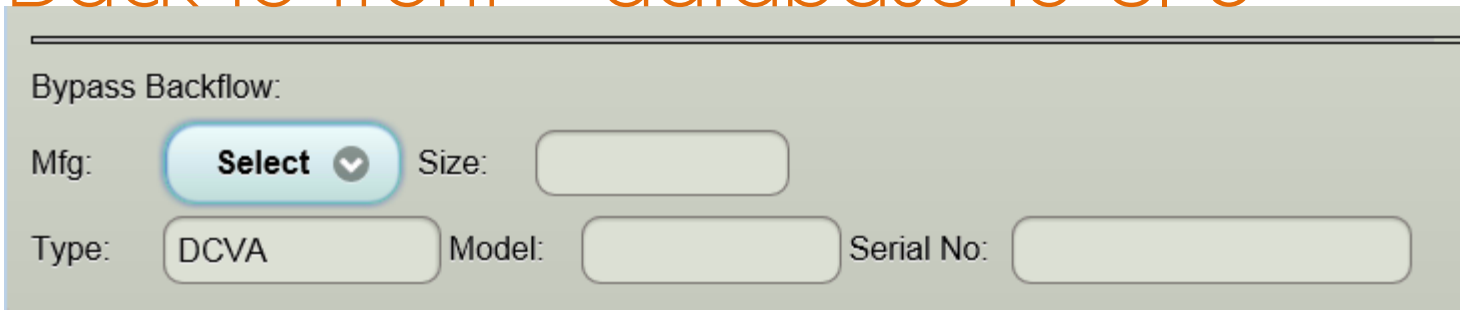
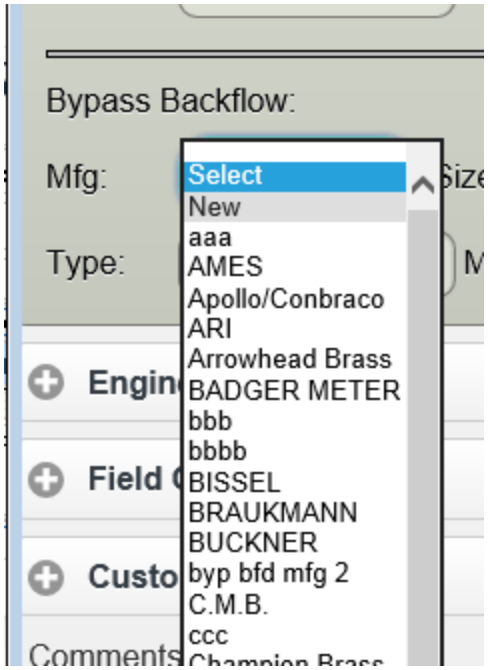
Back to front – database to UI 3





Lucity custom database internals

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Custom views in GBAWater database

- dbo.DSRSD_vwAccountNumber
- dbo.DSRSD_vwFindMeterSetRequestsOlderThan48Hours
- dbo.DSRSD_vwGetAllBackflowManufacturers
- dbo.DSRSD_vwGetAllElevationZones
- dbo.DSRSD_vwGetAllMeterMakes
- dbo.DSRSD_vwGetAllMeterTypes
- dbo.DSRSD_vwGetAllProjects
- dbo.DSRSD_vwGetBypBFD
- dbo.DSRSD_vwGetMeterSet
- dbo.DSRSD_vwGetPriBFD
- dbo.DSRSD_vwMeterDeviceDetail
- dbo.DSRSD_vwMSRDetail
- dbo.DSRSD_vwOpenMeterSet
- dbo.DSRSD_vwSearchBackflowDevices

Sample view

```
+    CREATE view [dbo].[DSRSD_vwOpenMeterSet]
+    as

+    SELECT MT_ID
+    ,mt_number AS number
+    ,isnull(mt_lid_des,'')  AS lot
+    ,isnull(convert(VARCHAR(12),MT_ADR_BDG),'')  + ' ' +
+     isnull(MT_ADR_DIR,'')  + ' ' +
+     isnull(MT_ADR_STR, '')+ ' ' +
+     isnull(MT_ADR_TY, '')  + ' ' +
+     isnull(mt_adr_sfx , '') AS address
+    ,MT_LOCATE AS location
+    ,MT_Y1 AS latitude
+    ,MT_X1              AS longitude
+     FROM WTMETER
+     WHERE mt_op_a_cd = 0
```

