US Army Corps of Engineers
North Pacific Division

CBT USER'S MANUAL

Columbia Basin Telecommunications Network

Revised 2004

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I.1 PURPOSE AND SCOPE OF MANUAL

The Columbia Basin Telecommunications (CBT) network provides the primary system for the exchange of data and text messages between select hydropower and flood control projects in the Pacific Northwest and their operating agencies. The CBT system exists to provide to these projects, and to the agency offices responsible for their operation, the current reservoir system and hydrometeorologic data necessary for their efficient, economic and safe operation.

The U.S. Army Corps of Engineers manages the CBT system for the mutual benefit of all cooperating agencies (see below). The CBT network includes both federal and private projects in the Columbia River Basin, including the Snake and Willamette River basins, and the Rogue River basin. This is the *Pacific Northwest Reservoir System* and is located at the following web location: http://www.nwd-wc.usace.army.mil/pdf/wmbroch.pdf

This manual is intended to be a basic reference guide for the CBT network users and operators. A review of the historic CBT network and telecommunications circuits will be presented, along with a description of the new CBT Web Messenger system, as there have recently been considerable changes made from the TTY circuits used for the first 40 years of operation. The configuration and use of the new CBT Web Messenger program will also be described in detail. The manual will discuss the required "protocols" used in the daily operation of the CBT system, i.e. what data are to be sent, when, by whom, to whom, and the required transmission format of the data. The system of project and data "codes" set up for the original CBT network has been a defining feature of the CBT system. These codes have subsequently been extended beyond those stations solely processed through the CBT system and applied to all data from throughout the Pacific Northwest collected and processed by the U.S. Army Corps of Engineers and the cooperating agencies. These CBT station codes and data codes are provided in Appendices A and B. The CBT system is expected to transition to the more universal and encompassing SHEF codes (Appendices D and E) in the near future.

This manual will briefly discuss the Columbia River Operational Hydromet Management System (CROHMS). CROHMS, also operated by the U.S. Army Corps of Engineers, collects and maintains data from many sources, the CBT being but one.

I.2. COOPERATING AGENCIES

Participation in the Columbia Basin Telecommunication system has varied over the years, mostly related to the inclusion of new agencies as new projects were constructed in the 1960's and 1970's. Participation is restricted to those agencies that have a real-time operational responsibility for one or more of the projects. Only five agencies (or their successors) have continuously participated since its inception in 1957. Current participants (as of July 2000) include:

Public Utility District No. 1 of Douglas County, WA
Public Utility District No. 1 of Chelan County, WA
Public Utility District No. 2 of Grant County, WA
Puget Sound Energy (PSE), Redmond, WA
Controlled Area Scheduling Services (CASSO Corp.), Spokane, WA
Seattle City Light, Seattle, WA
Tacoma Power and Light, Tacoma, WA
Eugene Water and Electric Board, Eugene, OR
PacifiCorp, Portland, OR
Portland General Electric, Portland, OR
Public Utility District No. 1 of Pend Oreille County, Newport, WA
PP&L Montana, Butte, MT
Avista Corporation, Spokane, WA
Bonneville Power Administration, Portland, OR and Vancouver, WA
U.S. Bureau of Reclamation, Boise, ID
U.S. Army Corps of Engineers, Portland, OR, Seattle & Walla Walla, WA
British Columbia Hydropower, Vancouver, B.C.

I.3. DISTRIBUTION

This CBT Manual will exist exclusively in electronic form on the web site of the Northwestern Division, US Army Corps of Engineers (http://www.nwd-wc.usace.army.mil) and may be considered in the public domain. Any party, public or private, is hereby granted permission to download and print this document for whatever use they may deem appropriate, but without any claim by the US Army Corps of Engineers or any other CBT cooperator as to its accuracy or completeness. As it will occasionally be necessary to revise this manual to reflect corrections, additions or changes in procedure or data being reported, such revisions will be made directly to the web site and highlighted to identify the change. Any corrections or suggestions for the manual may be sent informally by email to the Hydrologic Engineering Branch: dawning.liu@usace.army.mil or by surface mail to: U.S. Army Corps of Engineers, ATTN: CENWD-CM-WH, PO Box 2870, Portland, Oregon 97208-2870.

I.4. HISTORICAL REVIEW

The U.S. Army Corps of Engineers initiated the Columbia Basin Teletype Circuit (CBTT) in 1957. The original CBTT system used AT&T Model 15 or Model 19 teletypewriters and consisted of approximately 12 nodes serving 8 projects and their agency offices. These teletypes used 5-level BAUDOT coding and operated at 56 baud (60 “words” per minute). The Model 19’s had accessory perforated paper tape punch and tape reader units attached. (It is not known whether the circuits in this era were AT&T private line or dial-up TWX service.) Major construction of power and flood control projects during the 1960’s brought many more dams into the Columbia River basin, putting additional requirements on the CBT system. The Model 15’s and 19’s were subsequently replaced in 1969 by Model 33 or Model 35 ASR (Automatic Send/Receive) teletypewriters at each site. Each Model 35 ASR included a perforated paper tape punch and tape reader units along with the standard

keyboard and page printer units. Lines leased from AT&T at this time provided half-duplex Private Line Teletypewriter Service over a 110 baud (100 "words" per minute) circuit. This private circuit provided alternating two-way communications, permitting transmission of messages in either direction, but allowing only one station at a time to send. A Selective Calling System AT&T Model 35A Line Controller (LINCO) in Portland provided the intelligence for scheduling and controlling the message transmissions to permit each site an opportunity to send their message without interference from any other site. The CBT messages were prerecorded locally on punched paper tape in 8-bit ASCII coding and then the paper tape was re-fed through the ASR to queue the message for transmission over the teletype circuit in 8A1 protocol (a protocol commonly utilized in police TTY systems of this era). The LINCO unit would sequentially poll the list of sending stations, allocating the TTY circuit to the next station that replied that it has a message queued for transmission. The capability for manually composing the messages on the ASR keyboards was not a viable option because of the inherent slowness of manual typing. Unlike Central Broadcast TTY systems whereby most of the nodes function in listen-only mode, the CBT system is a large multiple-sending-node system (24 sending nodes in 1969) that must grant each node its own time-slice to compose and transmit their message. It also required the capability to permit unscheduled ad hoc message transmissions from the Reservoir Control Center, among others. Manual typing would have resulted in CBT messages queuing up and interfering with each other.

By 1976 the LINCO was upgraded to permit up to 49 transmission nodes, with the CBT system actively using 29 sending nodes, 5 read-only nodes, and a hardwire connection into the BPA RODS computer. The five projects in the Lower Snake TTY system operated as an independent system that used a CBT node at McNary Dam to relay messages between the two systems.

In 1978 the Corps inaugurated the Columbia River Operational Hydromet Management System (CROHMS) at their computer center in Portland. CROHMS is an interconnected system of interagency computers and automated remote data stations with a large cooperative data bank at the Corps' North Pacific Division (NPD) office. CROHMS utilized an Interdata computer as the "Central Facility Data Controller" (CFDC) to collect data from the CBT network, six Data Acquisition Controllers, the BPA RODS computer, and the GOES, AFOS and SNOTEL systems. The CFDC would then send the data to the Corps' IBM 360 mainframe for storage in the CROHMS database and for subsequent processing into "reports" that were transferred back to the CFDC. These CROHMS reports were available for access by dozens of agencies and hundreds of users throughout the Pacific Northwest. During this era the CBT LINCO was retired and the CFDC Interdata computer was programmed to function as the CBT poller.

In approximately 1981 the Model 33/35 ASRs were replaced by AT&T Model 43 teleprinters, which dispensed with the paper tapes and permitted faster transmission speeds. Internal storage buffers in the Model 43 teleprinters allowed for off-line message preparation, batch transmission, and 1800 baud transmission rates. The AT&T circuits were upgraded to permit 1200 baud operation.

The CFDC Interdata computer was replaced in 1987 by a VAX computer that became known as the CROHMS Automated Front End (CAFÉ) system. As part of this transition the CBT poller function was moved to a Sidereal Poller computer and the low speed TTY circuits were reconfigured into two distinct TTY broadcast circuits (Figure 1). The two-circuit configuration permitted the

Sidereal Poller to more efficiently poll the nodes and handle message broadcasts than did the single circuit configuration.

In 1996 many of the Model 43 Teleprinters were replaced with the PSS-2000 Workstation developed by Datamaxx Corporation. A Datamaxx PSS-2000 unit was essentially a PC adapter card, a dot-matrix printer, and PC software that emulated the AT&T teleprinter functions for a fraction of the cost of leasing the Model 43 unit. Along with this change, the Columbia Basin Teletype system began being called the Columbia Basin *Telecommunications* network, retaining the CBT acronym.

In August 1998 the CBT system began a transition that over the next year would totally replace all of the TTY units and the long haul, low speed dedicated TTY circuits with the CBT Web Messenger Network. As new circuits (to be described in the following section) were brought into service at each site, that site was migrated to the new "Web" based system. The Sidereal Poller was retired in December of 1998, with the polling function temporarily run from an available Sun workstation. Internet circuits, with direct dial-in circuits to back them up, were employed to provide interim capabilities while new circuits were awaiting installation. The last of the AT&T circuits was disconnected in May 6, 1999 and the TTY-based CBT network ceased to exist. The following section will provide the details of the CBT Web Messenger capabilities, the network topology and infrastructure, and the use and operation of the CBT Web Messenger software**.**

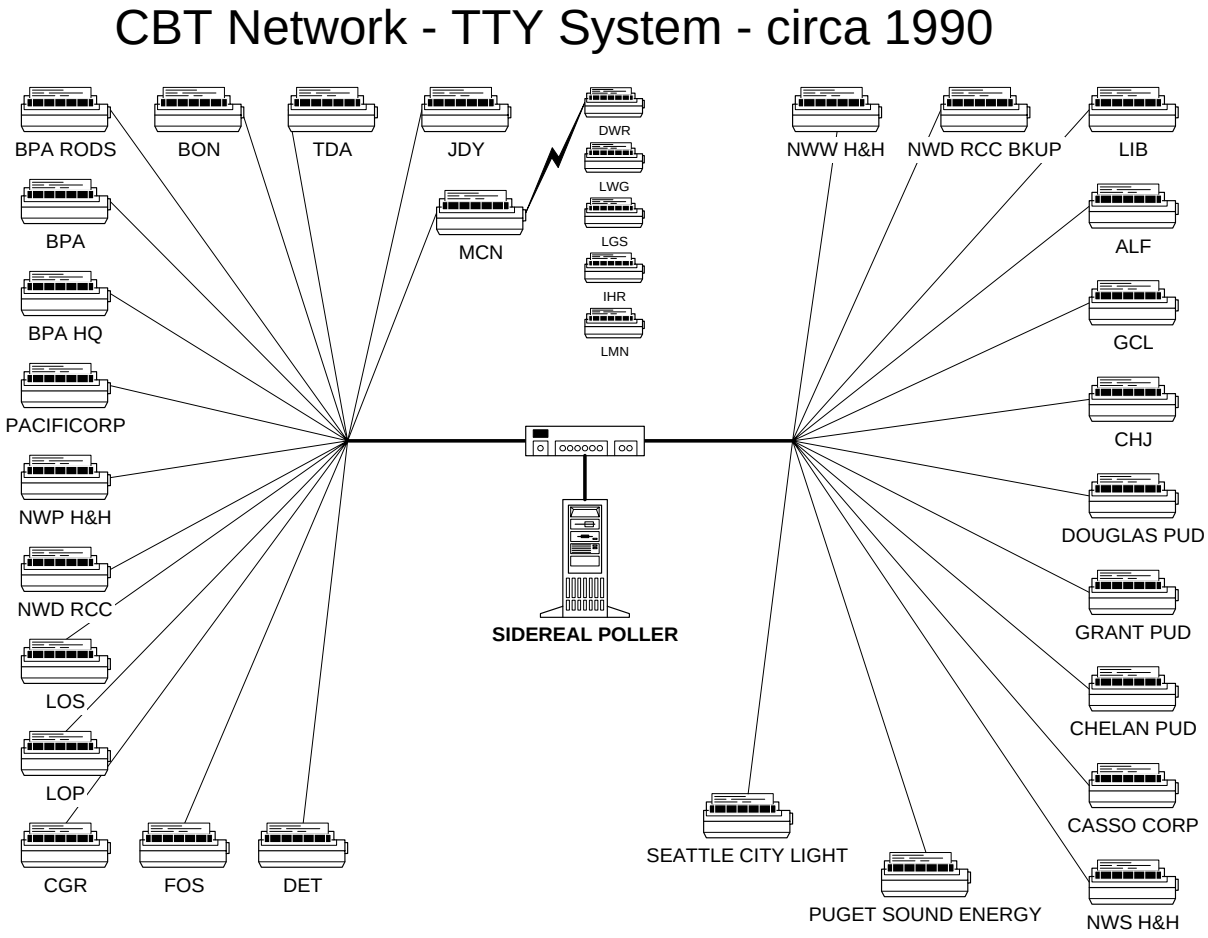


Figure 1 - CBT Teletype Network

I.5. CBT WEB MESSENGER DESIGN AND FUNCTION

Design Specifications. The following is a summary of the design specifications that were used in the development of the new CBT system:

Support legacy CBT message formats and protocols
Standard networking and communications protocols
Highly reliable central computer system
Dial-up communications alternative
Maximum use of commercial software
User interface easy to learn and use
Excellent message integrity
Excellent transmission speed
Low hardware and software capital costs
Low maintenance costs
System configuration easily modified (add or remove users/nodes)
Optional security features - user authentication and message encryption
Optional "rules" based message processing
Optional "bounds checking" on message creation
Optional "forms" features

I.5.a. Overview

The Columbia Basin Telecommunication (CBT) Web Messenger system that resulted from these specifications provides a client-server system based on "Web-pages" that are available to the user for both the creation of new CBT messages and the reading of current messages. Computer-to-computer automated message delivery and retrieval using FTP procedures is also supported.

The CBT Web Messenger uses a standard personal computer running Microsoft Windows and Netscape Communicator web browser software for most of the 35 nodes in the CBT system. The Corps maintains the CBT web site on a web server running on the current CAFÉ computer platform. Using their web browser through a standard network connection to the Corps of Engineers CBT web site, each CBT node can input and view their project's CBT data in real time. A few CBT nodes are using automated scripts to send and receive their CBT messages using FTP methodology over standard network circuits.

I.5.b. Network Connections and Topology

The TTY-based circuits of the first 40 years provided an extremely simple, yet inflexible and costly communications infrastructure (see Figure 1). The new CBT network provides a collection of smaller independent networks linked together at the Corps' computer center in Portland (Figure 2). The new CBT network also accommodates connections from the Internet through the Corps' CEAP Internet gateway at the CEAP Western Processing Center in Portland and dial-up Point-to-Point Protocol connections have standard telephone circuits to the CEAP Western Processing Center 56K modem pool. The networks that collectively make up the new CBT network are as follows:

- The Corps' Seattle District Network – T1 circuits connecting four projects to Seattle District office
- The Corps' Walla Walla District Network - T1 circuits connecting Lower Snake River and McNary projects to Walla Walla District
- The BPA Microwave Network - BPA microwave circuit connecting five Lower Snake River
- basin projects to McNary
- The Corps' Portland District Network ("POPNet-PDX") – Frame Relay circuits connecting five projects to Portland District
- The Corps' Portland District Network ("POPNet-Valley") – Frame Relay circuits connecting four projects to Portland District
- Bonneville Power Administration's T1 circuits – Two T1 circuits, one each between BPA/Dittmer and the Corps and BPA/HQ and the Corps
- The US Bureau of Reclamation network – connects USBR projects to NWRFC.
- The National Weather Service Northwest River Forecast Center (NWRFC) – routes USBR network over Portland MAN circuit, to Corps' computer center in Portland.
- The Corps/Casso frame relay circuit – Frame Relay circuit connecting Casso Corporation and power companies to the Corps
- The Corps of Engineers' Enterprise Information Systems network ("CEEIS") – T1 circuits connecting Seattle and Walla Districts to the computer center in Portland. The CEEIS Western Processing Center in Portland also provides the Corps' west coast Internet gateway and the Radius dial-in modem pool.
- The Corps' Portland MAN circuits – Fiber-optic ATM circuits connecting Northwestern Division office with the computer center at Portland District
- The Internet – via the Corps' Internet gateway in Portland
- "Plain-Old-Telephone-Service" (POTS) circuits for PPP dial-up connections

CBT Network Circuit Chart

CBT PROJECT/ SITE	PRIMARY (LOCAL) CIRCUIT	INTERMEDIATE SITE	INTERMEDIATE CIRCUIT(S)	TARGET SITE
Libby Dam	Corps: Seattle District T1	Seattle District	Corps: CEAP T1	RDP
Albeni Falls Dam	Corps: Seattle District T1	Seattle District	Corps: CEAP T1	RDP
Chief Joseph Dam	Corps: Seattle District T1	Seattle District	Corps: CEAP T1	RDP
Lake Washington Canal	Corps: Seattle District T1	Seattle District	Corps: CEAP T1	RDP
Seattle District	Corps: Seattle District LA LAN	Seattle District	Corps: CEAP T1	RDP
Dworshak Dam	BPA Microwave	McNary Dam	Corps: Portland District Frame Relay –PDX (Alternate circuit: T1 line from project to Walla Walla District to CEAP T1)	RDP
Lower Granite Dam	BPA Microwave	McNary Dam	Corps: Portland District Frame Relay –PDX (Alternate circuit: T1 line from project to Walla Walla District to CEAP T1)	RDP
Little Goose Dam	BPA Microwave	McNary Dam	Corps: Portland District Frame Relay –PDX (Alternate circuit: T1 line from project to Walla Walla District to CEAP T1)	RDP
Ice Harbor Dam	BPA Microwave	McNary Dam	Corps: Portland District Frame Relay –PDX (Alternate circuit: T1 line from project to Walla Walla District to CEAP T1)	RDP
Lower Monumental Dam	BPA Microwave	McNary Dam	Corps: Portland District Frame Relay –PDX	RDP

