Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

This procedure and attached criteria follows the same procedure and references within the WSSAP Final Report Appendix F-Electrical Survey Procedure and Criteria.

PURPOSE

1. This integrity study is designed to locate anomalies on wrapped steel services identified and selected utilizing PSE's WSSAP risk model. The anomalies will be evaluated and repairs made in accordance with PSE's Gas Operating Standards.

PROCEDURE

1. Gather service specific data on services utilizing PSE's plat maps and service design drawings (D4's).
2. Locate and mark out service line.
3. Install additional test stations as required to perform the surveys.
4. Identify regions by factors that will affect the survey tools performance based on Table 6.1 of IMP Standard 7500.4100, "External Corrosion Direct Assessment Plan." (Attached to this document).
5. Run two surveys, Close Interval Survey (CIS) and Direct Current Voltage Gradient (DCVG). The surveys will be performed in accordance with PSE's Gas Field Procedures 4515.1710, "Conducting a Close Interval Survey (CIS)," and 4515.1720, "Conducting a Direct Current Voltage Gradient (DCVG) Survey."
6. Data for the services will be presented both graphically and in a table.
7. Indication severity will be determined using criteria set forth in IMP Standard 7500.4100, "External Corrosion Direct Assessment Plan," Tables 9-1 and 10-1. (Attached to this document).
8. If the results from the indirect inspection are not consistent with the historical and construction data, then tool selection for the indirect inspections will be reassessed.
9. Direct examination excavation sites will be chosen based on indication prioritization Table 13-1 of IMP Standard 7500.4100, "External Corrosion Direct Assessment Plan." (Attached to this document).
10. The inspections at excavation sites will be made in accordance with PSE's Direct Examination Procedure.
11. A direct examination of all survey indications prioritized as immediate action will be made within 180 days of completing the prioritization of survey data classifications. In cases where there is sensitivity on the part of the homeowner or direct examination might be unacceptable, services with severe anomalies will be replaced rather than examined.
12. A direct examination of all survey indications prioritized as scheduled action will be carried out within 12 months of completing the prioritization of survey data classifications.
13. Where significant corrosion activity is found during the course of the direct examinations, a root cause analysis shall be performed to determine the underlying causes of the significant corrosion activity.
14. If the root cause analysis that is performed at areas of significant corrosion activity reveals conditions that exceed the limitations of the indirect inspection tools that were selected, the service will be replaced.
15. At the completion of the direct examination the WSSAP database will be re-populated with the survey results.
16. Inspection and examination records will be maintained for the life of the pipeline.

References

Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

Gas Operating Standards	2575.1700 Repairing Steel and Cast-Iron Pipelines 2575.2800 Examining Buried Pipelines 2600.1100 Field Coatings for Pipe and Fittings
Gas Field Procedures	4515.1710 Conducting a Close Interval Survey 4515.1720 Conducting a Direct Current Voltage Gradient Survey 4515.1755 Examining Buried Pipe 4515.1210 Taking Pipe-to-Soil Potential Reads 4515.1760 Taking a Pit Depth Measurement
IMP Standard	7500.4100 External Corrosion Direct Assessment Plan
Forms	2453 Exposed Pipe Condition Report 4023 Indication alignment and Prioritization 4027 Excavation Site Description 4029 Root Cause Analysis

Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

Figure 1. Electrical Survey Process

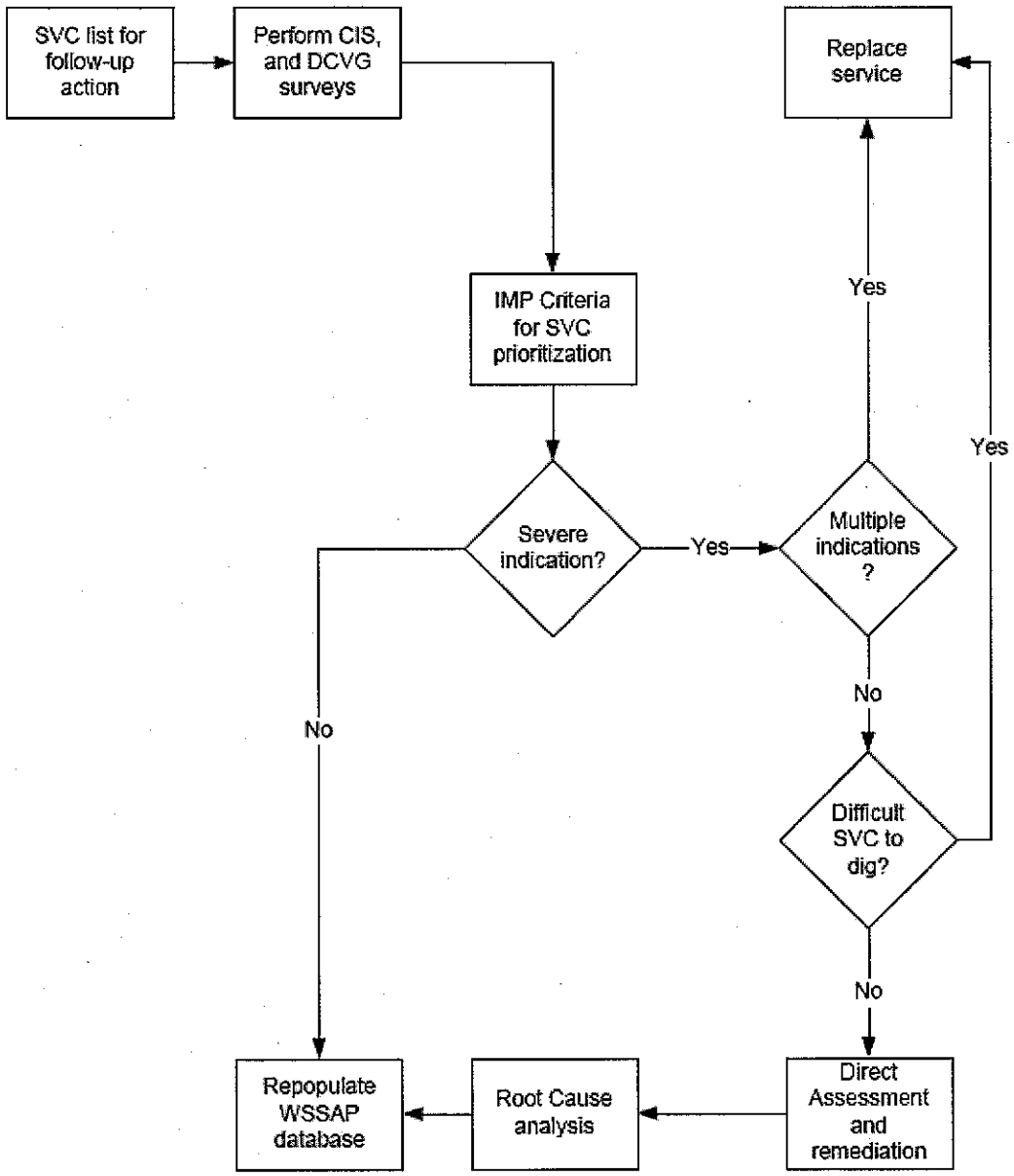

Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

Table 6-1: Criteria for Defining ECDA Regions

Data Element	Criteria
Material (steel, cast iron, etc.)	Special considerations should be given to locations where dissimilar metals are joined.
Seam type	Locations with pre-1970 low-frequency electric resistance welded (ERW) or flash welded pipe with increased selective seam corrosion susceptibility may require separate ECDA regions
Bare Pipe	Segments with bare pipe in coated pipelines should be in separate ECDA regions
Coating Type - pipe	Mainline coating types within each unique ECDA region must have the same capacity for shielding pipe beneath areas of disbondment (i.e., coatings of significantly different dielectric constants require separate ECDA regions)
Coating Type - joints	Joint coating types within each unique ECDA region must have the same capacity for shielding pipe beneath areas of disbondment (i.e., coatings of significantly different dielectric constants require separate ECDA regions)
Coating Condition – high dielectric (shielding) coating types	The coating condition, expressed in terms of the amount of pipe exposed at holiday locations must be the same for each ECA region, when assessed on a scale of "good", "fair" and "poor"
Coating Condition – non-shielding coating types	The coating condition expressed in terms of both the amount of coating disbondment and the amount of pipe exposed at holiday locations must be the same for each ECDA region, when assessed on a scale of "good", "fair" and "poor".
Bonds to adjacent structures	Each unique ECDA region must represent a unique condition with respect to bonds to adjacent structures. In the case where the adjacent structures are buried, such as is the case for adjacent pipelines, the coating condition, number, and size of the buried structures must be generally the same throughout each ECDA region.
Proximity to other pipelines, structures, high-voltage electric transmission lines, and rail crossings	Regions where the CP currents are significantly affected by external sources should be treated as separate ECDA regions
Interference	Each unique ECDA region must be equally susceptible to stray current and interference – both from DC and AC sources.

Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

Data Element	Criteria
Soil characteristics / types	Each unique ECDA region must have soil conditions that are representative of the same general soil resistivity. For instance, low resistivity soils, such as moderately to poorly drained loam's, sands, and clays must be considered to be a distinct ECDA region from well-drained sands, or rocky soils.
Drainage	Influences where corrosion is most likely; significant differences may require separate ECDA regions
River Crossings / wetlands	This condition, where present, is cause for the creation of a unique ECDA region.