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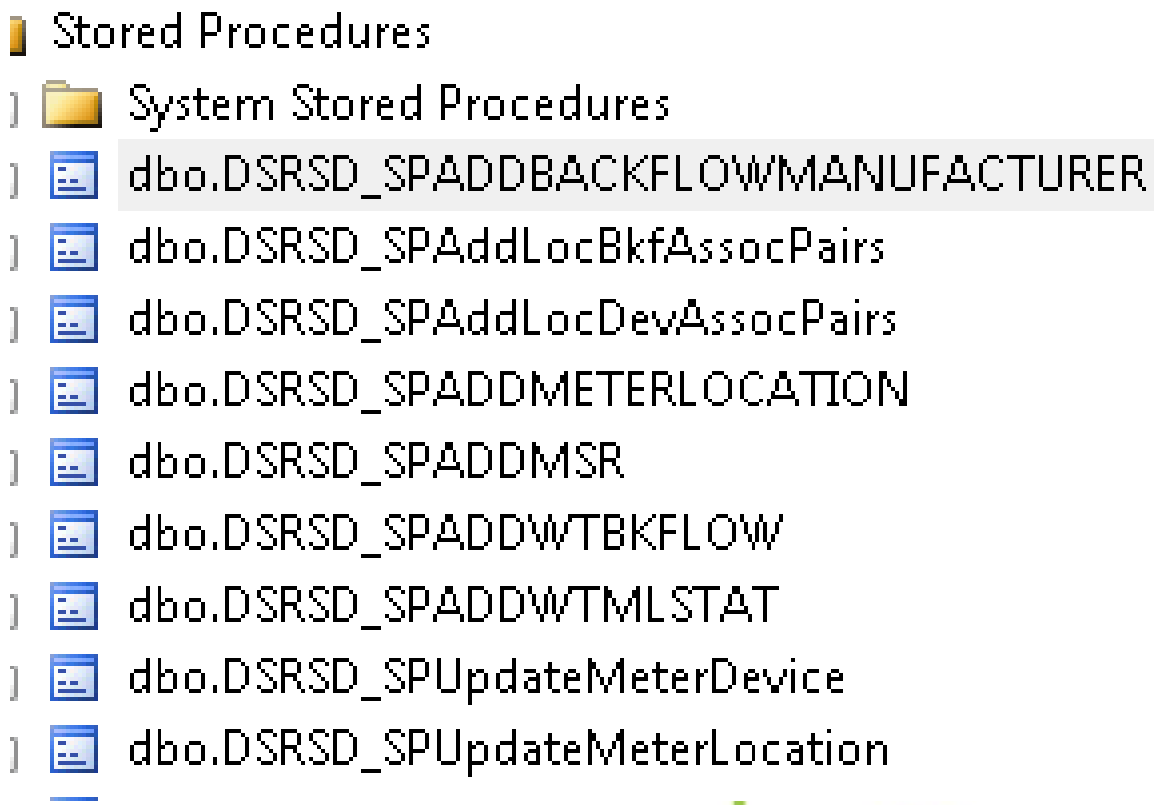
Custom stored procedures

PRO: Lucity comes with many pre-defined stored procedures
CON: Lucity comes with many pre-defined stored procedures



Sample stored procedure

```
CREATE PROCEDURE [dbo].[DSRSD_SPADDBACKFLOWMANUFACTURER]

                @DESC
                VARCHAR(50)
                --,@NEWDEVELOPERID        INT OUTPUT
AS
BEGIN
                SET NOCOUNT ON;
DECLARE @MAXCODE INT = 0
set @MAXCODE = (select MAX(Code) from WTFIELDSDESC WHERE id = 3298)
set @MAXCODE = @MAXCODE + 1

INSERT INTO [Gbawater].[dbo].[WTFIELDSDESC]
        ([ID]
        ,[Code]
        ,[Description]
        ,[UserDefined])
    VALUES
        (3298
        ,@MAXCODE
        ,@DESC
        ,1)
```