CBT PROJECT/ SITE	PRIMARY (LOCAL) CIRCUIT	INTERMEDIATE SITE	INTERMEDIATE CIRCUIT(S)	TARGET SITE
			(Alternate circuit: T1 line from project to Walla Walla District to CEAP T1)	
McNary Dam	Corps: Walla Walla District LAN	Walla Walla District	Corps: CEAP T1	RDP
Walla Walla District	Corps: Walla Walla District LAN	Walla Walla District	Corps: CEAP T1	RDP
John Day Dam	Corps: Portland District Frame Relay –PDX	--	--	RDP
The Dalles Dam	Corps: Portland District Frame Relay –PDX	--	--	RDP
Bonneville Dam	Corps: Portland District Frame Relay –PDX	--	--	RDP
Lookout Point Dam	Corps: Portland District Frame Relay –PDX	--	--	RDP
Detroit Dam	Corps: Portland District Frame Relay –PDX	--	--	RDP
Foster Dam	Corps: Portland District Frame Relay -Valley	--	--	RDP
Cougar Dam	Corps: Portland District Frame Relay –Valley	--	--	RDP
Lost Creek Dam	Corps: Portland District Frame Relay –Valley	--	--	RDP
Portland District	Corps: Portland District LAN	--	--	RDP
North Pacific Division-Primary (RCC)	US West LSS MAN	--	--	RDP
North Pacific Division-Seconda	US West LSS MAN	--	--	RDP
BPA HQ	BPA: US West T1	--	--	RDP
BPA Duty Schedulers	BPA: US West T1	--	--	RDP
BPA RODS computer	BPA: US West T1	--	--	RDP
Bonneville Power Dittmer	BPA: US West T1	--	--	RDP
CASSO Corporation	Winstar/US West Frame Relay	--		RDP
Grant Co PUD	Winstar/US West Frame Relay	--	--	RDP
Douglas Co PUD	Winstar/US West Frame Relay	--	--	RDP
Avista Corp	Winstar/US West Frame Relay	--	Alternate circuit – Internet	RDP
PP&L Montana	Winstar/US West Frame Relay	--	Alternate circuit – Internet	RDP
BC Hydropower	Internet	--	--	RDP
Puget Sound Energy	Internet	--	--	RDP
Seattle City Light	Internet	--	--	RDP
Tacoma Power	Internet	--	--	RDP
Portland General Electric	Internet	--	--	RDP
PacifiCorp	Internet	--	--	RDP
Eugene Water & Electric	Internet	--	--	RDP
Chelan Co PUD	Internet	--	--	RDP
Pend O'reille Co PUD	Internet	--	--	RDP
Grand Coulee Dam & Hungry Horse Dam	USBR WAN	USBR/NWRFC	Qwest LSS	RDP

CBT PROJECT/ SITE	PRIMARY (LOCAL) CIRCUIT	INTERMEDIATE SITE	INTERMEDIATE CIRCUIT(S)	TARGET SITE
** ALL PROJECTS **	PPP Dial-In over standard phone line	Western Proc Center Modem Pool in Ptld		RDP

Figure 2

"RDP" is the Corps' computer center in Robert Duncan Plaza, Portland, Oregon. This computer center includes the Portland District computers and networks, the Northwestern Division Water Control Data System computers, and the CEAP Western Processing Center, which includes the CEAP computers, the Internet gateway, the dial-in modem bank, the Network Operations Center, and the CEAP 24x7 operations center.

The five projects in the Lower Snake River System have a unique fully automated telecommunications system that utilizes the BPA microwave network to transmit and receive their CBT messages (Figure 1). The DACS software at each project is programmed to automatically generate the CBT project data messages throughout the day. Each local PDP-11 DACS computer has a modem connection into the BPA microwave circuit and is assigned a unique microwave transmission frequency. A microwave antennae at McNary project receives these five signals, separates the signals by frequency, and transmits the signals into each of five modems connected to a Sun Sparcstation computer (the "McNary Controller"). The McNary Controller checks every few seconds for new messages, and performs an FTP transfer of the message to the CBT Web Messenger computer in Portland. It similarly checks the CBT Web Messenger computer in Portland for new messages addressed to any of it's five Lower Snake River System projects, pulls those messages back, and retransmits them over the BPA microwave link to the DACS systems at the target projects.

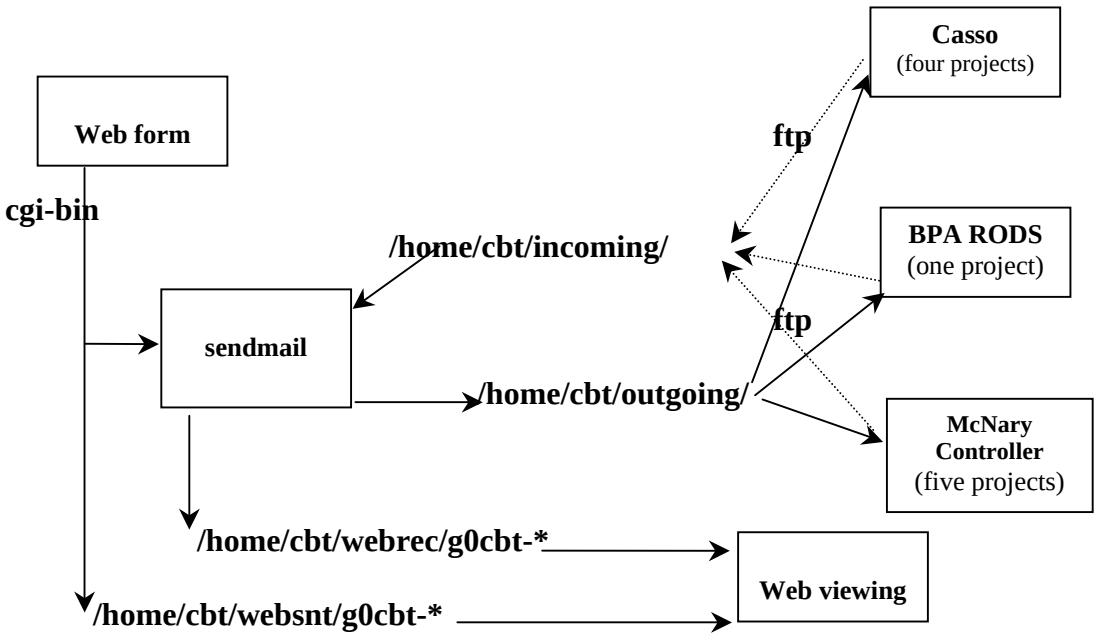
Due to the use of standard TCP/IP networking protocols and client-server software, the new CBT network no longer relies on hardwired nodes at fixed locations, i.e. any individual (or multiple individuals) with an CBT User-ID and password can access their CBT web page if their computer is anywhere on one of the incorporated networks or the Internet. The Call Directing Codes (CDC's) of the old CBT have been retained and provide a two-character ID to designated each project. The CDC's for the operating agencies provide additional flexibility in the new CBT system since they are not tied into a particular piece of hardware on a particular circuit. This provides the ability for multiple users at the Seattle District office, for example, to use the CBT account assigned to "NS", the Seattle District CDC, at the same time, from multiple locations, or for a manager to dial into an internal network from home and access the latest CBT data.

All CBT data is now coming to us using the CBT Web Messenger and/or FTP.

1.5.c. CBT Web Messenger Server Design

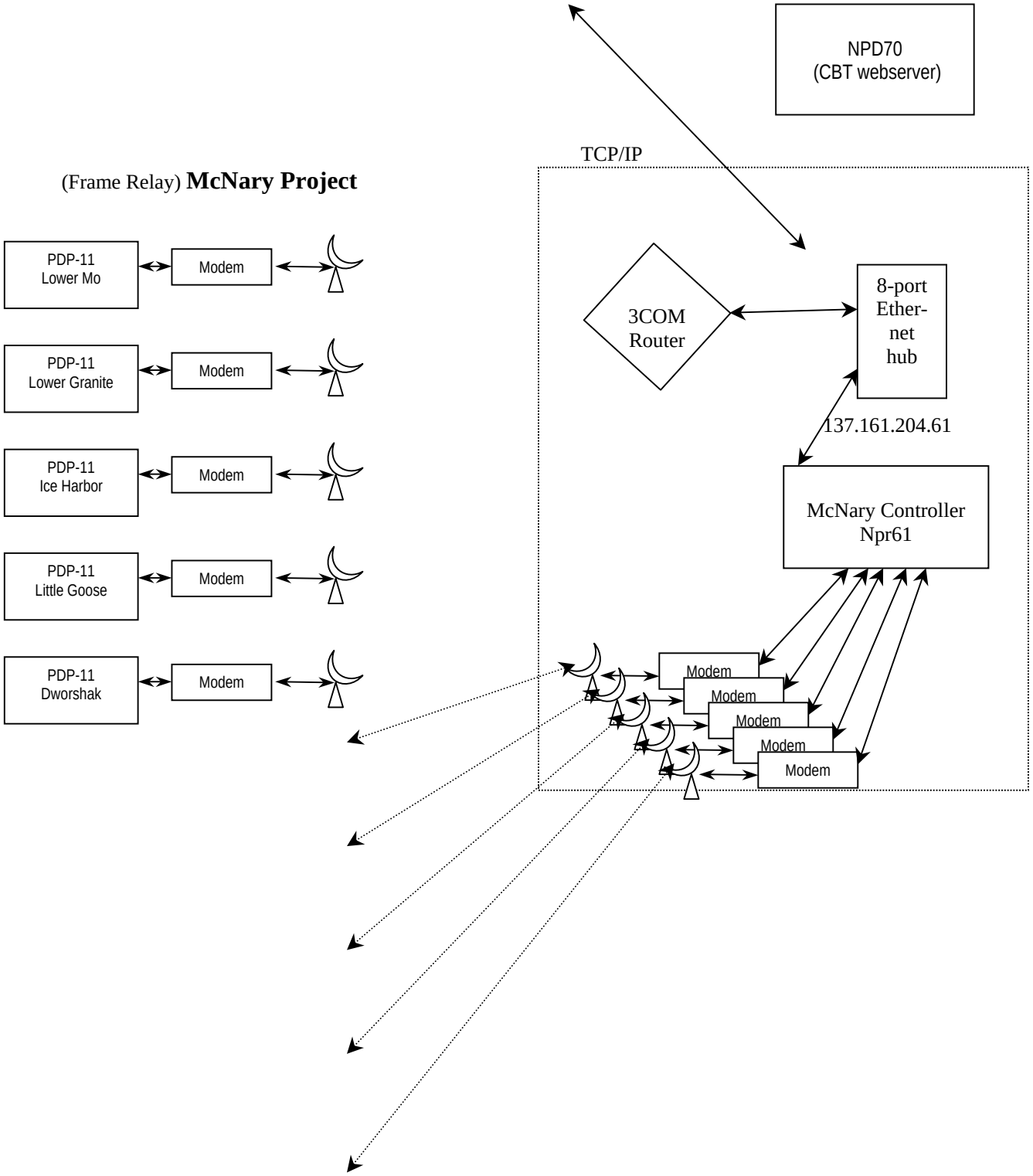
The CBT Messenger Network operation uses a web-based message delivery capability and an email based message retrieval along with flexible telecommunications media (frame relay, T1, BPA microwave, etc).

HOW THE DATA FLOWS IN THE CBT SYSTEM



1.5.d. McNary Controller

HOW THE MCNARY CONTROLLER (NPR71) EXCHANGE DATA WITH THE DACS SYSTEMS



I.5.e. PROCEDURE TO REPORT PROBLEMS

Occasionally the CBT Messenger Network will "go down" for some minor reason. In case these things happen during normal business hours, 0730-1600 Monday through Friday, call the Hydrologic Engineering Branch in Portland, Oregon, at (503) 808-3963 (Dawning Liu). For problems after duty hours and weekends call the Computer Center in Portland at (503) 808-5100.

II. CBT DATA FORMATS

II.1. GENERAL OPERATIONS

An important aspect of sending any CBT message is the Call Directing Code (CDC). These codes are entered at the time of initiating message (see Example 1). Call Directing Codes are a two-letter abbreviation for each station on the network. Below is a list of each CDC, three letter station identifier and station name. Also, notice the five group codes; by using the group code many stations can receive a message using only one-two CDC.

GROUP CODES

VV - All points Lower Snake
WW - All points Willamette – APW
XX – All points Lower Columbia – APL
YY – All points Upper Columbia – APU
ZZ – All points Columbia – APC

TABLE 1

CALL DIRECTING CODES (CDC) for single project

Station Name	Station Identifier	CDC
Albeni Falls	ALF	AL
Bonneville Dam	BON	BO
BPA Dittmer	BPA	BP
BPA Portland	BPA	BB
BPA Dittmer	BPA	BE
BPA Portland	BPA	BH
Casso Corps	ICP	IC
Cougar Dam	CGR	CG
Chief Joseph	CHJ	CH
Detroit Dam	DET	DE
Dworshak	DWR	DW
Ephrata, Grant Co PUD	EPH	EP
Foster	FOS	FO
Grand Coulee	GCL	GC
Ice Harbor	IHR	IH
John Day Dam	JDA	JD
Little Goose Dam	LGS	LG
Libby Dam	LIB	LI
Lower Monumental Dam	LMN	LM
Lookout Point Dam	LOP	LP
Lost Creek Dam	LOS	LS
Lower Granite Dam	LWG	LW
McNary Dam	MCN	MC
North Pacific Div	NPD	ND
NPD Backup Terminal	NPB	NB

Table 1 (continued)

Portland District	NPP	NP
Seattle District	NPS	NS
WallaWalla District	NPW	NW
PACIFICORPS	PPL	PL
Puget Sound Energy	PUG	PU
NPD Computer	NPC	RR
Seattle City Light	SCL	SC
The Dalles Dam	TDA	TD
Tacoma City Light	TCL	TP
Wells, Douglas Co PUD	WEL	WL
Wenatchee, Chelan PUD	WEN	WN

CALL DIRECTING CODES FOR GROUP OF PROJECTS

AA: AL,BB,BE,BH,BO,BP,CG,CH,DE,DW,EP,FO,GC,IC,IH,JD,LG,LI,LM,LP,LS,LW,MC,NB,ND,NP,NS,PL,PU,
RR,SC,TD,WL,WN,NW,TP
AF: AL,BB,BH,BE,BP,IC,NB,ND,NS,RR,SC
BS: BE,BP,CG,FO,IC,LP,NB,ND,NP,RR,BB,BH
CJ: BE,BP,CH,EP,GC,IC,NB,ND,NS,RR,WL,BB,BH,TP,PG
CN: BB,BH,BE,BO,BP,DW,IC,IH,JD,LG,LM,LW,NB,ND,NP,RR,TD,NW,IC,TP
CO: BE,BO,BP,IC,JD,MC,NB,ND,NP,RR,TD,BB,BH
DF: BB,BH,BE,BO,BP,DW,EP,IC,IH,JD,LG,LM,LW,NB,ND,RR,TD,NW,TP
DR: BB,BH,BE,BP,DW,IC,IH,LG,LM,LW,MC,NB,ND,RR,NW,WL
EL: BB,BH,BE,BP,CH,EP,GC,IC,MC,NB,ND,NS,PL,PU,RR,WL,WN,TP,PG
EN: BB,BH,BE,BP,EP,GC,IC,MC,NB,ND,PL,PU,RR,WL,WN,TP,PG
FI: BO,EP,IC,IH,JD,LM,MC,TD,WL,WN,BP,BE,BB,BH,TP
GS: BB,BH,BE,BP,DW,IC,IH,LM,LW,MC,NB,ND,RR,NW,LG
HC: BB,BH,BE,EP,IC,NB,ND,NS,PL,PU,RR,SC,WL,WN,NW,TP
HC: BB,BH,BE,IC,NB,ND,NS,PL,PU,RR,SC,WL,WN,NW,TP,PG
HR: BE,BP,DW,IC,LG,LM,LW,MC,NB,ND,RR,WL,BB,BH,NW
LB: AL,BE,BP,IC,LI,NB,ND,NS,RR,BB,BH
LO: BE,BP,IC,LS,NB,ND,NP,RR,BB,BH
MN: BB,BH,BE,BP,DW,IC,IH,LG,LW,MC,NB,ND,RR,NW,LM
MY: BB,BH,BE,BP,EP,IC,IH,JD,MC,NB,ND,RR,NW,TP
NO: CG,FO,IC,LP,NB,ND,NP,RR,BB,BH,BE,BP
PH: BB,BH,BE,BP,CH,GC,IC,MC,NB,ND,NS,PL,PU,RR,SC,WL,WN,NW,TP
PO: BE,BP,CG,DE,FO,IC,LP,NB,ND,NP,RR,BB,BH,TP
RI: AL,BE,BP,EP,IC,NB,ND,NS,RR,BB,BH,NW,TP
SN: BB,BH,BE,BP,IC,IH,LG,LM,LW,MC,NB,ND,RR,NW
VV: DW,IC,IH,LG,LM,LW,NB,ND,BB,BH,BE,BP,NW
WA: BO,CG,DF,DW,FO,IC,IH,JD,LG,LM,LP,LS,LW,NB,ND,TD,BB,BH,BE,BP,NW
WB: AL,BO,BP,CG,CH,DE,DW,EP,FO,GC,IC,IH,JD,LG,LI,LM,LP,LS,LW,MC,NB,ND,NS,PU,SC,TD,WL,
WN,BO,BP,CH,DW,EP,GC,IC,IH,JD,LI,LM,LW,MC,NB,ND,NS,PU,SC,TD,WL,WN,LG,BE,BB,BH,NW,CG,TP
WG: BE,BP,DW,IC,IH,LG,LM,MC,NB,ND,RR,BB,BH,NW
WK: AL,BO,CH,DE,DW,FO,GC,IC,IH,JD,LG,LI,LM,LP,LS,LW,NB,ND,NP,TD,WL,BE,BB,BH,BP,NW
WR: BE,BP,IC,IH,LG,LM,LW,MC,NB,ND,RR,WL,BB,BH,NW
WW: BP,CG,DE,FO,IC,LP,LS,NB,ND,NP,RR,BB,BH
XX: BO,BP,DW,GC,IC,IH,JD,LG,LM,LW,MC,NB,ND,NP,PU,RR,TD,WL,BB,BH,NW,PL
YY: AL,BP,CH,EP,GC,IC,MC,NB,ND,NS,PL,PU,RR,SC,WL,WN,BB,BH,NW,IC,TP,PG
ZZ:AL,BO,BP,CH,DW,EP,GC,IC,IH,JD,LG,LI,LM,LW,MC,NB,ND,NP,NS,PU,RR,SC,TD,WL,WN,BB,BH,NW,
PL,PG

All CBT messages begin with a station identifier. The station identifier is a three-character or four-character code that usually has some phonetic significance. A more complete discussion of the station identifiers will be given in the next chapter.