River weights and anchors	This condition, where present, may be cause for the creation of a unique ECDA region.
Frozen ground	This condition, where present, is cause for the creation of a unique ECDA region.
Land use (paved roads, etc.)	Paved roads, where they exist may require the creation of a unique ECDA region. Other land use issues can influence ECDA application and ECDA region selection
Locations of, and construction methods used at casings	This condition, where present, is cause for the creation of a unique ECDA region.
Anodic zones on bare pipe	This condition, where present, is cause for the creation of a unique ECDA region.
Route Changes / modifications	Changes may require separate ECDA regions
Route maps / aerial photos	Provides general applicability information and ECDA region selection guidance
Depth of cover	May require different ECDA regions for different ranges of depths of cover
Diameter	A diameter change beyond 3 nominal pipe sizes is cause for the creation of a unique ECDA region.
Construction Practices	Construction practice differences may require separate ECDA regions
CP system type	Each ECDA region must have the same CP system type and general design (i.e., interruptible anodes vs. non-interruptible anodes, anode spacing, rectifiers)

Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

Data Element	Criteria
Test point locations	Each ECDA region must have the same general accessibility via test point locations.
CP maintenance history / years without CP	May provide input when defining ECDA regions
Previous CIS data	May provide input when defining ECDA regions.
Monitoring programs – coupons, patrol, leak surveys, etc.	May provide input when defining ECDA regions
Pipe inspection reports – excavation	May provide input when defining ECDA regions
Locations of bends, including miter bends and wrinkle bends	Presence of miters and wrinkle bends may influence ECDA region selection
Locations of valves, clamps, supports, taps, mechanical couplings, expansion joints, cast iron components, tie-ins, insulating joints	Significant drains or changes in CP current should be considered separately; special considerations should be given to locations at which dissimilar metals are connected.
Repair history/records (e.g., steel / composite repair sleeves, repair locations, etc.)	Prior repair methods, such as anode additions can create a local difference that may influence ECDA region selection
Pipe operating Temperature / Age	Each ECDA region must have the same pipe temperature history with respect to the amount of time spent above the maximum operating temperature rating of the coating system. Significant differences require the creation of a new ECDA region.
Evidence of MIC (Microbiologically-Influenced Corrosion)	This condition, where present, is cause for the creation of a unique ECDA region.
Leak / rupture history (external corrosion)	Can indicate condition of existing pipe
Accessibility	Accessibility issues may limit the use of certain indirect inspection tools

Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

Table 9-1: Threshold Criteria for Various CIS Measurement Techniques

Circumstance	Optimal Measurement Technique(s)	Adopted Threshold Criteria*
Sacrificial anode CP system (not designed to allow interruption of all anodes simultaneously)	"On" Survey - Compensate for IR error by placing reference electrode directly over pipeline and as remote as possible from sacrificial anode. - If in doubt, or when potential readings are questionable, excavate to allow placement of reference electrode as close as possible to pipeline.	-850 mV "on"
Sacrificial anode CP system (designed to allow interruption of all anodes simultaneously)	Polarization survey	-100 mV polarization shift.
Impressed Current CP system - Distributed anode impressed current system - Coating in relatively good condition	Instant-off or Polarization Survey (for pipelines with a high dielectric strength coating, the instant-off technique may be easiest to use, however polarization technique may also be used)	-850 "off" (for instant-off); -100 mV polarization shift (for Polarization Survey)
Impressed Current CP system - Distributed anode impressed current system - Bare pipeline, or coating in poor condition	Polarization Survey	-100 mV polarization shift
Impressed Current CP system - Remote anode system - Low soil resistivity - High coating dielectric strength - Low circuit resistance of CP system	Instant Off Survey, Polarization Survey, On Survey - If an "on" survey is used, care should be taken to place the reference cell as close to the pipeline as possible. If in doubt, or when potential readings are questionable, excavate to allow placement of reference electrode as close as possible to pipeline.	- If an "on" survey is used, threshold criterion should be established on basis of knowledge of the dielectric strength of the coating, size of the pipeline, soil resistivity, distance and voltage at the anodes, rectifier output voltage, and rectifier output current. - If "instant off" survey is used, criterion should be –850 mV. - If polarization survey is used, criterion should be –100 mV.
Impressed Current CP system - Remote anode system, relatively good coating	Instant Off Survey, Polarization Survey	-850 mV instant off, -100 mV polarization shift
Impressed Current CP system - Remote anode system, bare, or poorly coated pipeline	Polarization Survey	-100 mV polarization shift

Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

Table 10-1: Guidelines for Severity Classification of Indications Utilizing DCVG Technique

Indication Classification	Defining Criteria	Comments
Minor	<= 15% IR AND cathodic / cathodic current flow characteristics	Indications in this category are often considered of low importance, and repair is usually not required.
Moderate	<=60% IR AND cathodic / neutral current flow characteristics OR >15% to <=60% IR AND cathodic / cathodic current flow characteristics	In this category, the indications tend to be larger, and/or the pipe at the location of the indications returns to native potential when the CP is interrupted.
Severe	> 60% IR OR anodic / anodic current flow characteristics	Indications in this category are largest and/or the pipe at the location of the indications is anodic at some point in the interruption cycle.

Exhibit A
Puget Sound Energy
Wrapped Steel Service Assessment Program
Electrical Survey Procedure and Criteria

Table 13-1: Guidelines for Prioritizing Indirect Inspection Indications

Immediate Action	Scheduled Action	Suitable for Monitoring
Multiple severe indications in close proximity to one another; Isolated indications that are classified as severe by more than one indirect inspection technique at roughly the same location; Where significant prior corrosion is suspected, individual indications that are classified as severe by one or more indirect inspection techniques; Where significant prior corrosion is suspected, groups of indications that are classified as moderate by one or more indirect inspection techniques; and, Indications which, when combined with other data, suggest the presence of third party damage	Regardless of the suspected prior corrosion activity, all severe indications that were not placed in the "immediate" category; Where moderate prior corrosion is suspected, all indications that are classified as moderate by one or more indirect inspection techniques, and that were not placed in the "immediate" category; and, In regions where severe prior corrosion is suspected, groups of indications, regardless of severity classification that were not placed in the "immediate" category.	All indications not otherwise classified as "immediate" or "scheduled".