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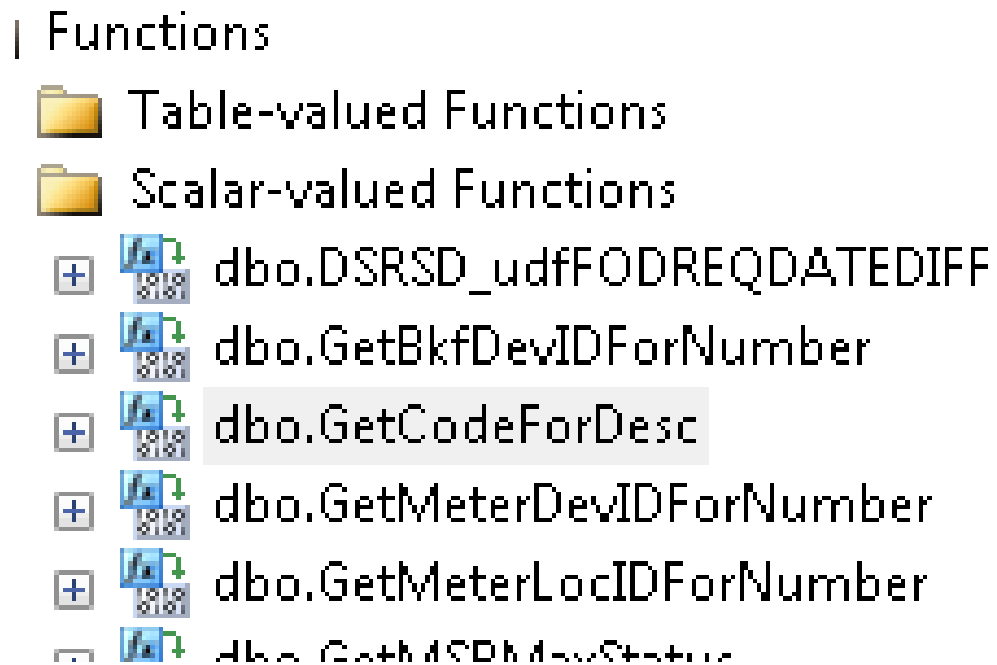
Custom Functions



Sample function

Goal: for a string “Highland Homes” -- give back the numeric code for the drop down list entry – AKA – magic decoder ring

```
CREATE FUNCTION [dbo].[GetCodeForDesc] (@description
VARCHAR(50), @id int)
RETURNS SMALLINT
WITH EXECUTE AS CALLER
AS
BEGIN
		declare @Tempvalue float;

		Set @Tempvalue =
		(
				SELECT code FROM WTFIELDSDESC W
WHERE ltrim(rtrim(DESCRIPTION)) = ltrim(rtrim(@description)) AND
ID = @id
		)

return (@Tempvalue);
End;
```

Reports – demo and detail

Poseidon

DEMO Reports

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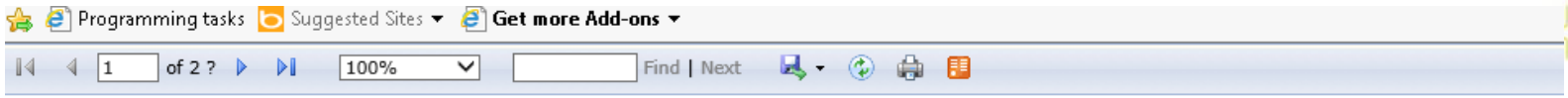
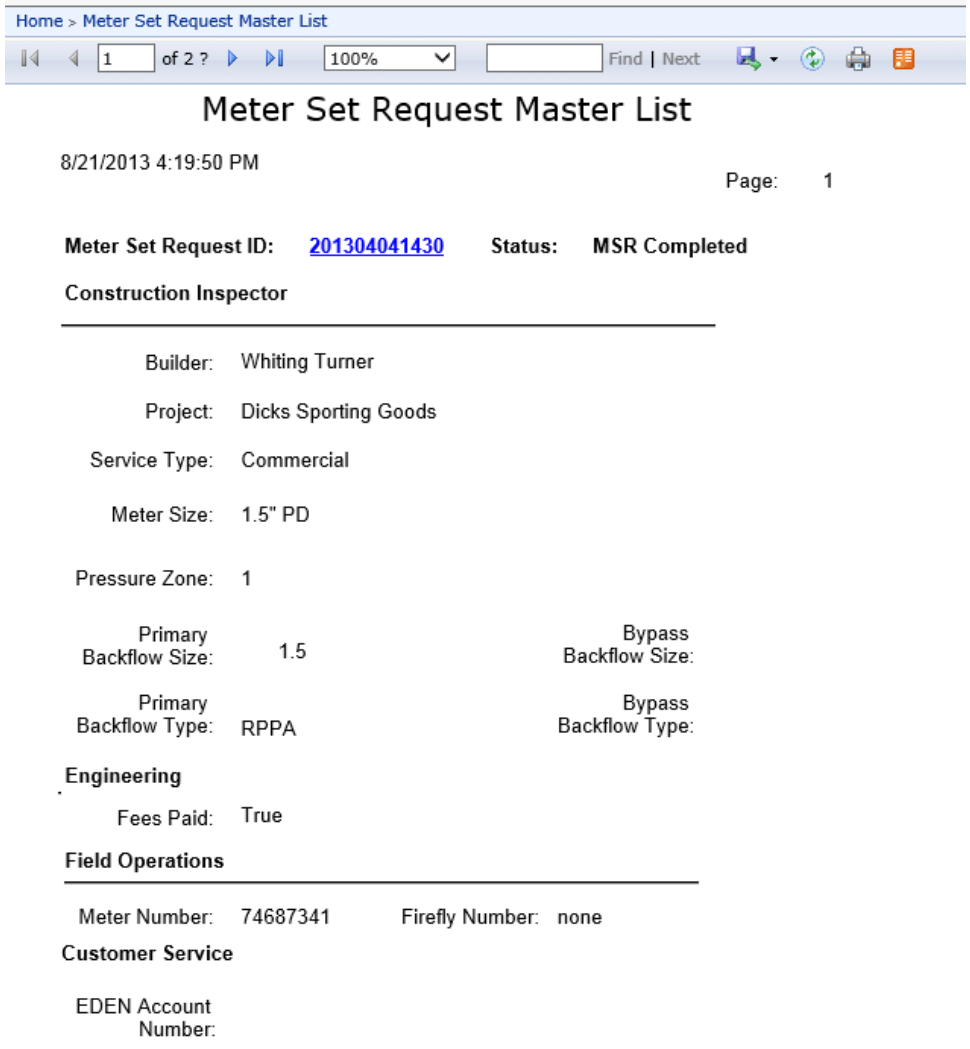
Meter set request status