A complete list of the Station Identifiers Currently in Use with Incoming Data can be found on the following web site: http://www.nwd-wc.usace.army.mil/ftppub/cafe/station_info.txt

A complete list of the Station Identifiers Not In Use with Incoming Data can be found on the following web site: http://www.nwd-wc.usace.army.mil/ftppub/stationsnotused.txt

A complete list of Stations Alphabetized by Name can be found at the following web site:
http://www.nwd-wc.usace.army.mil/cafe/location.prn

The web sites listed above include the National Weather Service's Handbook 5 station identifiers.

The National Weather Service has developed its own convention for allocating station identifiers. These are called Handbook 5 identifiers. The identifiers are very similar to CROHMS station identifiers, except there is a number in the fifth field. The number indicates the state the gage is in. For example, ABDI1 is Aberdeen, where I1 stands for Idaho; Idaho is the first state alphabetically that begins with I. Similarly, O3 in the fourth and fifth position stands for Oregon, the third state alphabetically to begin with O. Currently, the National Weather Service transmits data into the CROHMS system using these Handbook 5 identifiers, but all data are stored using CROHMS station identifiers. Identifiers are four letters long. Aberdeen would be stored as ABDI, where I alone would indicate Idaho, and O in the fourth position would indicate Oregon.

Since the first four spaces of a CBT message are reserved for the station identifier, the fifth and sixth spaces will describe the format of the message. Each of the formats will be discussed in detail in Section II.3.b through II.3.m.

The date and time of an observation begins in the seventh space of the message. The date describes the month and day of the observation, followed in some cases by the hour of the observation (not the hour of transmission), or the year. Again, this will be discussed in detail in each format description.

A system of one-and two-character parameter codes has been devised to describe each datum that is sent over the CBT. A one-character parameter code is usually found in an "F" format transmission and indicates the amount a spillway gate is open. For example, A2/G3 in the "F" format implies the first gate is open 2 feet and the seventh gate is open 3 feet. Two letter parameter codes are more frequently used and more widely recognized. In sending these data, the proper units are an important factor to be observed. A complete list of all parameter codes can be found in Appendix D. Also, frequently used parameter codes include a time frame such as: instantaneous value, daily value, or hourly value.

II.2 EQUIPMENT

II.2.a. The CBT Web Messenger

A website is set up for this purpose: http://cbt.nwd-wc.usace.army.mil.

The first page is a login page, prompting USERID and PASSWORD. Every CBT site has a USERID and PASSWORD. If the USERID check failed, the browser stops going any further. If you pass the password check, you will be brought to the main page, where you type in the CBT message.

Behind the web interface is an email system. The web page is only an interface between the users and the mail application of the server. When you send out the message from your web browser, the server's email application takes it over. The email program uses the CDC codes to deliver the messages to the appropriate projects. Some other programs are run in the background and/or cronjob handling files ftp to and from automated projects. These programs also interact with the email system.

II.2.b. Instructions

CBT message can be sent manually or automatically.

Manually: Operators use the CBT Web Messenger to enter and send out data. The initial page is a login page. Each project has a login identification beginning with g0cbt- . The password check is independent of the system's password check. The web page maintains its own password database. The database is generated based on the system's password shadow file.

Automatically: The Snake River projects, including Ice Harbor, Dworshak, Little Goose, Lower Monumental, and Lower Granite, are all automated. The DACS system (PDP-11) collect data and create files. The data is sent to a serial port and captured by a modem. The modem sends the data to a microwave antenna managed by BPA.

II.3 CBT DATA FORMATS

II.3.a. GENERAL

Special and generalized formats have been developed for most of the data transmitted via the CBT Web Messenger. These formats organize data so reports are shorter and can be scanned quickly by users; they also make automatic processing simple.

A SAMPLE RECEIVED DATA FILE

09:03 09/14/1999 From: Cougar To: CG WW RR BE
CGR H 091409 0/0/.71/.05/.66/1650.23/1251.73/0/002

09:02 09/14/1999 From: John_Day To: XX RR BE
JDA H 091409 908/2/122.2/119.7/1.5/264.2/159.2/565/071013

A SAMPLE SENT DATA FILE

07:14 09/14/1999 Sent To: MC CN
MCN H 091407 624/4/125.7/121.0/0.0/337.7/265.1/180/061010

07:13 09/14/1999 Sent To: MC CN
MCN H 091406 622/4/124.3/119.6/0.0/337.6/264.8/180/061010

07:12 09/14/1999 Sent To: MC CN
MCN H 091407 624/4/125.7/121.0/0.0/337.7/265.1/180/061010

II.3.c. "A" FORMAT DESCRIPTION

Any number or sequence of those parameters listed in Appendix D, except for fish counts and spillway gate openings, can be reported in the flexible "A" format. This format is indicated by the letter "A" in the fifth space and the report preamble is constructed as explained in preceding paragraphs. The first parameter code in an "A" type report always begins in the twelfth space and thereafter the report is flexible. Only one line of data is permitted in each "A" formatted report buy any number of reports are permitted in a message. If more than one line is required to report data from a station, then each line must begin with a standard formatted preamble (station identifier, format indicator and date-time group). For automatic processing purposes an "A" format report is terminated by a carriage return, line feed or three consecutive blank spaces.

Some examples of data reports in the "A" format and the decoding of these reports are given below:

IHR A 0131 MX38/MN32/H06/OB33/PP0/WV3604//WF36/WT+

IHR	**Station Identifier for Ice Harbor Dam**
A	**Format Indicator**
0131	**January 31**
MX38	**Daily maximum air temperature was 38 Degrees F.**
MN32	**Daily minimum air temperature was 32 Degrees F.**
H06	**The rest of the data in the transmission are 0600 hours observations**
OB33	**At observation time the air temperature was 33 Degrees F.**
PP0	**Total daily precipitation was zero**
WV3604	**Observed wind velocity was from 360 Degrees at 4 mph**
WF36	**River water temperature at 0600 was 36 degrees F.**
WT+	**Water turbidity was missing**

DCDBA 0131 H24/FB1829.92/ID1.68/QD3.98/MX+/MN+/PP0.01

DCDB	**Station Identifier for Duncan Dam**
A	**Format Indicator**
131	**January 31**
H24	**Following data re for 2400 hour**
FB1829.92	**Forebay reading was 1829.92 feet**
ID1.68	**Daily mean inflow was 1.68 kcfs**
QD3.98	**Daily mean discharge was 3.98 kcfs**
MX+	**Maximum air temperature was not available**
MN+	**Minimum air temperature was not available**
PP0.01	**Daily total precipitation was a trace**

NOX A 0131 H00/FB2330.80/QD75.5

NOX	**Station Identifier for Noxon Rapids Dam**
A	**Format Indicator**
131	**January 31**
H00	**Following data are for 00 hours; the same time as January 30 at 2400 hours**
FB2330.80	**The forebay reading was 2330.80 feet**
QD75.5	**Daily mean outflow was 75.5 kcfs**

Notice that January 31 does not have a year indicated. The computer puts a year on the data, based on a six-month window that begins at the current system time and goes backward six months. Once-a-day observations that are routinely made at the same hour each day (see Reference 2, Scheduled Transmissions from all Stations) normally are only identified by the date in the preamble if it is a midnight to midnight reading, such as the first two parameter codes in the first example message. The one per day readings that are taken from 0700 to 0700 also includes the hour of observation in the data. The second example illustrates the method used to indicate data parameter readings that have intentionally been left out so that other stations in the network will know these parameters (MX and MN in this case) have not been inadvertently omitted.

Parameter readings that are missing are indicated by a "+" following the parameter code as illustrated in the second example above. Missing data should be indicated by a single plus ("+"). Parameter readings that are zero should be reported as "0" and not simply omitted. The above procedures will eliminate any ambiguity in data transmission. If there is no entry following the parameter code it will be assumed the data were omitted and a corrected report should be sent.

II.3.d. "AR" FORMAT DESCRIPTION

The letters "AR" in the fifth and sixth spaces of a CBT formatted report indicate that data are being submitted in an "A" format for the purpose of replacing data that have been previously reported in either an "A" or "B" format. Except for the "R" in the sixth space, the "AR" format is identical to the "A" format, but the "A" format will not replace data. The "R" must be in the

sixth column for the revision of existing data to take place. An example of an "AR" formatted report and the decoding of this report is given below:

IHR AR0131 MX40/MN+

IHR	**Ice Harbor Dam**
AR	**Format Indicator**
0131	**January 31**
MX40	**The correct daily maximum air temperature was 40 Degrees F. and not the previously reported value. (See the first "A" report in paragraph II.3.b).**
MN+	**The daily minimum air temperature was missing rather than being the previously reported value.**

II.3.e. "B" FORMAT DESCRIPTION

The letter "B" is used in the fifth space of a CBT formatted report to indicate that the data are in the basic listing type format. This multiple line format is very flexible. It has been developed for the convenient listing of repetitious data where the parameter codes and their sequence are specified in the first line of the report, and then the data readings are entered for individual stations on subsequent lines. The subsequent lines are numbered except for the last line in the report, which simply includes the word "END", and this terminates the report. For data processing purposes a "B" report is also terminated by a blank line or a line in which the first three spaces are blank. Any parameter than can be reported in the "A" format can be reported in the "B" format. This means that any number or sequence of those parameters listed in Appendix D, except for fish counts and spillway gate openings, can be reported in the "B" format. Any number of lines of data can be sent in a "B" formatted report, but the normal minimum is at least three numbered lines (one each for three individual data stations). In the "B" format, each line of data must begin with a character, either a number or text. The first line of the "B" format begins with a character, the station/agency identifier. Each data line must begin with a number; a blank in the first column is not allowable. The last line of the transmission is the word "END" in the first three columns. In many cases, the "A" format is more convenient that the "B" format and the "A" format is more generally preferred because it is subject to fewer encoding errors and is easier and quicker to decode.

Two examples of data reports in the "B" format and the decoding of those reports are given below:

NPD B 1206 H22/PQ/MD1207/H04/PQ/PP/SD

1 AST .001/.40/.53/0
2 BOKO +/.18/.41/0
3 EUG .001/.32/.70/0
4 LKVO +/+/+/+
5 MFR 0/.01/.05/0
6 ONP .09/.25/.83/0
END

NPD	**Sending station identifier, North Pacific Division Corps of Engineers**
B	**Format Indicator**

1206	**December 6, which applies until the MD parameter changes the date**
H22	**Reading is for hour 2200. Had no hour been specified, all data would be assumed to be at the default hour of 2400, midnight.**
PQ	**Parameter code for 2200 hour reading on December 6 for each of the stations named at the beginning of each of the numbered lines to follow. See Appendix D for parameter definitions.**
MD1207	**For the rest of the parameters, the date is December 7, 0400 hours, for each station. See Appendix D for parameter definitions.**
1 AST	**Each subsequent line is numbered to indicate the message is being continued. The identifier of the station to which the data on that line apply is the second item given. See Appendix A for definition of station identifiers.**
.001	**At Station AST the reading for parameter PQ was .001 at 2200 hours on December 6; on December 7 at 0400 hours, PQ was .40, PP was .53 and SD was 0. The numerical data on subsequent lines are decoded similarly.**
END	**Indicates official end of report.**

BCH B 0130 MX/MN/PP/SD/MD0131/MX/MN/PP/SD

1 CPBB 17/6/0/+/14/-3/0/54
2 RVBB 32/21/0/40/33/20/+/45
3 YFBB 40/30//2/51/34//+
4 FDLB 19/16/.68/+/31/24/1.51/+
5 GRPB 25/19/.53/1.5/36/20/1.54/1.5
END

BCH	**Sending station identifier, B.C. Hydro and Power Authority**
B	**Format indicator**
130	**January 30 which applies to all data until a new date is specified.**
MX/MN/PP/SD	**Parameter code list for the first four data values in each of the subsequent data lines**
MD0131	**The data values for the following parameter codes in each line are dated January 31**
MX/MN/PP/SD	**Second group of parameter codes in the sequence that data are to be reported on following lines.**
1 CPBB	**Each subsequent line is numbered and includes a data station identifier.**
17/6/etc	**At Station CPBB on January 30, the reading for parameter MX was 17 Degrees F; MN was 6 Degrees F; PP was zero inches of water; the SD reading is missing or not available; and on January 31 MX was 14 Degrees F; MN was minus 3 Degrees F; PP was zero inches of water; and SD was 54 inches of snow. The numerical data on subsequent lines are decoded similarly.**
END	**Indicates official end of report.**

The first parameter code in the leading line of a “B” formatted report must always begin in the twelfth space and thereafter the report Construction is flexible. The above examples illustrate several optional features in the construction of the “B” format. The first report has been constructed normally.

The second report also illustrates how one or more date-time parameters can be specified in the leading line. This is a useful feature that has been developed for the listing of data in a repetitious pattern for several days as might be done following a weekend or holiday. This does make the data more difficult to read and is subject to more encoding errors. Therefore, some offices prefer not to use this feature, but it is acceptable when applied properly.

In the past, there have been misunderstandings and some ambiguity in reporting with the "B" format data readings that are zero and those that are missing or not available. To clarify this situation all data readings of zero should be reported as "0" while missing and unavailable readings are reported as "+". This procedure is demonstrated several times. At station CPBB for January 30 parameter PP was zero, SD was missing or unavailable, for January 31 PP was zero, SD was missing or unavailable, and for January 31 PP was zero. At station RVBB the parameter PP was zero the first day and was missing the second day. At station YFBB parameter PP was missing the first day while on the second day the readings for PP and SD were both omitted and, therefore, assumed to be missing or not available. Notice that the value of PP is not shown as "0" or "+". Rather, the CBT coding is two slashes (//). In this case, PP was not available at the time of transmission and should be sent later. At station FDLB parameter SD was not available either January 30 or 31. This procedure of reporting "0" for zero readings and "+" to indicate missing parameter readings solves the ambiguous situations for automatic processing purposes, but can leave room in some cases for human conjuncture as to why the readings are not available. In the "B" format, as in the "A" format only a single "+" should be used to indicate missing data; multiple pluses are unacceptable.

It should be noted that any station can be reported on any numbered line in a "B" report since there is no permanent relationship between the line number the station on that line. The line number simply indicates that the date-time group and the parameter sequence given in the leading line in that one report apply to all of the following numbered lines. If a line is numbered out of sequence, this does not disrupt the computer storage process and is, therefore, not considered an error requiring retransmission.

II.3.f. "BR" FORMAT DESCRIPTION

If data submitted in a "B" formatted report need to be revised, this can be done using the "AR" format previously described or a "BR" format. Except for the "B" in the sixth space the "BR" format is identical to the "A" format. The following examples illustrates how data reported in the second sample "B" report in paragraph II.3.d. can be revised using either format.

FDLBAR0130 PP.58/SD43

BCH BR 0130 PP/SD

1 FDLB .58/43

END

Either format will correct the precipitation (PP) and snow depth (SD) reported in "B" format and all other data will remain in files as previously reported. The "AR" format is decoded as explained in paragraph II.3.c. The "BR" format is decoded as follows:

BCH	**Sending Station**
BR	**Format Indicator**
130	**January 30**
PP/SD	**List of two parameter codes in sequence for data that are to be corrected for station(s) named at the beginning of each numbered line(s) that follow. Parameter codes explained above.**
1 FDLB	**Each subsequent line is numbered to indicate the message is being continued. The identifier (FDLB) of the station to which corrected data on that line apply is the second item given.**
.58	**At station FDLB the correct reading for precipitation on January 30 was .58 inches not .68 as previously reported.**
43	**At station FDLB the correct reading for snow depth on January 30 Was 43 inches not missing as previously reported.**
END	**Indicates official end of report.**

II.3.g. "H" FORMAT DESCRIPTION

Hourly operation reports from projects with hydropower generating facilities are indicated by the letter "H" in the fifth space. These project reports comprise a large portion of the message traffic on the CBT. To shorten the report format the data are reported in a routine sequence and no alphabetic parameter codes are used. The date-time group in the "H" format includes six digits for the numerical month, day and hour, and always begins in the seventh space and is always followed by one blank space. This format is semi-flexible beginning with the first parameter value reported in the fourteenth space. Each data field is separated by slashes and the number of digits in each field can vary according to individual requirements each time data are reported. The first nine data fields are for identical parameters at all projects. Special arrangements have been made to use additional fields in the "H" format to report pertinent special data at some of the projects. These additional data fields can be placed on the first line, on a second line or on both lines in the "H" format. Any additions or deletions in the special data reported with the "H" format should be coordinated with CENWD-WM, HEB.

The sequence of the parameters reported in the "H" format are: (1) VE, (2) VS, (3) QH, (4) QE, (5) QW, (6) FB, (7) TW, (8) VC, (9) VU, (10) XA, (11) XB, (12) XC, (13) XD, etc. These parameter codes are listed and defined in Appendix D, and more detailed explanations of the first nine codes are given below. The explanation of the additional

data fields and the special parameter codes XA, XB, XC, XD, etc. are included in Reference 2 with the scheduled transmissions for each sending station. Example of data reports in the "H" format and the decoding of these reports is:

BON H 011514 950/3/247.9/242.0/1.0/74.1/20.0/0/001414/74.9/75.1/20.0

BON	**Station Identifier for Bonneville Dam**
H	**Format Indicator**
011514	**Date-time group for January 15th at 1400 hours**
950	**(VE) Total generation was 950 mw during the past hour. The quantity reported is not reduced for station service usage.**
3	**(VS) Station Service usage was 3 mw during the past hour. This quantity can be estimated by those plants which do not Normally read it hourly.**
247.9	**(QH) Mean total discharge was 247.9 kcfs during the past hour. Total discharge includes power, spillway and miscellaneous discharge. Therefore, miscellaneous discharge QZ equals QH – QE – QW and is comprised of fish ladder flows, navigation lockages, leakage, trash sluice flows, etc.**
242.0	**(QE) Mean power discharge was 242.0 kcfs during the past hour. Power discharge should include discharges of station service units and power producing fish turbines. It should be the discharge associated with the reported hourly gross power generation.**
1.0	**(QW) Mean spillway discharge was 1.0 kcfs during the past hour. A zero will be reported for this parameter when a project is not spilling.**
74.1	**(FB) Instantaneous powerhouse forebay elevation was 74.1 feet. (This is a beginning of the hour reading and so are the following three parameter readings whereas the first five parameters have been hourly totals or means.)**
20.0	**(TW) Instantaneous powerhouse tailwater elevation was 20.0 feet. The tailwater is subtracted from the forebay to compute the total head on the powerhouse.**
0	**(VC) Surplus generation capability at the end of the hour was zero from those units actually on-line.**
1414	**(VU) Generating unit status report at the end of the hour was zero on remote, 14 on-line and 14 available. This is a six-digit field with the first two digits used to indicate the number of main units carrying load under the remote control of a control dispatcher office. The third and fourth digits indicate the number of main units actually on-line and generating or condensing at speed-no-load at the end of the hour. The fifth and sixth digits indicate the total**

number of main units available and could be on-line within five minutes if needed. This unit status report is the last data field in a standard "H" format report.

74.9 **(XA) Additional miscellaneous data field that when used has a specific definition at each individual project a explained in Section IV.10. At BON this field is used to report the reservoir elevation at the spillway which in this case was 74.9 feet.**

75.1 **(XB) Miscellaneous data field, reservoir elevation at Stevenson was 75.1.**

20.1 **(XC) Miscellaneous data field, project tailwater was 20.0 feet.**

II.3.h. "HR" FORMAT DESCRIPTION

The letters "HR" are used in the fifth and sixth spaces of a CBT formatted report to indicate information is being submitted to revise data previously reported in an "H" or an "HR" format. The need for many corrections can be eliminated by checking the preamble prior to sending a report. The construction requirements for the "HR" format are identical to the "H" format with one exception. Numerical values for all nine data fields (or more if additional fields are used for special data) can be reported in the "HR" format and should be used in most cases, but this is not always necessary. At least nine valid data fields are always required in the "H" format. If nine or more valid data fields were included in the original report and only one or a few of the numerical readings need to be revised, the "HR" report can include only the corrected values. However, the data fields to be revised must be indicated by the appropriate number of slashes. For this reason values omitted in an "HR" report are assumed to be the same as submitted previously. Only one "H" report is accepted by the automatic data bank for each project and valid date-time group. If an error was made in the preamble of an "H" report or if any data field was missing (less than eight slashed used) or if there is any question as to what format or how many data fields are required, than a complete report using the "HR" format should be used for the correction.

The following is an example of the data reported in the "H" reports in paragraph II.3.i.

BON HR011817 950/3/247.9/242.0/1.0/75.1/19.0/0/001515/74.8/75.1/20.0

BON	**Station Identifier**
HR	**Format Indicator**
011817	**January 18th at 1700 hours**
950	**VE was 950 mw, same as reported previously.**
3	**VS was 3 mw, same as reported previously.**
247.9	**QH was 247.9 kcfs, same as reported previously.**
242.0	**QE was 242.0 kcfs, same as reported previously.**
1.0	**QW was 1.0 kcfs, same as reported previously.**
75.1	**FB was 75.1 feet, vice 74.1 feet as reported previously.**
19.0	**TW was 19.0 feet, vice 20.0 feet as reported previously.**

0	**VC was zero mw, same as reported previously.**
1515	**VU was zero remote, 15 on-line, 15 available, as reported previously.**
74.8	**XA was 74.8 feet, vice 74.9 feet as reported previously.**
75.1	**XB was 75.1 feet, same as reported previously.**
20.0	**XC was 20.0 feet, same as reported previously.**

II.3.i. "D" FORMAT DESCRIPTION

Daily summary operation reports from projects with hydropower generating facilities are indicated by the number sequence, and no alphabetic parameter codes are used. These reports cover a 24-hour period ending at midnight. The date-time group in the "D" format includes six digits for the numerical month, day and year, and always begins in the seventh space and is always followed by one blank space. The format is semi-flexible beginning with the first parameter value reported in the fourteenth space. Each data field is separated by slashes and the number of digits in each field can vary according to individual requirements each time data are reported. The first nine data fields are for identical parameters at all projects. Special arrangements have been made to use additional fields with the "D" format to report pertinent special data at some of the projects. These additional data fields can be placed on the first line of a "D" report, on a second line or on both lines. Any additions or deletions in the special data reported with the "D" format should be coordinated with NPDEN-WM, Reservoir Control Center because several stations process these data automatically.

The sequence of the parameters reported in the "D" format are: (1) VT, (2) VR, (3) ID, (4) QD, (5) QV, (6) QS, (7) EL, (8) FD, (9) TD, (10) YA, (11) YB, (12) VC, (13) YD, etc. These parameter codes are listed and defined in Appendix D. Explanations of the first nine parameter codes are given below. The specific definition of special parameter codes YA, YB, YC, YD, etc. are given in Reference 2 because these definitions can vary for each individual project. Some examples of data reports in the "D" format and the decoding of these reports are:

BON	**Station identifier for Bonneville Dam**
D	**Format indicator**
021699	**Date-Time group for February 16, 1999**
2000	**(VT) Daily total generation was 20,000 mwh**
77	**(VR) Station service usage during the day was 77 mwh**
223.7	**(ID) Daily mean inflow was 223.7 kcfs**
218.7	**(QD) Daily mean total discharge was 218.7 kcfs**
214.7	**(QV) Daily mean power discharge was 214.7 kcfs**
0	**(QS) Daily mean spillway discharge was zero kcfs**
75.9	**(EL) Lake or reservoir elevation at midnight was 75.9 feet**
74.6	**(FD) Daily mean forebay elevation was 74.6 feet**
20.7	**(TD) Daily mean tailwater elevation was 20.7 feet**

The construction of the "D" format and the definition of most of the nine format the parameters VT and VR are sums while QD, QV, QS, FD and TD are averages of data reported in the "H" format. A small difference that can occur in those cases where some hourly data are

estimated values; whereas the daily value is based on actual observed readings. In some cases the data for the last hourly report of the day are adjusted so that the sum of the 24 hourly reports will agree with the daily data. If there is a difference, the daily summary value is usually assumed to be correct. There are two items of data reported in the "D" format but not in the "H" format. The first of these is project inflow, the second is the instantaneous midnight lake or reservoir elevation, parameter code EL, which is reported in the "D" format to serve as a basis for determining reservoir storage content and is different from the midnight forebay elevation reported in the "H" format at some projects such as Bonneville and Albeni Falls.

II.3.j. "DR" FORMAT DESCRIPTION

The letters "DR" are used in the fifth and sixth spaces of a CBTT formatted report to indicate information is being submitted to revise data previously reported in a "D" or a "DR" format. The need for many corrections can be eliminated by checking the preamble prior to sending the report.

The following is an example of data reported in the sample "D" reports in paragraph II.3.h.

BON DR021699 20010/27/223.7/218.7/214.7/0/76.1/74.6/20.7

BON	**Project Identifier**
DR	**Format Indicator**
021699	**February 16, 1999**
20010	**VT was 20010 mwh, vice 20000 mwh as reported previously.**
27	**VR was 27 mwh, vice 77 mwh as reported previously.**
223.7	**ID was 223.7 kcfs, same as reported previously.**
218.7	**QD was 218.7 kcfs, same as reported previously.**
214.7	**QV was 214.7 kcfs, same as reported previously.**
0	**QS was 0 kcfs, same as reported previously.**
76.1	**EL was 76.1 feet, vice 75.9 feet as reported previously.**
74.6	**FD was 74.6 feet, same as reported previously.**
20.7	**TD was 20.7 feet, same as reported previously.**

II.3.k. "F" FORMAT DESCRIPTION

The letter "F" in the fifth space of a CBT formatted report indicates fish information is being reported in a one line flexible format that is similar in construction to the "A" format. A valid "F" report must have one of the following letters in the sixth space: T (adult total and summary data), L (adult count through the left ladder), R (adult count through the right ladder), C (comment) J (fingerlings transported by vehicle or trucked). Left and right are determined when facing downstream and refer to adult fish counts. Fingerling fish counts will be discussed later in this section. Any number and sequence of appropriate parameters can be reported in the "F" format as long as search report does not exceed one line. Any number of "F" formatted reports are permitted in a message as long as each report line begins with a standard preamble. For automatic processing purposes each "F" a carriage return, line feed or three consecutive blank spaces terminate report. The parameter codes listed in Appendix D that can be reported in the "F" format include fish counts, and spillway gate openings. The hour of fish count readings defaults to midnight, hour 2400, unless otherwise specified. If another hour is specified, it must

be coded as HR0400 instead of H04, since in "F" format, H indicates spillway gate number eight, and H04 would indicate spillway gate number eight is open four feet.

Some examples of data reports in each one of the "F" formats and the decoding of these reports are given below:

BON FL 1001 CA77/CJ447/SH136/KA30/KJ18/WT6.0
BON FR1001 CA702/CJ363/SH381/KA43/KJ148/AL5/WF64
BON FL1001 HF1000/A.3/R.3
IHR FC1001 No counts, ladder drained
IHR FT1001 CA0

BON	**Station Identifier for Bonneville Dam**
FL	**Format indicator for fish count data from ladder nearest to left bank**
1001	**October 1**
CA77	**On the above date 77 chinook adult salmon were counted passing upstream through this ladder.**
CJ447	**447 Chinook jack salmon**
SH136	**136 Steelhead**
KA30	**30 Coho Adults**
KJ18	**18 Coho Jacks**
WT6.0	**Water turbidity 6.0 Secchi Disk units**

BON	**Station Identifier**
FR	**Format indicator for fish count data from ladder nearest to right Bank.**
1001	**October 1**
CA702	**This and remaining parameter data decoded similar to above report.**
AL5	**5 Shad**
WF64	**Water temperature, 64 Degrees F.**

BON	**Station Identifier**
FL	**These data could have been sent in FL, FR, or FT format**
1001	**October 1**
HR1000	**Following data is for 1000 hours**
A.3	**At 1000 hours spillway gate no. 1 was open 0.3 feet**
R.3	**Spillway gate no. 18 was open 0.3 feet**

IHR	**Station Identifier for Ice Harbor Dam**
FC	**Format Indicator**
1001	**October 1**
NO etc	**This one line of comments will be added to the data bank and Printed at the Corps of Engineers, Reservoir Control Center.**

IHR	**Station Identifier**
FT	**Format Indicator**

1001 **October 1**
CA0 **Zero chinook adults. At least one fish count, even if it is zero, is to be sent each day in counting season.**

II.3.l. "R" FORMAT DESCRIPTION

Project regulation requests or instructions are indicated by the letter "R" in the fifth space of a CBT formatted message. The first line includes a preamble consisting of either a three letter project or group code, an "R" in the fifth space, a six digit date group followed by a four digit time group. Additional projects or stations to whom the message was transmitted or other information can be included on line one following the preamble. This format is used by Reservoir Control Center to issue project regulation requests or instructions. The following is an example of the "R" format:

Sent to: AF
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
ALF R 102099 0900 AF ALF SCL ICP BPA BPC NPD NPB NPC NPS
ATTN: ALBENI FALLS AND BPA
SUBJECT: ALBENI FALLS FLOW SCHEDULE

SCHEDULE FOR WEDNESDAY, 20 OCT 1999

TIME	APPROX GEN	FLOW	SPILL	TOTAL FLOW
0000 - 1000==>	27 MW	19000	0	19000 CFS
1000 - 2400==>	21 MW	14000	0	14000 CFS

- REDUCE TO 10 KCFS BY 1200 HRS ON 21 OCT AND MAINTAIN 10 KCFS UNTIL FURTHER NOTICE.

******OBJECTIVE*******
REACHES 2055.0 OR 2051.0 BY MID NOVEMBER.
WITH THIS INFORMATION THE CURRENT PLAN IS TO RAMP RELEASES GRADUALLY TO PASS INFLOW AND MAINTAIN THE HOPE GAGE ABOVE 2055.0' UNTIL FURTHER NOTICE. OPERATION PLANS MAY CHANGE AS NEW INFORMATION IS GATHERED.

REQUEST THE ALBENI FALLS OPERATOR NOTIFY SEATTLE CITY LIGHT AND BC HYDRO (604/891-5098) OF ANY FLOW CHANGES.

JULIE AMMANN
CENWD-NP/RCC
RRCBT/ALFINST

The Reservoir Control Center (RCC) normal staffing hours are 0730-1630 hours Monday through Friday. A point of contact duty list is published weekly for regulation assistance.

<u>IF THERE IS A PROBLEM OUTSIDE OF NORMAL RCC STAFFING HOURS WITH</u> THE WATER CONTROL DATA SYSTEM (CBT WEB PAGE, WILLAMETTE OR MCNARY CONTROLLERS, ETC.) OR THE NETWORK COMMUNICATIONS --- PLEASE CALL:
CEAP 24-HOUR SUPPORT CENTER (503) 808-5076
(800) 531-4472 AND PRESS "0"

AND REQUEST THEY OPEN A "WCDS SUPPORT REQUEST" AND INDICATE WHICH SYSTEM IS FAILING (E.G. CBT WEB PAGE) AND IF THE PROBLEM SHOULD BE TREATED AS "URGENT".

III.1. CROHMS

CROHMS is an acronym for Columbia River Operational Hydromet Management System. CROHMS was developed in 1970 as an agreement between the major federal agencies: The Corps of Engineers, Bonneville Power Administration (BPA), The National Weather Service, The United States Geologic Survey (USGS), The Bureau of Reclamation, and the Soil Conservation Service. The object of the agreement was to centralize the location of all hydrometeorlogical data for the Columbia Basin, in order to avoid duplication, and to distribute the data back to the agencies as needed. CROHMS consists of several hardware platforms which combine in function to provide current (operational) information to Reservoir Control Center sufficient to perform water control regulation.

Data collection is the first process in the CROHMS system. This includes the CBT Messenger Network routed within the Intranet and some communication is via the Internet. Data are collected via microwave, satellite, such as GOES (Geostationary Operational Environmental Satellite) System. The data comes from all the agencies in the CROHMS agreement and B.C. Hydro. Each agency is responsible for different areas of the Columbia Basin. The Corps of Engineers is responsible for project data in the Willamette and Columbia Basins. The Bureau of Reclamation enters most of the data in the Snake Basin. B.C. Hydro transmits data for the Canadian Projects, and so on.

Crohms Automated Front End (CAFE) platform collects (receives and gets) cbt and shef formatted data from the different sources. The data is stored in various directories in CAFE and posts data.

The DSS database or record platform retrieves the raw data, runs posting and posts to CROHMS database and prepares reports. This is also posted to the DSS alternate database (backup).

III.1.a. CROHMS DATA COLLECTION

CROHMS data collection is a vast process. Each day approximately 60,000 unique pieces of data are transmitted, and the data collection continues 24-hours each day. Each agency involved in the CROHMS agreement is responsible for data within its region.

The Northwestern Division Corps of Engineers in Portland is responsible for CBT data. CBT data is primarily flow and hydropower related. This is often referred to as project data. Each power project site on the Willamette and Columbia Rivers send the same type of data each hour. Some of the projects also transmit weather information; for a complete list of all the data transmitted via the CBT from each station see Reference 2.

The Portland District Corps of Engineers maintains the integrity of the data that comes from the Willamette Controller. This data controller is located at Foster Dam in the Willamette Basin and transmits gage and weather related data for locations throughout the Willamette Basin.

The Seattle District Corps of Engineers maintains the integrity of the data that comes from various projects (Libby, Albeni Falls, Chief Joseph) and data from other sites such as Howard Hansen, Mud Mountain, Wynoochee, etc.

The Walla Walla District Corps of Engineers maintains the integrity of the data that comes from the McNary Controller.

Bonneville Power Administration (BPA) oversees the Powerhouse Data Acquisition System. This network collects gage heights, precipitation, and weather data for stations on the tributaries to the Mid-Columbia River.

The National Weather Service is responsible for quite a bit of incoming data. This is because the Northwest River Forecast Center is located in Portland. The Reservoir Control Center (RCC) and the Northwest River Forecast Center (RFC) work together to forecast flows in the Columbia and Willamette Basins.

The USGS does not input great amounts of data. Their primary concern is the rating tables for gages in the basin. Many incoming gage heights do not have a corresponding, incoming flow; so with a rating table from the USGS, a flow can be computed.

The Bureau of Reclamation is very active in the input of data. The USBR in Boise transmits data to Crohms Automated Front End (CAFE) for the Snake Basin and its tributaries. Also, the Yakima office of the USBR transmits data for the Yakima River Basin into Crohms Automated Front End (CAFE).

The NRCS is responsible for the SNOTEL data. This is important in the forecasts of flows made by the River Forecast Center. SNOTEL data is available for the entire Columbia Basin, and it measures the amount of snow there is in the upper elevations of the mountains. This is especially important in the spring, during the snowmelt season, for forecast purposes.

B.C. Hydro is very important to data collection. Although B.C. Hydro has its own data collection and database, they send weather information flow data, and project data to Portland each hour so that the United States Federal Agencies will also have data for the Canadian portion of the Columbia River.

All these agencies together contribute data for a complete picture of weather and streamflow in the entire Columbia Basin, including the Canadian portion of the basin. Since all the data are kept in one central location in Portland, Oregon, access to the data is simple and universal for all the agencies.

III.1.b. THE CAFE (Crohms Automated Front End)

The CAFE is a platform, often referred to as the front-end computer. But the CAFE is also a temporary (four days of raw data) storage area for incoming data.

Raw data that are received in Portland are kept in CAFE in the raw format for approximately fourteen days. The raw data are retrievable during this time. The data are kept in an orderly, filing system-like fashion. All incoming data of the same source are kept together and named by CATID, a catalog identification; there are a total of 49 active CATID's in the CAFE (front-end computer). The Willamette Controller has five CATID's; each indicates that there are different data available. CATID WUPR contains data for the upper portion of the Willamette Basin; while CATID WTHR is primarily weather related data for the entire basin. The data also has a time stamp. This stamp is the day, hour, and minute the data were received in the CAFE (front-end). Any raw data can be retrieved from the front-end by looking through the raw data file for that CATID for particular time span. This feature is very helpful when hourly CBT data, or any other CATID's data are not being posted to the CAFE; the raw data can be checked for format errors.

III.1.c. Database or Record Platform

This platform holds the CROHMS database. This is the final residence of most of the raw data that are found in CAFE. The database is the well of information that is accessed by the federal agencies. However, all data are not kept on this platform indefinitely; at some point the data must be archived. For the most part the data will remain in this database platform for approximately six months before they are moved to the archive.