Meter Set Request Status

MSR ID	STATUS	FEES PD	BUILDER	PROJECT	SERVICE TYPE	METER SIZE	PRESSURE ZONE
201304041430	MSR Completed	True	Whiting Turner	Dicks Sporting Goods	Commercial	1.5" PD	1
201304090849	MSR Completed	True	Essex Property Trust	Winstar Essex	Commercial	3" Omni C2	1
201304090853	MSR Completed	True	Essex Property Trust	Winstar Essex	Commercial	2" Omni C2	1
201304160955	MSR Completed	True	KB Home Bay Area	Arroyo Vista	Commercial	1.5" PD	1
201304161004	MSR Completed	True	KB Home Bay Area	Arroyo Vista	Commercial	5/8"	1
201304240907	MSR Completed	True	Dublin Unified School District	Central Dublin RW project	Irrigation Recycled	3" Omni C2	1
201304250810	MSR Completed	True	D. R. Horton	Sorrento East	Irrigation Potable	1"	20
201304250833	MSR Completed	True	Standard Pacific Homes - East	Sorrento East	Fireline	5/8" Detector	20

Meter set request master list – note



Home > Meter Set Request Master List

1 of 2 ? 100% Find | Next

Meter Set Request Master List

8/21/2013 4:19:50 PM

Page: 1

Meter Set Request ID: 201304041430 **Status:** MSR Completed

Construction Inspector

Builder: Whiting Turner

Project: Dicks Sporting Goods

Service Type: Commercial

Meter Size: 1.5" PD

Pressure Zone: 1

Primary Backflow Size: 1.5

Bypass Backflow Size:

Primary Backflow Type: RPPA

Bypass Backflow Type:

Engineering

Fees Paid: True

Field Operations

Meter Number: 74687341 Firefly Number: none

Customer Service

EDEN Account Number:

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Service level agreement report – automated email delivery

Field operations team has 48 business hours from the initial request to physically setting the meter in the ground. Field operations supervisory personnel need to know if a request has slipped thru the cracks.

Service level agreement report – business rule enforcement function

dbo.DSRSD_udfFODREQDATEDIFF(MT_MOD_DT, GETDATE())

- If the meter set request begins on Friday, then the request is not overdue until 48 business hours, or the next Wednesday.
- For any meter request date (Sun/Mon/Tues etc) give back whether the request is currently on schedule or overdue

Service Level Agreement – function internals 1

dbo.DSRSD_udfFODREQDATEDIFF(MT_MOD_DT, GETDATE())

```
+       IF DATEDIFF(dd, @FODReqDate, @CurrentDate  ) > 5
+       BEGIN
+       RETURN 'OVERDUE'
+       END
                -- meter set request will NOT occur on saturday or sunday
+               -- but if it does...kick it up by one or two days day
+               -- the the fod
+         IF DATEPART(DW, @FODReqDate) = 7
+         BEGIN
+                         SET @FODReqDate = DATEADD(DAY, 2, @FODReqDate)
+         END
+         IF DATEPART(DW, @FODReqDate) = 1
+         BEGIN
+                         SET @FODReqDate = DATEADD(DAY, 1, @FODReqDate)
+         END
+               DECLARE @CurrentDayOfWeek     TINYINT = 0
+               SET @CurrentDayOfWeek = DATEPART(DW, @CurrentDate)
+
+               --fod req will never be sunday due to code just above
+
+               --fod req on mon
+         IF DATEPART(DW, @FODReqDate) = 2  (3,4,5,6…..)
```