The database platform is the driver of the CROHMS database. This platform performs posting runs that draw the raw data from the CAFE to the database. This platform has many programs that access the CROHMS database. Some of these programs include SSARR forecasting model and the Daily Morning Report Program. Housing the CROHMS database is only one small portion of its overall function. Not all federal agencies have access to this platform; the Corps of Engineers is the primary user of the database platform.

III.2. SHEF

SHEF stands for Standard Hydrometeorologic Exchange Format. This format was developed by the National Weather Service in conjunction with the Corps of Engineers. The purpose of SHEF is to nationally standardize data transmission formats. This standardization would make it possible for any U.S. Government agency to receive data in a readable format from another agency. Therefore, if the USGS in Washington, D.C. wanted data from the Corps of Engineers in Portland, Oregon, the data could be easily transferred and read in Washington, D.C.

While CBT codes have only one or two letters, CROHMS hydromet codes have six letters. With some experience with codes the user can tell at a glance if the datum is an hourly, daily or instantaneous reading. When the second version of the fifth letter source code is fully supported, the user will be able to distinguish if the datum was manually read, or transmitted

automatically via another system such as GOES. The six letter code also identifies data that are computed, like reservoir inflows that are computed from reservoir outflow and storage. These are called processed data. The fifth letter then indicates whether the datum is the best quality, second best, third or fourth. The sixth letter of the current code is usually a filler, or the letter "Z"; however this position is sometimes used. An "X" indicates maximum of the day, and "N" is minimum of the day, when used in the sixth position. Also, in the case of fish counts, an "R", "L", or "T" are right ladder, left ladder, and total count, respectively. To gain a better understanding of how CBT codes translate see Appendix E. This table lists default translations of many common CBT codes.

IV. CBT TRANSMISSIONS

IV.1. GENERAL

The heaviest traffic on the CBT Web Messenger generally occurs between 7:00 A.M. and 9:30 A.M. on weekdays and during the first fifteen minutes of each hour. The morning hours are the peak time to transmit weather, hydrologic and meteorologic data. Hourly project data (data in the "H" format) are sent as soon as possible after the beginning of each hour. Many projects are staffed 24 hours every day, and some are staffed beyond normal working hours on a seasonal or special situation basis; therefore, important messages can be sent or received at any time of the day or night. The data that are to be processed shall be sent in a structured format as described in Section II.3. The unprocessed messages can be sent in a more general format as also discussed in Section II.3.

Reference 2 lists outgoing CBT traffic for each station on the CBT Messenger. This reference includes the parameters transmitted and the time of day of the transmissions. Appendix C lists all the two letter CBT parameter codes and what each stands for Routine CBT transmissions are discussed in Reference 2 for each sending station as follows:

ALF Albeni Falls
BON Bonneville
BPA Bonneville Power Administration
CGR Cougar Dam
CHJ Chief Joseph Dam
DET Detroit Dam
DWR Dworshak Dam
WAN & PRD Grant County PUD
FOS Foster Dam
GCL Grand Coulee Dam
IHR Ice Harbor Dam
JDA John Day Dam
LGS Little Goose Dam
LIB Libby Dam
LMN Lower Monumental Dam
LOP Lookout Point Dam
LOS Lost Creek Dam
LWG Lower Granite Dam

MCN McNary Dam
NWD Northwestern Division
NPS Seattle District
TDA The Dalles
WEL Wells Dam, Douglas County PUD
RRH & RIS Rocky Reach and Rock Island Dams, Grant County PUD

IV.2. PROJECT REPORTS IN GENERAL

The reports described in subsequent paragraphs are common to most projects on the CBT Messenger System and will be discussed in general terms**.**

IV.3. PROJECT HOURLY REPORTS

The format of hourly reports is discussed in Section II.3.f. The hourly data are sent at the beginning of each hour and may vary slightly from project to project. Hydropower data are an important function of hourly reports; hydro-power schedules are sent from one project to another as follows:

a. Projects on the upper and mid-Columbia River, listed below, send hourly reports to All Points Upper Columbia (call directing code YY), the NWD computer (code RR) and the BPA computer (code BE).

LIB Libby
ALF Albeni Falls
GCL Grand Coulee
CHJ Chief Joseph
WEL Wells, Douglas County PUD
RRH Rocky Reach
RIS Rock Island
WAN Wanapum
PRD Priest Rapids

b. Projects on the Lower Columbia and Snake River send hourly reports to All Points Lower Columbia (call directing code XX); Snake projects also send to All Points Lower Snake (code VV). Both groups, listed below, send to the NWD computer, RR, and the BPA computer, BE.

DWR Dworshak Dam
LWG Lower Granite Dam
LGS Little Goose Dam
LMN Lower Monumental Dam
IHR Ice Harbor
MCN McNary Dam
JDA John Day
TDA The Dalles
BON Bonneville

c. Willamette and Rogue River projects, listed below, send hourly data to All Points Willamette (code WW), and the NWD and BPA computers, RR and BE respectively.

HCR Hills Creek
LOP Lookout Point
DEX Dexter Dam
CGR Cougar Dam
GPR Green Peter
FOS Foster
DET Detroit
BCL Big Cliff
LOS Lost Creek

IV.4. PROJECT DAILY REPORT

Each project transmits a daily hydropower summary report, in the "D" format, just after midnight. These reports are sent to all stations on the CBT Messenger as well as to the NWD computer, call directing code RR. Grand Coulee Dam is now transmitting daily summary reports for HGH (Hungry Horse). The "D" format is described in detail in Section II.3.i. The first nine data fields of the report are standard; any miscellaneous data begin in field ten.

Only the hydropower reports are sent in the "D" format. Other daily reports for reservoirs and associated stations are sent in the regular "A" and "B" formats.

IV.5. PROJECT FISH COUNT REPORTS

The season when fish movements through fish ladders are counted is generally April through November. Daily fish counts are transmitted each evening in the "F" format. The counts are sent to all stations on the CBT Messenger as well as the NWD computer (call directing code RR). The following projects report fish data:

BON- Bonneville Dam
TDA – The Dalles Dam
JDA – John Day Dam
MCN – McNary Dam
IHR – Ice Harbor Dam
LMN – Lower Monumental
LGS – Little Goose Dam
LWG – Lower Granite Dam
PRD – Priest Rapids Dam
RIS – Rock Island Dam
RRH – Rocky Reach Dam
WEL – Wells Dam

The eleven varieties of adult fish that are counted and the corresponding CBT parameter codes are:

AL Shad
BB Sockeye (Blueback)
CA Chinook Adult
CJ Chinook Jacks

FL Lamphrey
KA Coho Adults
KE Chum
KJ Coho Jacks
KM Under 12-inch Salmonids
PK Pink (Humpback)
SH Steelhead

Juvenile fish are counted at Lower Granite, Little Goose, McNary and John Day Dams. The CBT parameter codes for juvenile fish are:

JB Juvenile sockeye
JF Juvenile fall chinook
JK Juvenile coho
JR Juvenile spring chinook
JS Juvenile steelhead
JT Total sona count, used at John Day

Not all varieties of fish are counted at each project. A more specific discussion of fish counting at each project is included in Reference 2. Also a detailed discussion of the "F" format can be found in Sections II.3.k. and II.3.l.

IV.6. PROJECT WEATHER REPORTS

Each morning weather data from all Corps projects with weather stations will be transmitted to all stations on the network and the NWD computer. The weather data are coded in a general message format. Weather data for some hydrologic stations are sent by the transmitting stations responsible for collecting the data.

IV.7. PROJECT WATER QUALITY REPORTS

Since 1984 the water quality program on the Columbia River has increased due to operational needs. The water quality parameter codes used in 1999 along with the appropriate stations are listed below. The water quality reports are seasonal, from April through July, and roughly correspond to the fish counting season.

DSS WATER QUALITY PARAMETER CODES USED IN 1999		
PARAMETER	**PATHNAME**	**STATION CODE**
Total Dissolved Gas (YT)	irgzzazd	All but LIBM, WEL, CHJ, RRH, RIS, ANQW, PAQW
Example of a DSS pathname:	irvzzbzd	CHJ
//bon/yt//ir-month/irgzzazd/	irxzzazd	WEL, RRH, RIS
	irrzzazd	ANQW, PAQW
	irrzzbzd	LIBM
Barometric Pressure (YP)	irgzzazd	All but LIBM, WEL, CHJ, RRH, RIS, ANQW, PAQW

Example of a DSS pathname:	irvzzbzd	CHJ
//wel/yp//ir-month/irxzzazd/	irxzzazd	WEL, RRH, RIS
	irrzzazd	ANQW, PAQW
	irrzzbzd	LIBM
Oxygen Pressure (YO)	irgzzazd	All but LIBM, WEL, CHJ, RRH, RIS, ANQW, PAQW
Example of a DSS pathname:	irvzzbzd	CHJ
//wel/yo//ir-month/irxzzazd/	irxzzazd	WEL, RRH, RIS
	irrzzazd	ANQW, PAQW
	irrzzbzd	LIBM
Water Temperature (TW)	irgzzazd	All but LIBM, WEL, CHJ, RRH, RIS, WAN, ANQW, PAQW
(Hourly water temperatures as measured	irvzzbzd	CHJ
At water quality stations, not at project	irvzzazd	WEL, RRH, RIS
Scroll case). *Example of a DSS pathname:*	irgzzbzd	WAN
//rh/tw//ir-month/irvzzazd/	irrzzazd	ANQW, PAQW
	irrzzbzd	LIBM
Water Temperature (TW)	irgxzzazd	CHJ,WAN,DWR, MCN
(Daily water temperatures as measured	irxzzbzd	WEL, RRH, PRD, LWG, LGS,
at project scroll cases).		LMN, IHR, JDA, TDA, BON
Example of a DSS pathname:	irwzzczd	RIS
//bon/tw//ir-month/irxzzazd/		

common dss pathnames99.xls

Common CROHMS DSS Water Quality Pathnames

Barometric (yp) and TDG (yt) Pressures	**DSS Pathname**
Good for all stations except Wells, Rocky Reach, and Rock Island	//bon/yt//ir-month/irgzzazd/
Use for Wells, Rocky Reach, and Rock Island	//wel/yp//ir-month/irxzzazd/
Nitrogen (yn) and Oxygen (yo)	
Good for all stations except Wells, Rocky Reach, and Rock Island	//bon/yo//ir-month/irgzzazd/
No oxygen or nitrogen for Wells, Rocky Reach, and Rock Island	
Temperature (tw)	
a) water quality station water temperatures (15')	
Good for all stations except Peck, Wells, Rocky Reach forebay, Rock Island forebay, Wanapum forebay	//bon/tw//ir-month/irgzzazd/

Good for Wells, Rocky Reach forebay, and Rock Island forebay	//wel/tw//ir-month/irvzzazd/
Peck and Wanapum forebay	//peki/tw//ir-month/irgzzbzd/
b) scroll case water temperatures (deep) See "Scroll Case Water Temperature Data" table for details.	
Good for all projects except McNary, Dworshak, Wanapum, and Chief Joseph	//bon/tw//ir-month/irxzzbzd/
Good for McNary, Dworshak, Wanapum, and Chief Joseph	//mcn/tw/ir-month/irxzzazd/
There is no scroll case water temperature data from Grand Coulee	
Number of spill gates open (yu)	
Good for all projects except Priest Rapids, Wanapum, Dworshak, Lower Granite, Little Goose and Lower Monumental Dams	//jda/yu//ir-month/irxzzazd/

IV.8. MESSAGES SENT FROM RESERVOIR CONTROL CENTER (RCC)

Sent to: LB

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
LIB R 102699 0825 LB LIB ALF BPA BPC NPD NPB NPC NPS
ATTN: LIBBY AND BPA
ALL TIME IN MOUNTAIN LOCAL TIME
** REPLACES TTY LIB R 102299 0815 LB **

- REVISED * SCHEDULE FOR TUESDAY, 26 OCT 1999

TIME	APPROX GEN	FLOW	SPILL	TOTAL FLOW
0000 - 0830==>	270 MW	11000	0	11000 CFS
0830 - 2400==>	294 MW	12000	0	12000 CFS

SCHEDULE FOR WEDNESDAY - FRIDAY, 27 - 29 OCT 1999

TIME	APPROX GEN	FLOW	SPILL	TOTAL FLOW
0000 - 2400==>	294 MW	12000	0	12000 CFS

NOTE 1: AS FLOW AUGMENTATION SEASON HAS BEEN COMPLETED, LIBBY WILL BE GRADUALLY DRAFTED ACROSS THE LATE SUMMER/FALL SEASON TO TARGET A FLOOD CONTROL ELEVATION OF 2411 FEET ON DECEMBER 31ST.
NOTE 2: RAMP DOWN TO TWO UNITS (240 MW) FOR PROJECT REQUESTED MAINTENANCE ON T-2; TIME 0630 - 1700 HOURS, OCTOBER 26TH.

JULIE AMMANN
CENWD-NP/RCC
RRCBT/LIBINST.TXT
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

APPENDIX A

STATION IDENTIFIERS CURRENTLY IN USE WITH INCOMING DATA

Location: http://www.nwd-wc.usace.army.mil/ftppub/café/station_info.txt

APPENDIX B

STATION IDENTIFIERS CURRENTLY NOT IN USE WITH INCOMING DATA

Location: http://www.nwd-wc.usace.army.mil/ftppub/stationsnotused.txt

APPENDIX C

STATIONS ALPHABETIZED BY NAME

Location: http://www.nwd-wc.usace.army.mil/café/location.prn

APPENDIX D

CBT CODES CURRENTLY IN USE

A Spillway gate No. 1 opening – for fish report (feet)

AF Reservoir Content (thousand acre-feet)

AL Fish Count, shad

AU Air temperature, instantaneous (degrees Fahrenheit) (used by USBR at agricultural stations under the crop canopy

B Spillway gate No. 2 opening – for fish report (feet)

BB Fish Count, sockeye (blueback)

BH Barometric pressure (milliliters of mercury)

BP Barometric pressure in millibars

BV Battery voltage at gaging stations

C Spillway gate No. 3 opening – for fish report (feet)

CA Fish count, chinook adult (king)

CD Precipitation, snow total depth on ground (centimeters)

CH Canal gage height, instantaneous (feet)

CJ Fish count, chinook jack

CN Air temperature, (degrees Celsius), minimum for previous 24 hours

CP Precipitation, daily total (millimeters of water)

CP Precipitation, daily total (centimeters of snow)

CX Air temperature, (degrees Celsius), maximum for previous 24 hours

D Spillway gate No. 4 opening – for fish report (feet)

DD Discharge, forecasted daily mean (kcfs)

DG Dissolved gas (milligrams per liter)

(Appendix D continued)

DM Water dissolved oxygen, mean (parts per million)

DN Water dissolved oxygen, minimum (parts per million)

DO Water dissolved oxygen (milligrams per liter)

DX Water dissolved oxygen, maximum (parts per million)

E Spillway gate No. 5 opening – for fish report (feet)

EH Pan evaporation at the water surface elevation (inches)

EL Elevation, lake or reservoir, instantaneous (feet)

F Spillway gate No. 6 opening – for fish report (feet)

FB Elevation, forebay instantaneous (feet)

FD Elevation, forebay daily mean (feet)

FE Event forebay, event telemetry (feet)

G Spillway gate No. 7 opening – for fish report (feet)

GA Number of gates open at a project

GE Event gage height, event telemetry (feet)

GH Gage height, instantaneous (feet)

GM Gage height (metric)

GN Gage height, daily minimum (feet)

GX Gage height, daily maximum (feet)

H Spillway gate No. 8 opening - for fish report (feet)

I Spillway gate No. 9 opening - for fish report (feet)

ID Inflow, daily mean (kcfs)

IQ Inflow, 6-hour mean (kcfs)

Appendix D (continued)

IS Inflow, instantaneous (kcfs)

J Spillway gate No. 10 opening – for fish report (feet)

JB Fish count, juvenile sockeye

JF Fish count, juvenile fall chinook

JK Fish count, juvenile coho

JR Fish count, juvenile spring chinook

JS Fish count, juvenile steelhead

JT Fish count, total fingerling sonar count

K Spillway gate No. 11 opening – for fish report (feet)

KA Fish count, coho adult (silver)

KE Fish count, chum (dog)

KJ Fish count, coho jack

KM Fish count, jacks under 12”

KT Fish count, total

KW Wind speed (kilometers per hour)

L Spillway gate No. 12 opening – for fish report (feet)

M Spillway gate No. 13 opening – for fish report (feet)

MA Air temperature, (degrees Fahrenheit) cumulative daily value

MB Megawatt hour, reading at meter

MC Air temperature (degrees Fahrenheit) cumulative daily value, computer generated quantity

MN Air temperature, (degrees Fahrenheit), minimum for previous 24 hours

MX Air temperature, (degrees Fahrenheit), maximum for previous 24 hours

Appendix D (continued)

N Spillway gate No. 14 opening – for fish report (feet)

NP Dissolved nitrogen pressure

NT Water total dissolved gas (milliliters of mercury)

O Spillway gate No. 15 opening – for fish report (feet)

OB Air temperature, (degrees Fahrenheit), instantaneous observation

OP Dissolved oxygen pressure

OR Oxidation-reduction potential (1000 millivolts)

P Spillway gate No. 16 opening – for fish report (feet)

PC Precipitation, cumulative (inches of water)

PE Pan evaporation (inches of water per day)

PH Water acidity or alkalinity (hydrogen ions per liter)

PK Fish count, pink (humpback)

PM Precipitation, (inches of water) monthly total

PP Precipitation, (inches of water), total for previous 24 hours

PQ Precipitation, 6-hour total (inches of water)

PV Pan evaporation, (inches of water) monthly total

Q Spillway gate No. 17 opening – for fish report (feet)

Q Discharge, instantaneous (kcfs)

QA Adjusted flow for storage

QC Discharge, instantaneous, in a canal (kcfs)

QD Discharge, daily mean (kcfs)

QE Discharge, powerhouse hourly mean (kcfs)

Appendix D (continued)

QH Discharge, hourly mean (kcfs)

QN Discharge, daily minimum (kcfs)

QS Discharge, spillway daily mean (kcfs)

QT Discharge, gate changes (kcfs)

QU Discharge, computed unregulated (kcfs)

QV Discharge, powerhouse daily mean (kcfs)

QW Discharge, spillway hourly mean (kcfs)

QX Discharge, daily maximum (kcfs)

R Spillway gate No. 18 – opening – for fish report (feet)

RH Relative humidity

S Spillway gate No. 19 – opening – for fish report (feet)

S Precipitation, snow daily total only (inches of snow)

SA Spillway gate #1 (feet)

SB Spillway gate #2 (feet)

SC Spillway gate #3 (feet)

SD Precipitation, snow total depth on ground (inches of snow)

SE Precipitation, snow water-equivalent total (inches of water)

SF Spillway gate #4 (feet)

SG Spillway gate #5 (feet)

SH Fish count, steelhead

SI Solar radiation (langley per minute)

SJ Spillway gate #6 (feet)

Appendix D (continued)

SL **Soil temperature, instantaneous (degrees Fahrenheit) (used by USBR at agriculture stations for shallow soil temperature from the surface to one and one half inches)**

SM **Soil moisture (inches of saturation)**

SN **Soil temperature, daily minimum (degrees Fahrenheit)**

SP **Precipitation, snow water-equivalent from snow pillow (inches of water)**

SQ **Accumulated solar radiation (langleys)**

SW **Soil temperature, instantaneous (degrees Fahrenheit) (used by USBR at agricultural stations for temperature at depth of 15 cm)**

SX **Soil temperature, daily maximum (degrees Fahrenheit)**

T **Spillway gate No. 20 opening – for fish report (feet)**

TA **Mean daily relative humidity (percent)**

TD **Elevation, tailwater daily mean (feet)**

TN **Air temperature, (degrees Fahrenheit) 12-hour minimum**

TP **Air temperature, dew point (degrees Fahrenheit)**

TU **Relative humidity (percent)**

TW **Elevation, tailwater instantaneous (feet)**

TZ **Air temperature, freezing level (thousands of feet above mean sea level, except surface – 0**

U **Spillway gate No. 21 opening – for fish report (feet)**

UI **Accumulated wind, unspecified duration (miles)**

V **Spillway gate No. 22 opening – for fish report (feet)**

VC **Generation, surplus capability on line (megawatts)**

VE **Generation, total during past hour (megawatt-hours)**

Appendix D (continued)

VR Generation, station service daily total usage (megawatt-hours)

VS Generation, station service usage during past hour (megawatt-hours)

VT Generation, daily total (megawatt-hours)

VU Generating units status report (on remote/on line/available)

VV Generation, instantaneous in unit #1 (megawatts)

VW Instantaneous generation in unit #2 (megawatts)

W Spillway gate No. 23 opening – for fish report (feet)

WA Wind accumulation (miles per month)

WC Water temperature (degrees Celsius)

WD Wind direction (tens of degrees)

WE Water specific conductance (micromhos per centimeter)

WF Water temperature (degrees Fahrenheit)

WJ Water turbidity (jackson candle units)

WM Water temperature, maximum (degrees Celsius)

WN Water temperature, minimum (degrees Celsius)

WR Accumulated wind travel (miles)

WS Wind Speed (miles per hour)

WT Water turbidity (seechi disk units)

WV Wind vector, direction & speed (tens of degrees & mph)

WX Weather, instantaneous observation (National Weather Service weather code)

WY Water temperature, mean (degrees Celsius)

X Spillway gate No. 24 opening – for fish report (feet)

Appendix D (continued)

Y Spillway gate No. 25`opening – for fish report (feet)

Z Spillway gate No. 26 opening – for fish report (feet)

XA to XZ misc data (special definition for each use)

YA to YZ misc data (special definition for each use)

YE Air temperature, instantaneous (degrees Fahrenheit) (used by USBR at agricultural stations above the crop canopy)

YL Mean daily soil temperature at a shallow depth, from the surface to one and one half inches (degrees Fahrenheit) (used by the USBR at agricultural stations)

YO Mean daily air temperature (degrees Fahrenheit) (used by USBR)

YP Highest dew point between 0000 and 0800 hours (USBR Yakima)

YS Total monthly discharge from a power house (kaf) (USBR Yakima)

YU Mean daily air temperature, above the crop canopy (degrees Fahrenheit) (used by USBR at agricultural stations)

YW Mean daily soil temperature at a depth of 15 cm (degrees Fahrenheit) (used by USBR at agricultural stations)

YU Mean daily air temperature, under the crop canopy (degrees Fahrenheit) (used by USBR at agricultural stations)

APPENDIX E

CBT TO CROHMS HYDROMET TRANSLATIONS

This table lists CBT to SHEF translations. These are not full seven-letter SHEF codes, but these are psuedo_SHEF codes that are used in CROHMS database. These are default values and do not include any exceptions, such as a secondary quality translations.

CBT CODE	SIX-LETTER SHEF PARAMETER
AL	FADRAZ
BB	FBDRAZ
BH	YPIRAZ
CA	FCDRAZ
CD	SDIRAZ
CJ	FCDRAZ
CN	TAIRAN
CX	TAIRAX
DD	QRDFZZ
EL	HFIRAZ
FB	HFIRAZ
FD	HFDRAZ
GA	YUIRAZ
GH	HGIRAZ
ID	QIDRAZ
IQ	QIQRAZ
IS	QIIRAZ
JA	FADRJZ
JB	FBDRJZ
JC	FCDRJZ
JD	FDDRJZ
JF	FFDRJZ
JK	FKDRJZ
JP	FPDRJZ
JR	FRDRJZ
JS	FSDRJZ
JU	FUDRJZ
KA	FKDRAZ
KE	FEDRAZ
KJ	FKJRJZ
KM	FZMRMZ
KT	FZDRAZ
MN	TAIRAN
MX	TAIRAX
NP	YNIRAZ

Appendix E (continued)

NT	**YTIRAZ**
OB	**TAIRAZ**
OP	**YOIRAZ**
PE	**EPDRAZ**
PH	**WPIRAZ**
PK	**FPDRAZ**
PP	**PPDRAZ**
Q	**QRIRAZ**
QA	**QAIRAZ**
QD	**QRDRAZ**
QE	**QGHRAZ**
QH	**QRHRAZ**
QS	**QSDRAZ**
QT	**QTIRAZ**
QU	**QUIRAZ**
QV	**QGDRAZ**
QW	**QSHRAZ**
SD	**SDIRAZ**
SH	**FSDRAZ**
TD	**HTDRAZ**
TW	**HTIRAZ**
VC	**VCIRAZ**
VH	**VEHRAZ**
VR	**VSDRAZ**
VS	**VSHRAZ**
VT	**VEDRAZ**
VU	**VUIRAZ**
WC	**TWIRAZ**
WE	**WCIRAZ**
WF	**TWIRAZ**
WJ	**WTIRAZ**
WT	**WTIRAZ**
WV	**USIRAZ**
WX	**UDIRAZ**
XA	**YAHRAZ**
XB	**YBHRAZ**
XC	**YCHRAZ**
XD	**YDHRAZ**
XE	**YEHRAZ**
XF	**YFHRAZ**
XG	**YGHRAZ**
XH	**YHHRAZ**
YA	**LSIRAZ**

APPENDIX F

SHEF HYDROMET TRANSLATIONS

STANDARD HYDROLOGIC EXCHANGE FORMAT

1. PHYSICAL ELEMENTS

CODE	EXPLANATION (UNITS)
A	**Agricultural Data Compatible with ROSA System**
AD	**Reserved**
AF	**Surface Frost Intensity**
AM	**Surface Dew Intensity**
AT	**Time below Critical Temperature (25 DF, -3.9 DC) (Hours and Minutes)**
AU	**Time below Critical Temperature (32 DF, 0 DC) (Hours and Minutes)**
AW	**Leaf Wetness (Hours and Minutes)**
B	**Reserved**
C	**Reserved**
D	**Reserved for Data/Data Type Non Physical Elements**
E	**Evaporation**
EA	**Evapotranspiration Potential (Amount) (IN, MM)**
ED	**Evaporation, Pan Depth (IN, MM)**
EM	**Evapotranspiration, Amount (IN, MM)**
EP	**Evaporation, Pan Increment (IN, MM)**
ER	**Evaporation Rate (IN/DAY,MM/DAY)**
ET	**Evapotranspiration Total (IN, MM)**
EV	**Evaporation, Lake (Computed) (IN, MM)**
F	**Fish Count Data**
FA	**Fish – Shad**
FB	**Fish – Sockeye**
FC	**Fish – Chinook**
FE	**Fish – Chum**
FK	**Fish – Coho**
FL	**Fish – Lamphrey**
FL	**(V) Fish – Ladder (1–left, 2-right, 3-Total)**
FP	**Fish – Pink**
FS	**Fish – Steelhead**
FT	**(V) Fish Type – Type (1-Adult, 2-Jacks, 3-Fingerlings)**
FZ	**Fish – Count of all types Combined**

Appendix F (continued)

G	**Ground Frost and Ground State**
GD	**Frost Depth, Depth of Frost Penetration (non-Permafrost) (IN, CM)**
GR	**Frost Report, Structure**
GS	**Ground State**
GT	**Frost, Depth of Surface Frost Thawed (IN, CM)**
H`	**Height**
HA	**(V) Height of Reading (Altitude above surface) (FT,M)**
HB	**(V) Depth of Reading below surface (FT,M)**
HC	**Height, Ceiling (FT,M)**
HD	**Height, Head (FT,M)**
HE	**(V) Height, Regulating Gate (FT,M)**
HF	**Elevation, Project Powerhouse Forebay (FT,M)**
HG	**Height, River Stage (FT,M)**
HH	**(V) Height, of Reading (Elevation – MSL) (FT,M)**
HI	**Stage Trend Indicator**
HJ	**(V) Height, Spillway Gate (FT,M)**
HK	**Height, Lake above a Specified Datum (FT,M)**
HL	**Elevation, Natural Lake (FT,M)**
HM	**Height of Tide (MLLW) (FT,M)**
HN	**(S) Height, River Stage (MIN) (FT,M)**
HP	**Elevation, Pool (FT,M)**
HR	**Elevation, Lake or Reservoir Rule Curve (FT,M)**
HS	**Elevation, Spillway Forebay (FT,M)**
HT	**Elevation, Project Tailwater Stage (FT,M)**
HW	**Height, Spillway Tailwater (FT,M)**
HX	**(S) Height, River Stage (MAX) (FT,M)**
HY	**(S) Height, River Stage at 7AM Local Just Prior to DATE/TIME STAMP (FT,M)**
HZ	**Elevation, Freezing Level (KFT,KM)**
I	**Ice**
**IC ` **	**Ice Cover, River (%)**
IE	**Extent of Ice from Reporting Area (MI,KM) +=Upstream -=Downstream**
IO	**Extent of Open Water from Reporting Area (FT,M) +=Downstream, -=Upstream**
IR	**Ice Report (Structure, Type, Cover), (CODED)**
IT	**Ice Thickness (IN,CM)**
J	**Reserved**
K	**Reserved**

Appendix F (continued)

L	**Lake Data**
LA	**Lake Surface Area (KAC,KM2)**
LC	**Lake Storage Volume Change (KAF,MCM)**
LS	**Lake Storage (Volume) (KAF,MCM)**
M	**Moisture and Fire/Fuel Parameters**
MI	**Moisture, Soil Index of API (IN)**
ML	**Moisture, Lower Zone Storage (IN,CM)**
MM	**Fuel Moisture, Wood (%)**
MS	**(V) Moisture, Soil (Amount) (IN,MM)**
MT	**Fuel Temperature, Wood Probe (DF,DC)**
MU	**Moisture, Upper Zone Storage (IN,CM)**
MW	**Moisture, Soil, Percent by Weight (%)**
N	**Gate and Dam Data**
NG	**Total of Gate Openings (FT,M)**
NN	**(V) Number of the Spillway Gate Reported (Used with HP,QS)**
O	**Do Not Use for External Recognition, Confused with Zero**
P	**Pressure and Precipitation**
PA	**Pressure, Atmospheric (IN-HG,KPA)**
PC	**Precipitation, Accumulator (IN,MM)**
PP	**Precipitation, Actual Increment (IN,MM)**
PR	**Precipitation Rate (IN/DAY,MM/DAY)**
PT	**Precipitation, Type (CODED)**
PY	**(S) Precipitation, Increment Ending at 7AM Local just prior to DATE/TIME Stamp (IN,MM)**
Q	**Discharge**
QA	**Discharge, Adjusted for Storage at Project Only (KCFS, CMS)**
QC	**Runoff Volume (KAF,MCM)**
QD	**Discharge, Canal Diversion (KCFS,CMS)**
QG	**Discharge from Power Generation (KCFS,CMS)**
QI	**Discharge, Inflow (KCFS,CMS)**
QL	**Discharge, Rule Curve (KCFS,CMS)**
QM	**Discharge, Pre-Project Conditions in Basin (KCFS,CMS)**
QN	**(S) Discharge, Minimum Flow (KCFS,CMS)**
QP	**Discharge, Pumping (KCFS,CMS)**
QR	**Discharge, River (KCFS,CMS)**
QS	**Discharge, Spillway (KCFS,CMS)**
QT	**Discharge, Computed Total Project Outflow (KCFS,CMS)**
QU	**Discharge, Controlled by Regulating Outlet (KCFS,CMS)**
QV	**Cumulative Volume Increment (KAF,MCM)**

Appendix F (continued)

QX	**(S) Discharge, Maximum Flow (KCFS,CMS)**
QY	**(S) Discharge, River at 7AM Local just prior to DATE/TIME Stamp (KCFS,CMS)**
R	**Radiation**
RA	**Radiation, Albedo (%)**
RC	**Radiation, Total Sky Cover (Tenths)**
RI	**Radiation, Accumulated Incoming Solar over specified Duration in Langleys (LY)**
RP	**Radiation, Sunshine Percent of Possible (%)**
RT	**Radiation, Sunshine Hours (Hours)**
S	**Snow Data**
SA	**Snow, Areal Extent of Basin Snow Cover (%)**
SD	**Snow, Depth (IN,CM)**
SF	**Snow, Depth (New Snowfall) (IN,CM)**
SL	**Snow, Elevation of Snow Line (KFT,M)**
SR	**Snow Report (Structure, Type, Surface, Bottom) (CODED)**
SS	**Snow Density (IN SWE/IN Snow, CM SWE/CM Snow)**
SW	**Snow, Water Equivalent (IN,MM)**
T	**Temperature Data**
TA	**Temperature, Air (Dry Bulb) (DF,DC)**
TC	**Temperature, Degree Days of Cooling (Above 65DF, 18.3DC) (DF,DC)**
TD	**Temperature, Dew Point (DF,DC)**
TF	**Temperature, Degree Days of Freezing (Below 32DF, 0DC) (DF,DC)**
TH	**Temperature, Degree Days of Heating (Below 65DF, 18.3DC) (9DF,DC)**
TM	**Temperature, Air (Wet Bulb) (DF,DC)**
TN	**(S) Temperature, Air (MIN) (DF,DC)**
TP	**Temperature, Pan Water (DF,DC)**
TS	**Temperature, Soil (DF,DC)**
TW	**Temperature, Water (DF,DC)**
TX	**(S) Temperature, Air (MAX) (DF,DC)**
U	**Wind**
UC	**Wind, Accumulated Wind Travel (MI,KM)**
UD	**Wind, Direction (Tens of Degrees)**
UL	**Wind, Travel Length Accumulated Over Specified Duration (MI,KM)**
US	**Wind, Speed (MI/HR,M/SEC)**
V	**Generation and Generator Data**
VB	**Voltage – Battery (Volt)**

Appendix F (continued)

VC	**Generation, Surplus Capacity of Units On Line (Megawatts)**
VE	**Generation, Energy Total (Megawatt Hours)**
VG	**Generation, Pumped Water, Power Produced (Megawatts)**
VH	**Generation Time (Hours)**
VJ	**Generation, Energy Produced from Pumped Water (Megawatt Hours)**
VK	**Generation, Energy Stored in Reservoir Only (Megawatt * 'Duration')**
VL	**Generation, Storage Due to Natural Flow Only (Megawatt " 'Duration')**
VM	**Generation, Losses Due to Spill and Other Water Losses (Megawatt * 'Duration')**
VP	**Generation, Pumping Use, Power Used (Megawatts)**
VQ	**Generation, Pumping Use, Total Energy Used (Megawatt Hours)**
VR	**Generation, Stored in Reservoir Plus Natural Flow (Energy Potential)**
VS	**Generation, Station Load, Energy Used (Megawatt Hours)**
VT	**Generation, Power Total (Megawatts)**
VU	**Generator, Status (ENCODED)**
VW	**Generation, Station Load, Power Used (Megawatts)**
W	**Water Quality**
WA	**Water, Dissoved Nitrogen and Argon (PPM,MG/L)**
WC	**Water, Conductance (uMHOS/CM)**
WG	**Water, Dissolved Total Gases, Pressure (IN-HG,MM-HG)**
WH	**Water, Dissolved Hydrogen Sulfide (MG/L)**
WL	**Water, Suspended Sediment (MG/L)**
WO	**Water, Dissolved Oxygen (PPM, MG/L)**
WP	**Water, PH (PH Value)**
WT	**Water, Turbidity (JTU)**
WV	**Water, velocity (FT/SEC,M/SEC)**
X	**Weather Codes**
XG	**Lightning, Number of Strikes per Grid Box**
XL	**Lightning, Point Strike (Assumed one Strike at Transmitted Latitude and Longitude**
XP	**Weather, Past; NWS Synoptic Code**
XR	**Humidity, Relative (%)**
XV	**Weather, Visibility (MI,KM)**
XW	**Weather, Present; NWS Synoptic Code**
Y	**Reserved for Unique, Station Specific Type Codes with Local Area**
YA thru YZ	**Assigned on an individual basis for unique data**
Z	**Reserved**

STANDARD HYDROLOGIC EXCHANGE FORMAT

2. DURATION CODES

PE D TSEP

CODE	EXPLANATION
I	Instantaneous
U	1 Minute
C	15 Minute
J	30 Minute
H	One Hourly
B	Two Hourly
T	Three Hourly
Q	Six Hourly
A	Eight Hourly
K	Twelve Hourly
L	Eighteen Hourly
D	Daily (Twenty Four Hourly)
W	Weekly
M	One Month (Monthly)
Y	Yearly
P	Duration for a Period Beginning at Previous 7 AM Local and Ending at Time of Observation
V	Variable Period, Duration Defined Separately
S	Period of Seasonal Duration (normally used to designate a Partial Period, for Example 1 January to Current Date)
R	Entire Period of Record
X	Unknown Duration
Z	Filler Character