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Service Level Agreement – function internals 2

```
+	DECLARE @CurrentDayOfWeek		TINYINT = 0
+	SET @CurrentDayOfWeek = DATEPART(DW, @CurrentDate)
+	--fod req on mon
+	IF DATEPART(DW, @FODReqDate) = 2
+	SET @res = CASE @CurrentDayOfWeek
+	WHEN 1 THEN 'OVERDUE' --sun - should never get here
+	WHEN 2 THEN 'OK' --mon
+	WHEN 3 THEN 'OK' --tue
+	WHEN 4 THEN 'OK' --wed
+	WHEN 5 THEN 'OVERDUE' --thur
+	WHEN 6 THEN 'OVERDUE' --fri
+	WHEN 7 THEN 'OVERDUE' --sat
+	ELSE
+	'OVERDUE' -- negative outcome on default
+	END
```

Coding details – ASP markup

```
+    <td>
+            <asp:HiddenField ID="saveMT_ID" runat="server" />
+            <asp:Button ID="btnsearchmeterlocation" runat="server"
CausesValidation="False"
+                onclick="btnsearchmeterlocation_Click" Text="Search"
UseSubmitBehavior="False" />
+    </td>
```

Web application coding - JQUERY

PRO: TRIMS UI ON ANY BROWSER / ANY DEVICE
CON: LOOKS GOOD BUT AVOID AT ALL COSTS

```
$('a[id="btnadd"]').attr("data-icon", "plus");
        $('a[id="btnsearch"]').attr("data-icon", "search");
        $('a[id="btnsubmit"]').attr("data-icon", "forward");
        $('a[id="btncancel"]').attr("data-icon", "delete");
        $('a[id="btnadddevelopersubmit"]').attr("data-icon)
```

C# application code behind – ~8K lines of code

```
// coded sul56 here
        {
          if ((meterdevicelongitude.Text.Length > 3) && (meterdevicelongitude.Text.IndexOf('.')
> 0))
          {
            if (meterdevicelongitude.Text.Substring(0, 5) != "-121.")
            {
              WebMsgBox.Show("46 Longitude must start with 37.");
              returncode = false;
            }
            string holdvalue = meterdevicelongitude.Text;
            //string hold6chartorightofdecimal = "";
            //int locationofperiod = holdvalue.IndexOf('.');
            //hold6chartorightofdecimal = holdvalue.Substring(locationofperiod, 6);
            //if (hold6chartorightofdecimal.Length != 6)
            if (holdvalue.Length != 11)
            {
              WebMsgBox.Show("47 Longitude must have 6 decimal positions.");
              returncode = false;
            }
          }
          else
          {
            WebMsgBox.Show("48 Longitude must start with -121 and have a decimal point.");
            returncode = false;
          }
        }
```

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C# application code to add record to Lucity DB

```
+           SqlConnection conn = new SqlConnection();
+           conn.ConnectionString = GlobalVar.gbacommwriter;
+           SqlCommand cmd = new SqlCommand();
+           cmd.CommandText = "DSRSD_SPADDDEVELOPER";
+           cmd.CommandType = CommandType.StoredProcedure;

+           SqlParameter parmRetValue = new SqlParameter("@NEWDEVELOPERID", SqlDbType.Int);
+           parmRetValue.Direction = ParameterDirection.Output;
+           cmd.Parameters.Add(parmRetValue);

+           cmd.Connection = conn;
+           conn.Open();
+           try
+           {
+               newdevid = (int)cmd.ExecuteScalar();
+           }
+           catch (SqlException e)
+           {
+               ShowException(e);
+           }
+           conn.Close();
+           SetDebugStatusText("OUT AddDeveloperToDB");
+           return newdevid;
```

Summary – what went wrong

+ Jquery technology in early life cycle
+ Dup dropdown list data killed application
+ Confusion on XY for empty meter box
+ Renaming fields on screen – bad
+ Associated record SP took 8 hours
+ Awkward mapping DB to UI
+ Needed more unit/system testing
+ Staff split up on too many other projects
+ Tablets not favored device for all
+ Too many auxiliary MS Access DBs

Summary – what went right

+ Moved business process from paper to web
+ Provided tablet support to field personnel
+ Provided management reporting
+ Shortened process execution time
+ Improved data integrity / auditing
+ Reduce costs
+ Provided work for IT Analyst

Poseidon project - path forward

+ Adding residential meter sets (batch)