(UNITS)

STANDARD HYDROLOGIC EXCHANGE FORMAT

3. TYPE AND SOURCE CODES

PED TS EP

CODE	EXPLANATION
C	**Contingency Data**
C1	**Contingency 1**
C2	**Contingency 2**
C3 thru C9	**Contingency 3 thru 9**
CA thru CY	**Contingency A thru Y**
CZ	**Nonspecific Contingency (Default for this Type Category)**
F	**Forecast**
FA	**Adjusted Model 1**
FB	**Adjusted Model 2**
FC	**Adjusted Model 3**
FD	**Adjusted Model 4**
FE	**Public version, External**
FM	**Manual Method Number 1**
FN	**Manual Method Number 2**
FP	**Manual Method Number 3**
FQ	**Manual Method Number 4**
FU	**Unadjusted Model 1**
FV	**Unadjusted Model 2**
FW	**Unadjusted Model 3**
FX	**Unadjusted Model 4**
FZ	**Nonspecific Forecasted Data (Default for this Type Category)**
H	**Reserved for Historical Data Uses**
P	**Processed Data (Nonforecast) (Processes Defined Locally or by Convention Among Interrelated Users)**
PA	**Process #1**
PB	**Process #2**
PC	**Process #3**
PD	**Process #4**

(UNITS)
Type and Source Codes (Continued)

PE-PY	**Process #5 through #25**
PZ	**Nonspecific Processed Data (Default for this Type Category**
R	**Reading (Observed) Data**
RA	**Best Quality (Retrieve Code, Not for Transmission**
RB	**2nd Best (Retrieve Code, Not for Transmission)**
RC	**3rd Best (Retrieve Code, Not for Transmission)**
RD	**4th Best (Retrieve Code, Not for Transmission)**
RG	**GOES**
RM	**Meteor Burst**
RP	**Phone ASCII (DARDC)**
RR	**Radio #1**
RS	**Radio #2**
RT	**Telemark/BDT (Phone Audio)**
RV	**Visual/Manual #1**
RW	**Visual/Manual #2**
RX	**Visual/Manual #3**
RZ	**Nonspecific Observed Reading (Default for this Category, and universal Default for Type/Source)**

STANDARD HYDROLOGIC EXCHANGE FORMAT

4. EXTREMA CODES

PEDTS E P

CODE	EXPLANATION
J	Minimum of Record
K	Minimum of Year (Calendar)
L	Minimum of Month
M	Minimum of Week
N	Minimum of Day
P	Minimum of 12 Hours
T	Maximum of Record
U	Maximum of Year (Calendar)
V	Maximum of Month
W	Maximum of Week
X	Maximum of Day
Y	Maximum of 12 Hours
Z	Null Character (Filler)

STANDARD HYDROLOGIC EXCHANGE FORMAT

5. PROBABILITY CODES

PEDTSE P

CODE		EXPLANATION
A	.002	Chance Value is at or Below the Specific Value
B	.004	" "
C	.01	" "
D	.02	" "
E	.04	" "
F	.05	" "
1	.1	" "
2	.2	" "
G	.25	" "
3	.3	" "
4	.4	" "
5	.5	" "
6	.6	" "
7	.7	" "
H	.75	" "
8	.8	" "
9	.9	" "
T	.95	" "
U	.96	" "
V	.98	" "
W	.99	" "
X	.996	" "
Y	.998	" "
J	.0013	Chance Value Below Specified: -3 Standard Deviations
K	.0228	Chance Value Below Specified: -2 Standard Deviations
L	.1587	Chance Value Below Specified: -1 Standard Deviations
M	Mean (Expected Value)	
N	.8413	Chance Value Below Specified: +1 Standard Deviations
P	.9772	Chance Value Below Specified: +2 Standard Deviations
Q	.9987	Chance Value Below Specified: +3 Standard Deviations
Z	Null Character (Filler)	

REFERENCE 1

ORGANIZATION ADDRESS AND PROJECT LIST

ORGANIZATION AND PROJECTS	MAILING ADDRESS	TELEPHONE NUMBER
US Army Corps of Engineers		
Northwestern Division Corps of Engineers	**PO Box 2870 Portland OR 97208-2870**	**(503) 808-3954**
Portland District Corps of Engineers	**PO Box 2946 Portland OR 97208-2946**	**(503) 808-4870**
Seattle District Corps of Engineers	**4735 E Marginal Way S Seattle WA 98134-2385**	**(206) 764-3529**
Walla Walla District Corps of Engineers	**201 N 3rd Ave Walla Walla WA 99362-1876**	**(509) 527-7289**
Albeni Falls Dam	**PO Box 396 Newport WA 99156**	**(208) 437-3133**
Bonneville Dam	**Cascade Locks OR 97014-0150**	**(503) 374-8338**
Chief Joseph Dam	**PO Box 1120 Bridgeport WA 98813**	**(509) 686-5501**
Libby Dam	**17 115 Hwy 37 Libby MT 59923**	**(406) 293-7751**
Cougar Dam (Blue River Dam)	**PO Box 198 Blue River OR 97413**	**(541) 822-3344**
Detroit Dam/Big Cliff Dam	**Star Route 317 Mill City OR 97360**	**(503) 897-2385**
Dworshak Dam	**PO Box 148 Ahsaka ID 83520**	**(208) 476-3293**
Ice Harbor Dam	**RR 6 Box 693 Pasco WA 99301**	**(509) 547-7781**

Reference 1 (continued)

Little Goose Dam	**RR 2 Box 355 Dayton WA 99328**	**(509) 399-2233**
Lower Monumental Dam	**PO Box 10 Kahlotus WA 99335**	**(509) 547-7781**
Lower Granite Dam	**885 Almata Ferry Rd Pomeroy WA 99347**	**(509) 843-1493**
McNary Dam	**201 N 3rd Ave Walla Walla WA 99362**	**(541) 922-3211**
The Dalles/John Day Dam	**PO Box 564 The Dalles OR 97058**	**(541) 298-7502**
Upper Willamette Valley Projects (Lookout Point Dam/Dexter, Hills Creek, Fern Ridge, Dorena, Cottage Grove, Fall Creek)	**PO Box 429 Lowell OR 97432**	**(503) 937-2131**
Mid-Willamette Valley Projects (Foster/Green Peter Dams)	**PO Box 807 Foster OR 97345**	**(541) 367-5124**
Rogue River Basin (Lost Creek/Applegate Dams)	**31600 Hwy 62 Trail OR 97541**	**(541) 878-2255**

NONCORPS AGENCIES

BC Hydro Power & Authority	**E15 6911 Southpoint Dr Burnaby BC V3N4X8**	**(604) 528-7784**
Bonneville Power Administration Portland	**PO Box 3621 Portland OR 97208-3621**	**(530) 230-4341**
Bonneville Power Administration Dittmer – Vancouver	**PO Box 491 Vancouver WA 98666-**	**(360) 418-2319**
CASSO Corporation	**1330 N Washington Suite 3550 Spokane WA 99201**	**(509) 495-4599**

Reference 1 (continued)

Chelan County PUD #1	**PO Box 1231** **Wenatchee WA 98801-1231**	**(509) 663-8121**
Douglas County PUD #1	**1151 Valley Mall Pkwy** **E. Wenatchee WA 98801-4497**	**(509) 884-7191**
Grant County PUD #2	**PO Box 878** **Ephrata WA 98823**	**(509) 754-5093**
National Weather Service (NWS)	**5241 NE 122nd Ave** **Portland OR 97230**	**(541) 276-7832**
Pacificorps	**9951 SE Ankeney** **Portland OR 97216**	**(503) 251-5182**
Port of Portland	**6208 N Ensign** **Portland OR 97217**	**(503) 240-2203**
Portland General Electric	**121 SW Salmon** **Portland OR 97204**	**(503) 464-7067**
Puget Sound and Energy (PSE)	**13635 NE 80th** **Redmond WA 98052**	**(425) 452-1234**
Seattle City Light (Ross, Diablo, Gorge & Boundary Dams)	**614 NW 46th St** **Seattle WA 98107**	**(206) 706-0241**
Tacoma City Light	**PO Box 11007** **Tacoma WA 98411**	**(253) 502-8291**
US Bureau of Reclamation (Boise)	**1150 N Curtis** **Suite 100** **Boise ID 83706**	**(208) 378-5183**
US Bureau of Reclamation Grand Coulee Dam	**PO Box 620** **Grand Coulee WA 99133**	**(509) 633-9492**
USDA/NRCS	**101 SW Main St** **Suite 1600** **Portland OR 97204**	**(503) 414-3268**
U.S. Geological Survey (USGS)	**10615 SE Cherry Blossom Drive** **Portland OR 97216**	**(503) 251-3295**

REFERENCE 2
STATION SCHEDULED TRANSMISSIONS

ALBENI FALLS

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
ALF	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY	BE,BP,NS,LI,RR, YY
	H	XA (STATION (HOPI) *	08,16,24		BE,BP,NS,LI,RR, YY
ALF	D	VT,VR,ID,QD,QV QS,EL,FD,TD	DAILY	24	BE,BP,NS,RR,YY
ALF	A	MX,MN,OB,PP,SD, SX,TW,DD	08	08	BE,BP,NS,RR,ZZ
BOX	A	QD,FB,FD	24	24	BE,BP,NS,RR,ZZ
TOM	A	QD	24	24	BE,BP,NS,RR,ZZ
NOX	A	FB,QD	24	24	BE,BP,NS,RR,ZZ
CAB	A	FB,QD,DD	24	24	BE,BP,NS,RR,ZZ

*** NOTES**

XA is the lake elevation at the Hope gage. This datum is only sent four times each day with the hourly transmission.

BONNEVILLE DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	DIRECTING CODES
BON	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY	XX,RR,BE
	H	XA,XB (Station STVW), XC ,XD*			
BON	D	VT,VR,ID,QD,QV QS,EL,FD,TD	DAILY	24	ZZ,RR,BE
	D	YA *			
BON	A	MX,MN,OB,PP	07	07	ZZ,RR,BE
BON	F *	AL,BB,CA,CJ,FL, KA,KJ,SH,WF,WT	DAILY (Seasonal)	22	ZZ,RR
BON	A	QA,QU	DAILY	VARIES	RR,BE

*** NOTES**

XA is the spillway forebay elevation.

XB is the Stevenson Reservoir elevation.

XC is the project tailwater elevation.

XD is the number of spillway gates open at the time of the hourly transmission. This datum is used seasonally in water quality modeling.

EL (in the daily summary) is taken at the spillway forebay gage.

YA is the daily average tailwater elevation.

Bonneville (continued)

Fish counts are separated for the right and left fish ladders. Fish counting season is generally from March 15, through November 15, but this can vary from year-to-year. Water quality data are reported, generally, from the beginning of March through July.

COUGAR DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
CGR	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY 07-23	WW,RR,BE
	H	XA *	07,12,18,23	07,12,18,23	WW,RR,BE
CGR	D	VT,VR,ID,QD,QV QS,EL,FD,TD	DAILY	24	BE,BP,NS,RR,YY
	D	YA *	DAILY	24	WW,RR,BE
CGR	A	MX,MN,OB,WX,PP	07	07	WW,RR,BE
BLU	A	FB,AF	07	07	WW,RR,BE
SFCO	B	QD	DAILY	07	WW,RR,BE
CGRO	B	QD	DAILY	07	WW,RR,BE
SFCO	B	GH,Q	07	07	WW,RR,BE
CGRO	B	GH,Q	07	07	WW,RR,BE
BRTO	B	GH,Q	07	07	WW,RR,BE
LOCO	B	GH,Q	07	07	WW,RR,BE
BLUO	B	GH,Q	07	07	WW,RR,BE
BLUO	A	QT	Event related *		RR

*** NOTES**

XA is accumulated precipitation and is only transmitted four times each day.

YA is midnight lake storage.

QT is an event related parameter that is transmitted only when discharge changes due to a change in the number of gate openings.

Cougar Dam is only manned from 0700 through 1600 (and occasionally 2300).

During nonstaffed hours, Lookout Point Project transmits parameters VE and VS for the Cougar Project on an hourly basis.

CHIEF JOSEPH

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
CHJ	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY 07-23	RR,YY,BE,NS
	H	XA,XB,XC,XD,XE XF,XG *			
CHJ	D	VT,VR,ID,QD,QV QS,EL,FD,TD	DAILY	24	ZZ,RR,BE
	D	YA *	DAILY	24	WW,RR,BE
CHJ	A	MX,MN,OB,PP	24	08	RR,YY,BE,NS
CHJ	A	GA *	01,05,09, 13,17,21 (Seasonal)	11,22	RR,ND

*** NOTES**
XA is mean hourly forebay elevation.
XB is mean hourly tailwater elevation.
XC is unit hours for the hour.
XD is plant generation capacity for that hour.
XE is the number of units available.
(Continued)
XF is the number of old units not on forced outage.
XG is the number of new units not on forced outage.
The parameter GA is part of the Water Quality program. Other water quality parameters are now being sent automatically. GA will continue to be sent via the CBT during the months of March through July.

DETROIT DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
DET	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY	WW,RR,BE
	H	XA *	06,12,18,24	HOURLY	WW,RR,BE
BCL	H	VE,VS,QH,QE,QW, FB,TW,VC,VU	HOURLY	HOURLY	WW,RR,BE
DET	D	VT,VR,ID,QD,QV, QS,EL,FD,TD	DAILY	24	WW,RR,BE
	D	YA *	DAILY	24	WW,RR,BE
DET	A	IS	06	06	WW,RR,BE
BCLO	A	QD	24	06	WW,RR,BE
BCLO	A	GH,Q	06	06	WW,RR,BE
BCKO	A	GH,Q	06	06	WW,RR,BE
BRBO	A	GH,Q	06	06	WW,RR,BE

*** NOTES**
XA for Detroit is accumulated precipitation and is only transmitted for the 06,12,18 and 24 hours.
YA for both Detroit and Big Cliff is the midnight lake storage.

DWORSHAK DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
DWR	A	MX,MN,OB,PP,WF	08	08	RR

*** NOTES**
McNary Project transmits all hourly and daily data.

EPHRATA, GRANT COUNTY P.U.D.

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
PRD	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY	YY,RR,BE,MC
	H	XA,XB,XC,XD,XF, XG, XH *	HOURLY	HOURLY	YY,RR,BE,MC
WAN	H	VE,VS,QH,QE,QW, FB,TW,VC,VU	HOURLY	HOURLY	YY,RR,BE,MC
	H	XA,XB,XC,XD,XF, XG,XH *	HOURLY	HOURLY	YY,RR,BE,MC
PRD	D	VT,VR,ID,QD,QV, QS,EL,FD,TD	DAILY	24	ZZ,RR,BE
WAN	D	VT,VR,ID,QD,QV, QS,EL,FD,TD	DAILY	24	ZZ,RR,BE
PRD	F *	AL,BB,CA,CJ,FL, KA,KJ,SH,WF,WT	DAILY (Seasonal)	22	ZZ,RR
WAN	D*	TW	DAILY	24	ZZ,RR
	H*	TW,YO,YP,YT	HOURLY	HOURLY	ZZ,RR
PRD	A	BH,GA,NP,NT,OP,	01,05,09, 13,17,21 (Seasonal)	11,22	RR,ND
PRD	D*	TW	DAILY	24	ZZ,RR
	H*	TW,YO,YP,YT	HOURLY	HOURLY	ZZ,RR
WAN	A	WF	24	24	RR,ND

*** NOTES**
PRD (PRIEST RAPIDS):
XA is estimated generation capacity.
XB is the delivery to Seattle City Light for that hour.
XC is the delivery to Tacoma City Light.
XD is the delivery to Grant County P.U.D.
XE is the delivery to Cowlitz County P.U.D.
XF is the delivery to MINI-MUNIS.
XG is spill for downstream fish migration.
XH is spill for nitrogen reduction.
TW at the Priest Rapids Project is water temperature.
YO at the Priest Rapids Project is oxygen pressure.
YP at the Priest Rapids Project is barometric pressure.
YT at the Priest Rapids Project is total dissolved gas reading.
WAN (WANAPUM):
XA is estimated generation capacity.
XB is the delivery to Pacific Power and Light for that hour.
XC is the delivery to Portland General Electric.
XD is the Priest Rapids encroachment on Wanapum.
XE is the spawning channel energy use.
XF is the delivery to Eugene Water and Electric.
XG is the spill for downstream fish migration.
XH is the spill for nitrogen reduction.
TW at the Wanapum Project is water temperature.
YO at the Wanapum Project is oxygen pressure.
YP at the Wanapum Project is barometric pressure.
YT at the Wanapum Project is total dissolved gas reading

(Ephrata, Grant County PUD (Continued)

Fish counts at Priest Rapids are transmitted for both the right and left fish ladders. The fish counting season runs from April 12, through October 20, and may vary from year-to-year. The water quality season usually is March through July. The Grant County P.U.D. office in Ephrata also transmits the hourly coordination accounting report for the five P.U.D. Projects (Grant County, Douglas County, Chelan County, Cowlitz County and Okanogan County) and Chief Joseph and Grand Coulee Projects. This report is sent hourly to call directing codes ZZ, RR, and BE. Ephrata also issues a load estimate each day before noon for the following day for five P.U.D. Projects and Chief Joseph and Grand Coulee. A load distribution schedule is also included in this transmission.

FOSTER DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
FOS	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY	WW,RR,BE
	H	XA *	24	24	WW,RR,BE
GPR	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY	WW,RR,BE
FOS	D	VT,VR,ID,QD,QV, QS,EL,FD,TD	DAILY	24	WW,RR,BE
	D	YA *	DAILY	24	WW,RR,BE
GPR	D	VT,VR,ID,QD,QV, QS,EL,FD,TD	DAILY	24	WW,RR,BE
	D	YA *	DAILY	24	WW,RR,BE
FOS	A	MX,MN,OB,WX,PP	07	07	WW,RR
FOS	A	IQ	06	06	WW,RR,BE
GPR	A	IQ	06	06	WW,RR,BE
SSCO	B	QD	DAILY	06	WW,RR
SSFO	B	QD	DAILY	06	WW,RR
WCFO	B	QD	DAILY	06	WW,RR
SSCO	B	GH,Q	06	06	WW,RR
SSFO	B	GH,Q	06	06	WW,RR
WCFO	B	GH,Q	06	06	WW,RR

*** NOTES**
XA is rainfall accumulation and is only sent at 2400 hours.
YA is the midnight lake storage for both Foster and Green Peter Projects.

GRAND COULEE DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
GCL	H	VE,VS,QH,QE,QW FB,TW,VC,VU	HOURLY	HOURLY	RR,YY,BE
	H	XA (Station BNK) XB (Station GCL) XC,XD,XE (Station BNK), XF,XG,XH (Station GCL) *	HOURLY	HOURLY	RR,YY,BE
GCL	D	VT,VR,ID,QD,QV, QS,EL,FD,TD	DAILY	24	RR,ZZ,BE
	D	YA,YB,YC,YD,YE (Station BNK)	DAILY	24	RR,ZZ,BE
GCL	A	MX,MN,OB,PP	24	24	RR,ZZ
GCL	A	QA,QU	DAILY	24	RR

*** NOTES**

XA is the number of 600 MW units running and the number available, where the first two numbers are the number running and the third is the number available. This is stored under Station Banks (BNK).

XB is the number of 700 MW units regulating, on line and available, where each number is two digits, totaling a six digit number.

XC is the number of pump generator units on line and available, where the number contains only two digits and is stored in BNK.

XD is the number of megawatts used for pumping. This is stored in Station BNK.

XE is the number of megawatts generated by pump generators and is stored in BNK.

XF is the plant capacity.

XG is the maximum generation during the hour.

XH is the minimum generation allowable during the hour.

YA is the total daily pump discharge and is stored in Station BNK.

YB is the total pump generation and is stored in BNK.

YC is the Banks Lake elevation at midnight (stored in BNK).

YD is the total discharge from the pump generators, stored in BNK.

YE is total daily pump generation, stored in BNK.

ICE HARBOR DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
IHR	F *	AL,BB,CA,CJ,FL, KA,KJ,KM,SH,WF,WT (Station BNK)	DAILY (Seasonal)	22	ZZ,RR
IHR	A	MX,MN,OB,PP,WV	DAILY	24	ZZ,RR
IHR	A	GA	08,16,24, 13,17.21	HOURLY	RR,ND

*** NOTES**

The fish counting season is April 1, through October 31, and may vary. Fish counts are separated for the right and left fish ladders. Hourly and daily data are sent by McNary Project.

GA is the number of spillway gates open during the hour and this datum is only sent during the water quality season, March through July.

JOHN DAY DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
JDA	H	VE,VS,QH,QE,QW, FB,TW,VC,VU	HOURLY	HOURLY	XX,RR,BE
	H	XA	HOURLY	HOURLY	
JDA	D	VT,VR,ID,QD,QV, QS,EL,FD,TD	DAILY	24	ZZ,RR,BE
JDA	F *	AL,CA,CJ,FL,KA,KE, KJ,KM,KT,SH,WF, WT	DAILY (Seasonal)	22	ZZ,RR

*** NOTES**

XA is the number of spillway gates open at the time of transmission. This is a seasonal datum sent during the water quality season, March through July. Fish counts are made for both the right and left fish ladders during the counting season: April 1, through October 31.

LITTLE GOOSE DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
LGS	F *	AL,BB,CA,CJ,FL,KA, KJ,KT,SH,WF,WT (Seasonal)	DAILY	22	ZZ,RR
LGS	A *	GA	01,05,09, 13,17,21 (Seasonal)	11,22	RR,ND

*** NOTES**
Fish counts are made, generally, from April 1, through October 31. Only total counts are sent. There is no separation for right and left fish ladders. The water quality season is from March through July. Hourly and daily data re sent by McNary Project.

LIBBY DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
LIB	H	VE,VS,QH,QE,QW, FB,TW,VC,VU	HOURLY	HOURLY	RR,NS,BE,AL
LIB	D	VT,VR,ID,QD,QV, QS,EL,FD,TD	DAILY	24	RR,NS,BE,AL
	D	YA *	DAILY	24	RR,NS,BE,AL
LIB	A	MX,MN,OB,PP,WX	08	08	RR,NS,BE,AL

*** NOTES**
YA is lake storage at midnight.

LOWER MONUMENTAL DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
LMN	F *	AL,CA,CJ,FL, KM,SH,WF,WT	DAILY	22 (Seasonal)	RR,ZZ
LMN	A *	GA	HOURLY	11,22	RR,ND

*** NOTES**
Hourly and daily data are sent by McNary Project. Fish counts are made generally from the beginning of April through October. The counts are transmitted for both the right and left ladders.
GA is the number of spillway gates open during the hour. This information is only transmitted during the water quality season, March through July.

LOOKOUT POINT DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
LOP	H	FB,QE,QH,QS,TW, VC,VE,VS,VU	HOURLY	HOURLY	WW,RR,BE
	H	XA *	06,09,12, 18.21,24	HOURLY	WW,RR,BE
HCR	H	FB,QE,QH,QS,TW, VC,VE,VS,VU	HOURLY	HOURLY	WW,RR,BE
DEX	H	FB,QE,QH,QS,TW, VC,VE,VS,VU	HOURLY	HOURLY	WW,RR,BE
LOP	D	EL,FD,ID,QD,QS, QV,TD,VR,VT	DAILY	24	WW,ZZ,RR,BE
	D	YA *	DAILY	24	WW,ZZ,RR,BE
HCR	D	EL,FD,ID,QD,QS, QV,TD,VR,VT	DAILY	24	WW,ZZ,RR,BE
	D	YA *	DAILY	24	WW,ZZ,RR,BE
DEX	D	EL,FD,ID,QD,QS, QV,TD,VR,VT	DAILY	24	WW,ZZ,RR,BE
	D	YA *	DAILY	24	WW,ZZ,RR,BE
LOP	A	MN,MX,OB,PP,PE, WX	DAILY	08	WW,RR
HCOO	B	QD	24	06	WW,RR
MFOO	B	QD	24	06	WW,RR
HCRO	B	QD	24	06	WW,RR
DEXO	B	QD	24	06	WW,RR
HCOO	B	GH,Q	06	06	WW,RR
MFOO	B	GH,Q	06	06	WW,RR
HCRO	B	GH,Q	06	06	WW,RR
DEXO	B	GH,Q	06	06	WW,RR
FAL	B	EL,AF	07	07	WW,RR
COT	B	EL,AF	07	07	WW,RR
DOR	B	EL,AF	07	07	WW,RR
FRN	B	EL,AF	07	07	WW,RR
FCLO	B	GH,Q	07	07	WW,RR
FALO	B	GH,Q	07	07	WW,RR
LONO	B	GH,Q	07	07	WW,RR
COTO	B	GH,Q	07	07	WW,RR
DRRO	B	GH,Q	07	07	WW,RR
DORO	B	GH,Q	07	07	WW,RR
NOTO	B	GH,Q	07	07	WW,RR
CRWO	B	GH,Q	07	07	WW,RR
MNRO	B	GH,Q	07	07	WW,RR
FRNO	B	GH,Q	07	07	WW,RR
COTO	B	QT	*		RR
DORO	B	QT	*		RR
FRNO	B	QT	*		RR
FALO	B	QT	*		RR
COT	B	WX,PP,PE	07	07	WW,RR
DOR	B	WX,PP,PE	07	07	WW,RR
FRN	B	WX,PP,PE	07	07	WW,RR

Lookout Point (continued)

*** NOTES**
XA at Lookout Point is accumulated precipitation; this value is only sent six times each day.
YA at all projects (Lookout Point, Hills Creek and Dexter) is the midnight lake storage.
QT is not sent at regular times. This number is sent only when the discharge from the project is changed.

LOST CREEK DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
LOS	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	WW,RR,BE
	H	XA *	06,12,18, 24	HOURLY	WW,RR,BE
LOS	D	EL,FD,ID,QD,QS, QV,TD,VR,VT	DAILY	24	WW,RR,BE
	D	YA *	DAILY	24	WW,RR,BE
LOS	A	MN,MX,0B,PP,WX	07	07	RR,WW
PRSO	B	QD	DAILY	07	RR,WW
SFRO	B	QD	DAILY	07	RR,WW
MLBO	B	QD	DAILY	07	RR,WW
MCLO	B	QD	DAILY	07	RR,WW
PRSO	B	GH,Q	06	07	RR,WW
SFRO	B	GH,Q	06	07	RR,WW
MLBO	B	GH,Q	06	07	RR,WW
MCLO	B	GH,Q	06	07	RR,WW
APP	A	AF,FB,PP	04,08,10 16,22,24	04,08,10, 16,22,24	RR,WW
APPO	A	GH,Q,WF	04,08,10 16,22,24	04.08,10 16,22,24	RR,WW
APPO	A	QT	*		RR,WW

*** NOTES**
XA is the accumulated precipitation.
YA is the lake storage at midnight.
QT is not transmitted on a regular basis. The value represents a change in discharge from the Applegate Project.

LOWER GRANITE DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
LWG	F *	AL,CA,CJ,FL, SH,WF,WT	DAILY	22 (Seasonal)	RR,ZZ
LWG	A	GA *	HOURLY (Seasonal)	22,22	RR,ND

*** NOTES**
The McNary Project sends all hourly and daily transmissions. Fish counts are sent from the beginning of February through December. The counts indicate totals as opposed to being separated for right and left ladders. Water temperature and turbidity are sent year around (weather permitting). GA is the number of spillway gates that are open. This parameter is part of the water quality program. The datum is sent generally from March through July.

MCN	H	XA *	HOURLY	HOURLY	XX,RR,BE
IHR	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	XX,RR,BE
LMN	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	XX,RR,BE
LGS	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	XX,RR,BE
LWG	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	XX,RR,BE
	H	XA * (Station LWS)	HOURLY	HOURLY	XX,RR,BE
DWR	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	XX,RR,BE
	H	XA * (Station PEKI)	HOURLY	HOURLY	XX,RR,BE
MCN	D	EL,FD,ID,QD,QS, TD,VT,VR,VT	DAILY	24	ZZ,RR,BE
IHR	D	EL,FD,ID,QD,QS, TD,VT,VR,VT	DAILY	24	ZZ,RR,BE
LMN	D	EL,FD,ID,QD,QS, TD,VT,VR,VT	DAILY	24	ZZ,RR,BE
LGS	D	EL,FD,ID,QD,QS, TD,VT,VR,VT	DAILY	24	ZZ,RR,BE
LWG	D	EL,FD,ID,QD,QS TD,VT,VR,VT	DAILY	24	ZZ,RR,BE
	D	YA * (Station LWS)	DAILY	24	ZZ,RR,BE
DWR	D	EL,FD,ID,QD,QS TD,VT,VR,VT	DAILY	24	ZZ,RR,BE
	D	YA *	DAILY	24	ZZ,RR,BE
MCN	F *	BB,CA,CJ,FL,JB, JF,JK,JR,JS,KA,KJ, KM,SH.WF,WT	DAILY (Seasonal)	22	ZZ,RR
MCN	A	MN,MX,OP,PP,WV	06	06	XX,RR,BE

*** NOTES**
XA at Lower Granite is the gage height of the Lewiston gage, upstream of the project.
XA at Dworshak is the gage height of the Peck Gage, downstream of the project.

Lower Granite (continued)

YA at Lower Granite is the daily average gage height at the Lewiston gage. Fish counts are transmitted for both the right and left ladders at McNary Dam from the beginning of April through the end of October. The fish counts also include the number of fingerlings that are transported via barge and truck around the dam. McNary project also transmits water quality parameters during the months of March through July. McNary Project has two water quality instruments in the forebay and the data are transmitted in the "F" format for both the right and left instruments.

YA at Dworshak is the midnight lake storage.

XA at McNary Project is the number of spillway gates open at the time of transmission. This is a seasonal water quality parameter and is only transmitted from March through July.

SEATTLE DISTRICT

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
HAH	A	IS,MN,MX,PP,	08	09	RR,LI,ZZ
MMD	A	IS,MN,MX,PP Q * (Station MMDW)	08	09	RR,LI,ZZ
WYN	A	IS,MN,MX,PP	08	09	RR,LI,ZZ

*** NOTES**

Q at Mud Mountain is stored in station MMDW.

THE DALLES DAM

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
TDA	H	FB,QE,QH,QW,TW,	HOURLY	HOURLY	XX,RR,BE
TDA	H	XA * VC,VE,VS,VU	HOURLY	HOURLY	XX,RR,BE
TDA	D	EL,FD,ID,QD,QS, QV,TD,VR,VT	DAILY	24	ZZ,RR,BE
TDA	F *	AL,CA,CJ,FL,KA, KJ,KM,SH,WF,WT	DAILY (Seasonal daily)	22	ZZ,RR
TDA	D*	TW	DAILY	24	ZZ,RR
	H*	TW,YO,YP,YT	HOURLY	24	ZZ,RR

*** NOTES**

XA is the number of spillway gates open during the hour. This parameter is sent during the water quality season, March through July.

TW at The Dalles Project is a water temperature reading.

YO at The Dalles Project is oxygen pressure reading.

YP at The Dalles Project is barometric pressure reading.

YT at The Dalles Project is dissolved gas reading.

Fish counts are transmitted for both the right and left ladders during the fish counting season, which is generally from the beginning of April through the end of October.

DOUGLAS COUNTY P.U.D.

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
WEL	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	YY,RR,BE
	H*	XA,XB,XC,XD, XE,XF,XG,XH	HOURLY	HOURLY	YY,RR,BE
WEL	D	EL,FD,ID,QD,QS, QV,TD,VR,VT	DAILY	24	ZZ,RR,BE
	D*	TW	DAILY	24	ZZ,RR
	H*	TW,YO,YP,YT	HOURLY	24	ZZ,RR
WEL	F *	AL,CA,CJ,FL,KA, KJ,KM,SH,WF,WT	DAILY	22	ZZ,RR
WEL	A*	BH,GA,NP,NT,OP, WC	01,05,09,13, 17,21 (Seasonal daily)	11,22	ZZ,ND

*** NOTES**

XA is estimated generation capacity for the next hour.
XB is the energy delivery to Puget Sound Energy (PSE) for the previous hour.
XC is the Wells encroachment on Chief Joseph.
XD is the net generation for the previous hour.
XE is the delivery to Douglas County P.U.D. for the hour.
XF is the delivery to Okanogan County P.U.D. for the hour.
XG is the fish spill that has been replaced.
XH is the fish spill that has not been replaced.
TW at the Wells Project is a daily water temperature reading.
YO at the Wells Project is an hourly oxygen pressure reading.
YP at the Wells Project is an hourly barometric pressure reading.
YT at the Wells Project is an hourly total dissolved gas reading.
Fish counting season generally runs from April through October. Wells Project has only one fish ladder, and fish counts are daily totals. Water quality measurements are made from April through July.

CHELAN COUNTY P.U.D.

STATION NAME	FORMAT	CBT PARAMETERS REPORTED	TIME OF OBSERVATION	TIME OF TRANSMISSION	RECEIVING CALL DIRECTING CODES
RIS	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	YY,RR,BE
	H *	XA,XB,XC,XD,XD XE,XF,XG	HOURLY	HOURLY	YY,RR,BE
RIS	D	EL,FD,ID,QD,QS, QV,TD,VR,VT	DAILY	24	ZZ,RR,BE
	D *	YA,TW	DAILY	24	ZZ,RR,BE
RIS	H*	TW,YO,YP,YT	HOURLY	24	ZZ,RR,BE
RIS	F *	AL,CA,CJ,FL,KA, KJ,KM,SH,WF,WT	DAILY (Seasonal)	22	ZZ,RR
RIS	A *	BH,GA,NP,NT,OP, WC	01,05,09, 13,17,21 (Seasonal daily)	11,22	ZZ,ND
RRH	H	FB,QE,QH,QW,TW, VC,VE,VS,VU	HOURLY	HOURLY	YY,RR,BE
	H *	XA,XB,XC,XD,XD, XE,XF,XG	HOURLY	HOURLY	YY,RR,BE
RRH	D	EL,FD,ID,QD,QS, QV,TD,VR,VT	DAILY	24	ZZ,RR,BE
RRH	D*	YA,TW	DAILY	24	ZZ,RR,BE
RRH	H*	TW,YO,YP,YT	HOURLY	24	ZZ,RR,BE
RRH	F *	AL,CA,CJ,FL,KA, KJ,KM,SH,WF,WT	DAILY (Seasonal)	22	ZZ,RR
RRH	A *	BH,GA,NP,NT,OP, WC	01,05,09, 13,17,21 (Seasonal)	11,22	ZZ,ND

***Notes**

AT THE ROCK ISLAND PROJECT:

XA at Rock Island is the encroachment on Rocky Reach.
XB is the Wanapum encroachment on Rock Island.
XC is the energy delivery to Colockum Transmission Company for the hour.
XD is Rock Island's peak capability for the hour.
XE is the fish spill for that hour.
XF is the replacement fish spill for the hour.
YA at the Rock Island Project is the forebay water temperature in degrees Celsius.
TW at the Rock Island Project is a daily water temperature reading.
YO at the Rock Island Project is an hourly oxygen pressure reading.
YP at the Rock Island Project is an hourly barometric pressure reading.
YT at the Rock Island Project is an hourly total dissolved gas reading.
Fish counts generally run from mid-April through the end of November. Rock Island only has one fish ladder, so the counts are daily totals. The water quality program begins in mid-April and continues through July.

AT THE ROCKY REACH PROJECT;

XA is the estimated generation capacity for the hour.
XB is the energy delivery to Puget Sound Power and Light for the hour.

Chelan County PUD (Continued)

XC is the energy delivery to Washington Water Power.
XD is Rocky Reach's encroachment on Wells.
XE is the Douglas County P.U.D. share of the hour's generation.
XF is the Rocky Reach fish spill for the hour.
XG is the replacement energy spill.
YA at the Rocky Reach Project is the forebay water temperature in degrees Celsius.
TW at the Rocky Reach Project is a daily water temperature reading.
YO at the Rocky Reach Project is an hourly oxygen pressure reading.
YP at the Rocky Reach Project is an hourly barometric pressure reading.
YT at the Rocky Reach Project is an hourly total dissolved gas reading.
Rocky Reach also counts fish from mid-April through November; however, Rocky Reach has two fish ladders, so fish counts are separated for the right and left ladders. The water quality program at Rocky Reach also runs from mid-April through July.